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November 1936 to December 1937

Better Crops WITH PLANT FOOD

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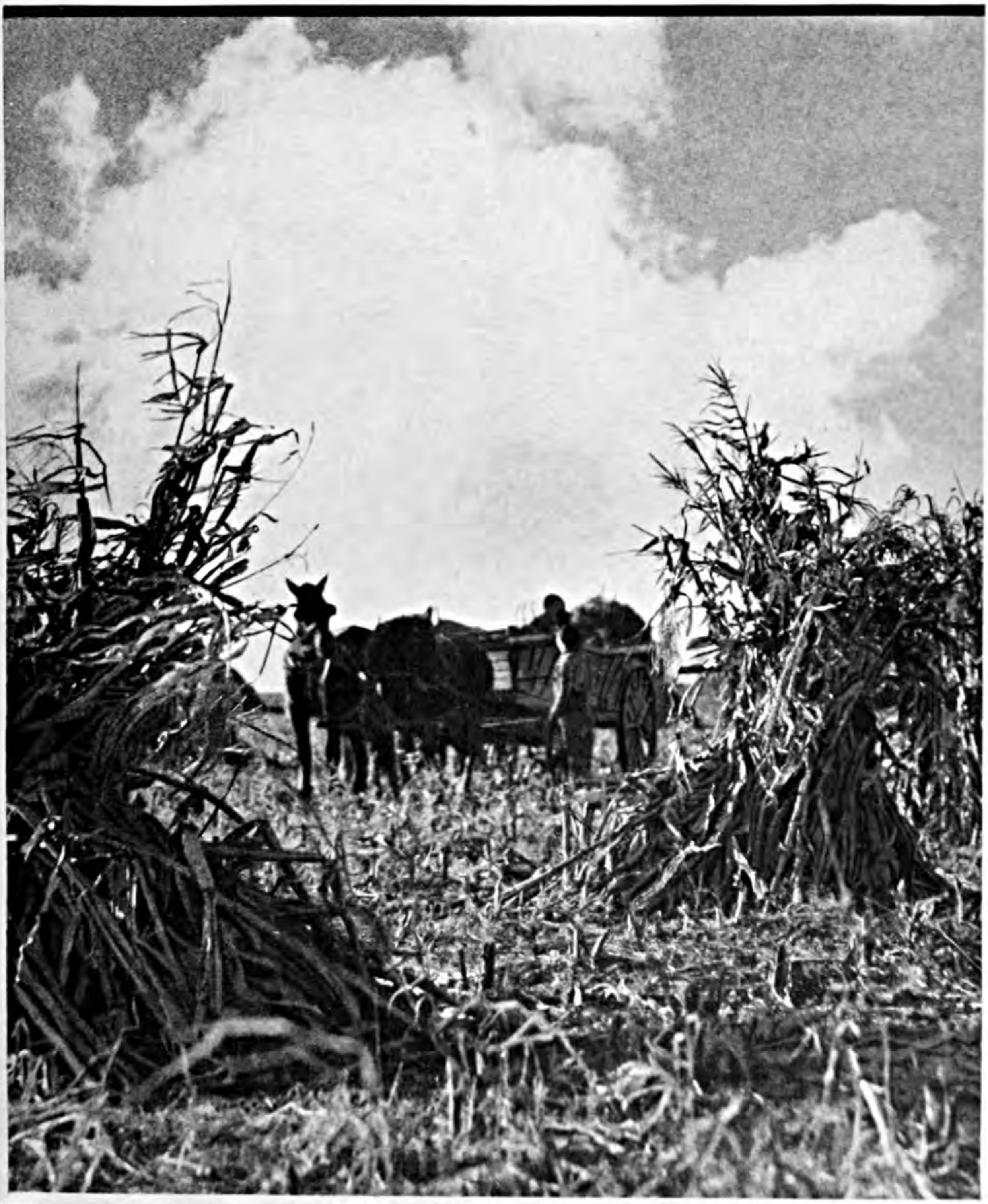

The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XXI NUMBER ONE

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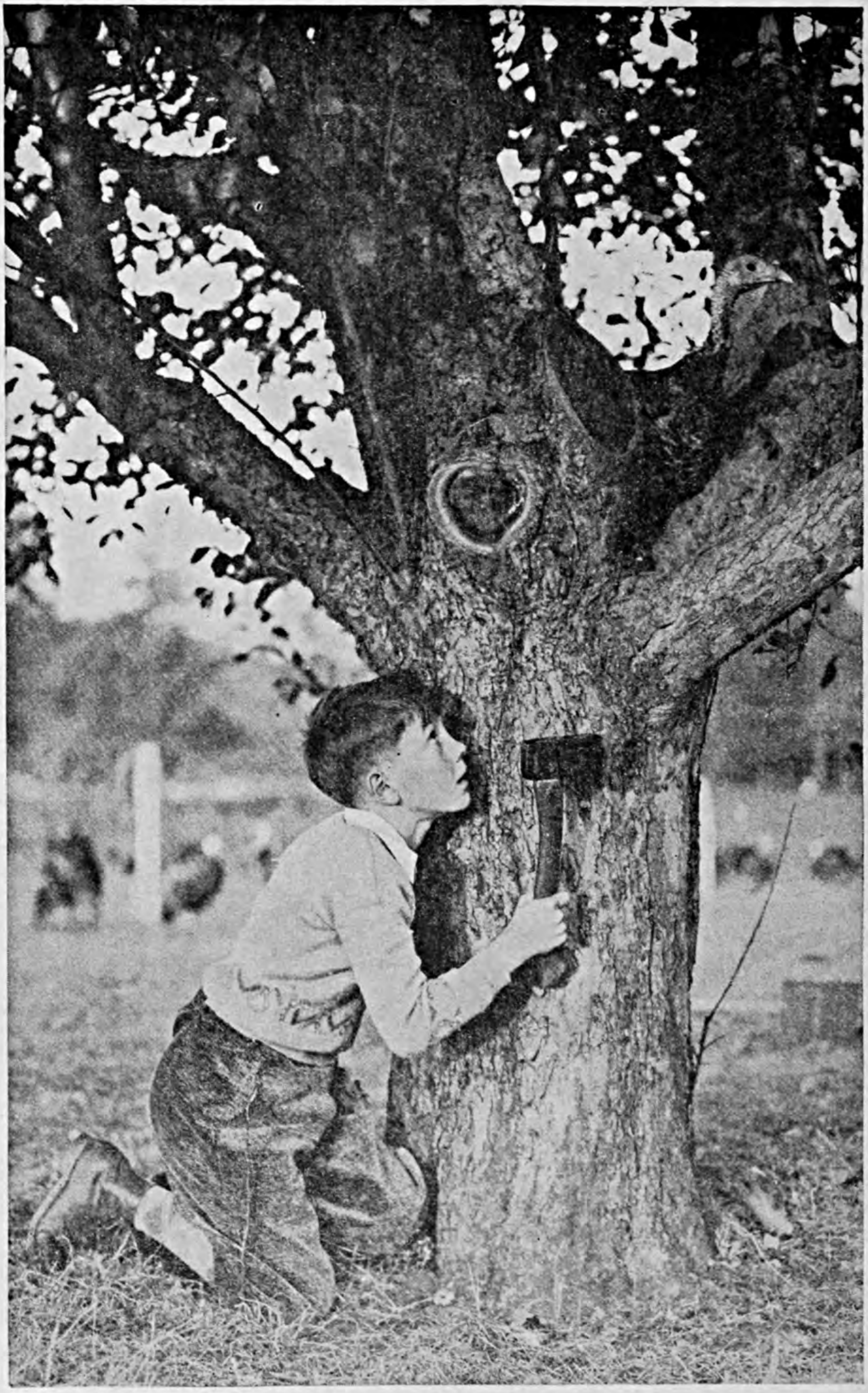

THE START OF A THANKSGIVING DINNER?

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., NOVEMBER 1936 No. 1

Jeff Journeys To Texas For

The Last Round-up

Jeff McDermid

LET me take you with me to the final round-up of the dairy breeds and their adherents—figuratively at least, the one held at Dallas, with its atmosphere of lactic placidity in the midst of the thundering hoofs of the Lone Star state's centennial cavalcade. We shall not be too literal and circumspect in our vaporings, and therefore do not be misled by the free use of the fictioneer's license, which I hold by virtue of several years of reviewing and recording on the fringes of many a smelly tanbark circus.

With numbered catalog clutched in eager hands and a stub pencil poised to mark the margins, we hover at the ropes and chat with old-timers of the breeds and the tyros as well, whilst the bulls come in for the judicial slaughter. After each trip made by the Texas lassie in her ten-gallon hat to award the ribbons and the roses to the sweaty halter haulers, we listen to the magnivox announcements by the vainglorious exponents of each traditional breed. Without cause for defense or any reason for offense, here goeth a sample of their jargon:

"Holsteins, page forty-five in your catalog, class ten, aged bulls, as follows: First, Skimmer & Waters on Pontiac's Flat Tire; second, Last Ditch Insurance Company on Sir Eaten Out of Homestead; third, Detts & Dicker on King Red Inks Hungerbelt.

"Jerseys, page twenty-three, class nine, four-year-old bulls, prizes as follows: First, Rone & Stox on Just Lousy with Lucre; second, Mrs. Goldie Harriman-Gould on Wexford Watch Charm; third, British Jersey Syndicate on John Bull of Baskerville.

"Brown Swiss, page sixty-five, class eight, aged bulls; First, Stauffacher & Stuessy on College Boy on a Bender; two and three, the Pretzel County Asylum on Bumpy's Brindle and Accidental Ox.

"Guernseys, page seventy-two, class seven, three-year-old bulls; First, The Scraper Farms on Langwater's Kick in the Slats; two and three, Wisconsinilla Board of Self-Control on May Rose with the Morn and Plutocrat's Hazard.

"Ayrshires, page fifteen of your catalog, class twelve, senior yearling bulls; First, MacTavish & Schlitz on Hoot Mon Uber Alles; second, Aberdeen Importing Co. on Slug o' Scotch; third, Thistle Acres Farm on We Dinna Ken Kine."

AND all the old familiar things! Judges furiously smoking stogies to send up a screen under which to make close decisions, in a land where derringers and lariats are numerous and active; the Man from Maryland spreading the good news that better days are here again in the auction ring; alert clerks checking numbers at the heads of cattle, and equally useful white-wings following with shovels at their rears.

Quiet banter goes on between the national Brown Swiss secretary and the assured president of the Holstein association, which ends in an agreement that the latter has the most past and the former retains the most future. Jerseymen and Guernseymen acknowledge to each other (to be polite) that, if they were not breeding their own kind of cows, they would be sure to choose the other's. Meanwhile the Ayrshire clansmen remain dourly aloof, as chary of words as they are of wallets.

CANES and lorgnettes and eastern accents denote the arrival of the Atlantic Jersey squadron, while a few hearty yips and yowsers proclaim that Gamboge and Oxford are gaining ground among the good hidalgos of the Rio Grande. Curious northern herdsmen gaze at the rows of Texas range-land brands and branding irons assembled in the outer halls, while a few timorous ones ask if by any chance the management intends to stamp the numbers on each winner with the fiery rods.

Delegations from the adjacent ranches with echoing bands and aching bunions stumble around the arena and soon refresh themselves with plates of Mexican chili and copious cups of kola-koka, or some more potent stimuli. And at noontime the judges, supers, and surveyors make the best of limited sight-seeing by a dash outside to take in the streets of Paris or Santa Anna's only original wooden leg. Meanwhile the chap with a flare for truth-in-advertising hunts up the show boss to point out that the dairy-show posters all bear Hereford lithographs, and he wants to know if that's the kind of milk they're bottling in Dallas. "Forget it," replies the secretary, "the best way to get even is to get Barney Heide to print a Brown Swiss bullock on the next International program."

BETWEEN jostles at noon I eschewed hoofs and horns for a brief perusal of political insults and injuries. During the intermission I was joined on the upper seats by the Man with Opinions. He approached with a paper box under each arm, one of which he laid on the cement cushions and the other he held. In his delivery of the following, he alternately stood up and sat down heatedly:

"Dairying, my dear friend," he shouted, "is at the zenith of its opportunity. There are more pedigreed cattle, more breed clubs, and more balanced rations available than America has ever beheld. The dairy cow is the queen of domestic industry, the foster mother of everything, the sire of success and the dam of progress! I have no patience with the Government for proposing a reduction program for milk, and I am equally disgusted with the administration because we didn't have any. The cotton barons got rich while we grew more grass and had less gravy. No, sir, the only safe road for dairymen is to follow the trail of rugged independence with science as their lodestar. "Right now," yelled he, "we have a new condensing and freezing process which will enable us to ship sweet milk from Oshkosh to El Paso, and with a few more pasteurizing orders and classifications, no milk shed in America will lack insulation and other modern improvements!" To which I said "Uh, huh," and he said, "Well, this excitement makes me hungry. Will you join me?"

I demurred because I had dined through a straw, and it was just as well, for the Man with Opinions held open on his lap one of those curious and motley collections of prickly Texas flora sold by the Skullduggery drug stores as "desert gardens." He hastily flung the cacti aside and arose to find a flattened lunch box beneath him. This, too, he quickly discarded. As he left me I reminded him that it was probably fortunate in the end that he had not done just the opposite trick, as judging by the contents of both boxes, both exterior and interior suffering would otherwise have been excessive and prolonged.

ALTHOUGH this was a painful noon hour it was of less personal embarrassment to me than what occurred the next day. "I'll see you over by the longhorns," said a stranger whose acquaintance I had scraped up in the ring. Taking him at his word I sauntered over during the recess to the extensive cheese display and hung around for an hour, while he in equal certitude went over to the range cattle show and waited for me in vain. In mutual explanations afterward we agreed that each was right and both were wrong—which seems the common lot of mortals.

Back in the ring again, I decided to see just how satisfied and united the dairymen were, based on things they might have to say. Hence I approached a doughty New England personage and remarked that no doubt the skies were clear again now that the Boston market had become relieved of the dead weight of a federal license.

"We would be as happy as the Green Mountain boys after Ticonderoga," replied he, "were it not for the constant threat of bootleg cream shipments from Vermont and the Mohawk Valley of York state."

"Not so good," I thought and turned to seek a rural New Yorker among the throng, and finally found him. "And I presume you are up and coming nicely with more employment," was my opener. "Pish, tush!" rejoined the Syracusan, "Our metropolitan markets are being filched from us by stealthy inroads of western cream, which should be kept at home for holey cheese and rancid butter."

Approaching a creamery patron of my own mid-west, I thrust the usual question at him, only to be told: "Rigid fluid milk control in the eastern markets means that they are able to get twice our prices and then dump the surplus into condensed channels or maybe into butter tubs. It's a rank injustice to us manufactured milk men. Then on top of that we have southern farmers going into the dairy game. They can produce poor cheese much cheaper than we can, and take the negro trade away from us."

PERPLEXED at this juncture and quite some alarmed, I hastened to Colonel Nowater Breckinridge for his august opinion, redolent of julep and justice.

"No, suh! You have no conception of the true situation, suh! As a matter of fact, nawthern bull-headedness about domestic vegetable oils and oleomargarine, coupled with their frequent underselling of pasteurized tank-car milk on our pure natural milk markets is bringing a crisis that will divide the country like sixty!"

However, I got different sentiments from two other trail blazers. One hailed from beyond the Great Divide in Oregon, and he answered me quaintly: "As long as we can keep the Rocky Mountains and a few deserts between us and the pestering dairymen of the rest of the country, we can run our show to capacity houses."

The second individual was a veterinary, and he withdrew a fat cigar long enough to say, "I'm right back at you with a 'bang!' As long as the disease-control fever keeps up we can sell cattle far, fast, and fancy. It's indemnities, not independence, that makes the cream thicker!"

Being muddled with the welter of human opinions and crossed viewpoints, I took more solace through a straw, furbished up my bovine vocabualry and sought as a last recourse the stall of the world's champion milk cow from Seattle.

Question: "Madam Champion, is it not true that the cows are more contented than their owners?"

Answer: "Yes, sire, a dam sight!"

Question: "And why, forsooth?"

Answer: "Because the 200-lb. cows don't worry because they can't produce as much as I do."

Question: "But the owners of the poor cows don't care much either do they?"

Answer: "Why should they? The world pays more for less milk and less for more milk. Our owners won't be contented until every family can have enough good milk without robbing producers."

Question: "Then what do you stand for?"

Answer: "I am the ideal cow for an ideal world where wants are filled for everyone."

Question: "But how about the law of supply and demand?"

Answer: "Oh, that's been changed to the law of bid high and be damned!"

Question: "You must be a socialist?"

Answer: "Moo to you! Just a well balanced rationist!"

Somebody shook my shoulder and informed me that I was not supposed to sleep on the straw in the "throne stall."

After considerable rampaging, not to say gallivanting, I met up with a shrewd salesman of the old school, who had plastered every fair-ground fence with feed signs from hither to yon; and who knew his dairying from the

(*Turn to page 45*)

Fertilized Legumes Pay Big Profits

By Ford S. Prince

Agronomist, New Hampshire College of Agriculture, Durham, New Hampshire

WITH the stress that is being placed upon soil-building crops in the soil conservation program and because of the significance of clover, alfalfa, and other legumes in northeastern dairy-farming systems, their proper fertilization is a question of live interest. The assumption has too often been held that these crops, since they have the power of taking free nitrogen from the air, need no fertilization, as they are in themselves soil-improving crops. This is a very short-sighted viewpoint, because their need for phosphoric acid and potash is greater than for other hay crops, and their demands for calcium and certain other soil minerals far outdistances that of the grasses.

In seasons of scant rainfall, such as the one which we have just experienced, alfalfa and clovers because of their deep-rooting habits give much higher yields relatively than the grasses. Second cuttings from the legumes have, in fact, yielded more in many cases than the first cuttings of the grasses. This advantage of clovers and alfalfa is more pronounced in dry years, but as one-half the seasons have less than average rainfall, these high-protein, high-mineral crops should be courted whenever possible by the northeastern dairyman.

Heavily fertilized legumes exclude weeds, prevent failure, and increase yield. Check plots on left, heavily fertilized on right.

We have been placing special emphasis upon the fertilization of alfalfa, clovers, sweet clover, and other legumes at the New Hampshire Station in our experimental work, as we have observed that high-quality roughage is transferred into milkpail profits. In other words, dairymen with good roughage are able to produce milk with a lower expense for purchased feed, and they have found that one of the easiest ways to produce good roughage is to grow alfalfa where adapted, or seed clovers frequently in their rotations. It has been our job to find out how best to fertilize these crops for high yields and particularly how to prevent failures due to lack of a proper level of fertility nutrients.

The first test, started about 1925, was made with alfalfa on a worn out, hay-land field that cut 380 pounds of hay per acre on unplowed plots the year the alfalfa was seeded. Without first seeding to cultivated crops the land was all manured and limed; then manure, lime, and the three important fertilizer elements were applied as variables.

The plots were then harvested for 5 successive years, two cuttings each year. All the substances used proved to stimulate the yield of the alfalfa crop, and the heaviest yields were from the plots which received the most fertilizer. Nitrogen, phosphoric acid, and potash were applied annually to the plots receiving those materials, but only one application of lime and manure was used.

The yields of the heavily fertilized and of the check plots for the 5-year period were as follows:

Treatment	Yield cured hay per acre
LMNPK	19.43 Tons
Check	11.54 "

The difference of 8 tons of alfalfa hay was produced at a cash outlay for materials of $64 at current fertilizer and lime costs. This does not include the cost of harvesting nor the cost of the manure which dairymen usually have in abundance. Furthermore, it is doubtful whether the extra lime used on these heavily fertilized plots paid for its cost, calculated in the above figure. At $14 certainly this would be true for the 5 years which are being discussed.

These yield figures do not quite tell the whole story, for the heavily fertilized plots had a fairly good stand at the end of the 5-year period, whereas on the check plots practically no alfalfa remained, and for that reason the entire area was plowed.

Potash Tops List

Because of the large number of plot series in this test it was possible to evaluate the effect of various substances used to encourage the growth of the crop. Potash was the strongest stimulant, and each dollar spent for potash returned a gross value of $4 in hay. Each ton of manure gave an increase of $3.50 in hay, while nitrogen and phosphoric acid paid for themselves in the amounts applied.

The basic application of manure on all plots probably lessened the necessity for nitrate of soda. Further, the annual top-dressing of 500 pounds of superphosphate is doubtless more than is needed for most economical results. Plots that had a complete fertilizer received an equivalent of about 400 pounds of a 4-20-20 fertilizer annually.

This soil with a pH of 5.2 at the outset did not give significant returns for more than 2 tons of lime during the first 5 years. Further trials with alfalfa on this land indicate better results from 2 tons applied in the beginning of the test and 1 ton 5 years later than from 4 tons as an initial application.

Additional studies on plots situated on an adjoining farm where manure was not used indicate more need for nitrogen in alfalfa production and a greater pressure for mineral nutrients, if manure is not applied.

After 5 years alfalfa persists in heavily fertilized areas but has almost disappeared on plots receiving little fertilizer. Heavily fertilized on left, check plots on right.

Preliminary tests for the available nutrients on the soils of these plots by 2-inch levels indicate that to maintain a good stand of alfalfa, the soil must be saturated with one or more of the minerals necessary for maximum production. In other words there must be an excess of available potash, phosphoric acid, lime, or two or three of these elements to maintain a stand and secure good crops of alfalfa.

These trials were conducted in eastern New Hampshire near enough to the seacoast to have had a good deal of seaweed applied as fertilizer in times past and on land that has doubtless been farmed for more than 200 years. The soil is of glacial terrace origin, and belongs in the Merrimack gravelly-loam category.

One hundred miles away, on a terrace of the Connecticut Valley, similar tests have been conducted with an alfalfa-timothy mixture and with red, alsike, and sweet clover.

Basically, the Connecticut Valley soils are not so well supplied with potash, but carry a slightly higher percentage of phosphoric acid. These western New Hampshire soils have had some lime influence in their formation, and the unlimed soils have a pH for untreated land of approximately 5.6 as against 5.0 to 5.2 for those in the trials previously noted.

One of the first trials on this Connecticut Valley field was with an alfalfa-timothy mixture, a practical combination for the dairy farmers of the region. It was used in this case because the drainage of the field is not absolutely perfect, as the upper part of the terrace on which the plots are located gets some seepage from the hills farther up.

Although alfalfa is not long-lived on this soil without lime, it did very well the first year, after which it yielded to timothy for which the land is quite ideal. Liming increased the yield of this mixture, and fertilizers were very effective as the figures for the first 3 years show:

Treatment	Total yield cured hay per acre 3 years
LNPK	11.36 Tons
Check plots	4.90 "

The field was manured uniformly and fertilized with variables before seeding and top-dressed annually with the fertilizer variation for 2 succeeding years. The fertilizer schedule was the same as that for the experiment previously described, and approximately 400 pounds of a 4-20-20 fertilizer were used on the heavily fertilized plots. One ton of lime was used on the LNPK plots. The difference in yield of almost 6.5 tons is the gain for a lime fertilizer expense of about $34, or slightly over $5 per ton! This means the difference between success and failure in hay production.

The results for all the plot series in this test are too cumbersome to be reported in detail here. One outstanding thing in this Connecticut Valley work in contrast with that in eastern New Hampshire lies in the fact that each of the various substances used as fertilizers appears to augment the other, and that when lime and potash are applied together the increase is greater than if the two are applied separately; whereas in the Greenland trial the results were just about equal where the fertilizers were used separately or conjointly.

Profitable Investment

The conclusions soon to be published in New Hampshire Experiment Station Circular 50 are as follows: "One dollar invested in potash returned $3.07 used alone, $4.78 used with lime, $3.76 used with phosphorus, and $5.93 when use with both lime and phosphorus.

"One dollar invested in phosphorus returned $0.97 used alone, $1.63 used with potash, and $1.79 used with lime and potash.

"One dollar invested in nitrogen used with phosphorus and potash returned $3.89; used with lime and these materials it returned $3.03.

"One dollar invested in lime used alone returned $1.38 in hay, but used with phosphorus and potash it returned $4.13."

Very good alfalfa and profitable crops were produced at Greenland with potash alone, along with the basic lime and manure applications. On this Connecticut Valley field it appears more important to balance the fertilizers for optimum results. This makes it more difficult in the latter area for farmers to get maximum results for their fertilizer dollar and serves to emphasize the necessity for fertilizing legumes rather heavily for best results.

Alfalfa is usually considered a delicate crop, and for that reason we present figures for alsike clover grown on these same plots following the alfalfa-timothy mixture. No more manure was used but the alsike was fertilized just the same as the alfalfa had previously been, with the following yields:

Treatment	Yield alsike clover cured hay per acre
LNPK	2.41 Tons
Check	.80 Ton

These yields appear to substantiate the fact that legumes need feeding, and since this particular soil is probably somewhat better suited for alsike than for alfalfa, the difference in yield is all the more convincing.

It is true that manure was used but once in the 4 years covered by the alfalfa-timothy and alsike crops, and it is quite possible that had more manure been applied the results for fertilizers would be less striking. We are rather confident, however, after studying all the trials that we have made, that manure does not carry enough phosphoric acid and potash for legumes, and if it were used in amounts sufficient to supply the phosphorus, for example, the waste of nitrogen would be terrific and certainly would not be an economical procedure.

These tests have, in fact, been so convincing that we are inclined to believe that clovers often fail because of potash and phosphorus deficiencies. For that reason it appears safe always to make a recommendation for seedings with these two important elements where legumes are considered, and for all three if manure is limited or if none is at hand.

(*Turn to page* 44)

Ohio Checks Fertility Needs of Vegetables

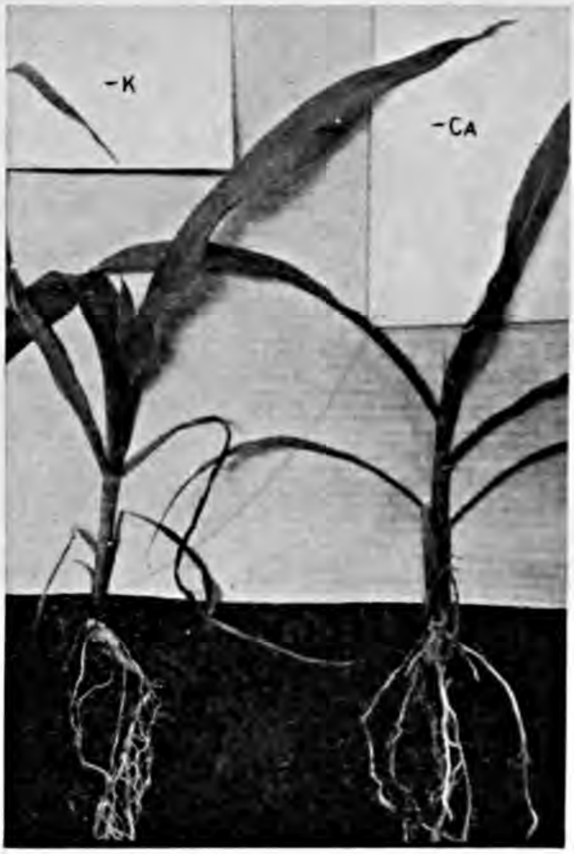
By Dr. H. D. Brown

Professor of Vegetable Gardening, Ohio State University, Columbus, Ohio

WITH the growing interest in rapid soil and plant-tissue tests, the question of the most reliable soil fertilizer plots against which to check the accuracy of these methods is becoming a very important one. In our work in Ohio we feel that we have made progress along this line. The following describes a series of plots and shows how yield ratings were compared with soil analyses.

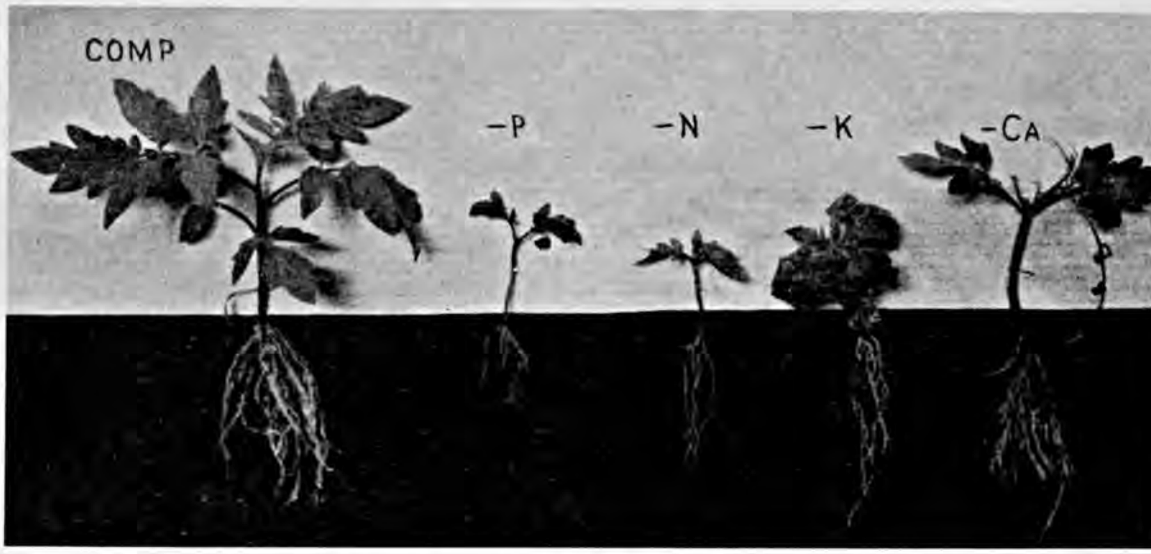
Table I presents a summary of fertilizer results with six vegetables for the 1935 season at Columbus, Ohio. For ease of interpretation the average yield of each vegetable for each treatment has been given a rank or rating. There are nine treatments and, therefore, nine different ranks for each vegetable. A rank of one is given the plot which produced the largest yield, and a rank of nine is given the plot which produced the lowest yield. Intermediate yields were assigned the appropriate ratings. For instance, plot 8 receiving the N-P-2K treatment yielded the most beets and was given a rating of one; the two checks, plots 1 and 9 receiving no fertilizer, ranked ninth and eighth, respectively, as the yields in these two plots were the lowest in the test. Plot 4, receiving nitrogen and phosphorus but no potash, ranked seventh, as the yield in this plot was but little better than the yields in the two plots that received no fertilizer whatever.

The rating system also provides a means of comparing the average effects of the different treatments for all the vegetables included in the test. This index of comparison is indicated in the last column to the right. Since it is a summation of ratings, it is obvious that the smallest numbers indicate the treatments which have been the most effective on the average for the vegetables included in the test. Likewise, the largest summations indicate the treatments which have been the least effective, on the average.



Corn plants illustrating potash and calcium starvation symptoms. Note absence of growing tip on the — calcium plant.

A glance at Table I shows that plots 5, 6, 7, and 8 all gave relatively good yields as the total numbered values are 21, 26, 16, and 25 respectively. These plots all received the basic fertilizer of 1,000 pounds per acre of an 8-20-12. Plot 6 received double the basic amount of nitrogen, plot 7 received double the basic amount of phosphorus, and plot 8 received double the basic amount of potash. It is interesting to note that plot 4, which received the basic application of nitrogen and phosphorus but no potash, ranked the lowest of all plots with a score of 42, which indicates lower yields than were secured on the check plots which received no fertilizer (scores 39 and 32).



Mineral deficiency symptoms illustrated by the tomato plant.

The interesting and most instructive comparison from the potash standpoint is the comparison of the yields from plot 4 receiving no potash, and plot 5 receiving the basic fertilizer application including potash. In no instance did plot 4 produce an excellent rating or yield, and in 2 out of 6 chances it secured the worst possible rating (9). Plot 5 on the other hand secured the best rating in 2 out of 6 chances.

A more careful study of the results indicates that the different vegetables respond differently to the different treatments. For instance, potatoes, onions, cabbage, and beets fared very poorly on plot 4, which received nitrogen and phosphorus, but no potash. This would seem to indicate that these crops require a more abundant supply of potash for a maximum growth than do peas and spinach. This statement should be given a liberal interpretation. Some evidence has been gathered during the six years of this test that potash is most essential for head lettuce, especially during dry seasons. Likewise, peas seem unable to secure adequate potash from these plots under certain environmental conditions.

It is obvious that an abundant supply of nitrogen is essential for the leafy vegetable, spinach, and that phosphorus has been especially beneficial for spinach, peas, beets, and cabbage. It would also appear from the summarized totals that the addition of large amounts of phosphorus (plot 7) seemed to have the best average effect in increasing yields, though the withholding of potash (plot 4) seemed to reduce the yields more than the withholding of any other fertilizing material. As a matter of fact, it is evident that each of the three fertilizing materials, i. e., nitrogen, phosphorus, and potash, is essential for the

Table I—Results of Fertilizer Tests for Vegetables
Columbus, Ohio, 1935

		Crops and Rank						
No.	Treatment	Peas	Beets	Onions	Spinach	Potatoes	Cabbage	Total
1	Check	5	9	8	6	2	9	39
2	O-P-K *	7	6	3	8	1	6	31
3	N-O-K	9	5	7	3	7	7	38
4	N-P-O	4	7	9	5	9	8	42
5	N-P-K	3	3	1	7	6	1	21
6	2N-P-K	2	4	5	2	8	5	26
7	N-2P-K	1	2	6	1	4	2	16
8	N-P-2K	8	1	4	4	5	3	25
9	Check	6	8	2	9	3	4	32

* All treatments are given in the order of N-P-K. O signifies omission of respective element in this order.

best growth of practically all of the vegetables grown on these plots.

It is interesting to compare the yield ratings with soil analyses. The results of the soil tests shown in Table II are from a composite mixture of five samples from each plot. The analyses were made by Fred Salter, using the improved Morgan Method for quantitative analyses (see Conn. Station Bulletin No. 372). By assigning values to the analyses as indicated, it is possible to compare the yields in Table I with the soil tests, results shown in Table II.

With the exception of plot 2 there is a very close correlation between the apparent fertility, as shown by the indices, and the yields, as shown by similar indices. For instance, plot 7 shows the highest average fertility and the highest average yields. Plots 1, 3, 4, and 9 show the lowest average fertility and the lowest average yields.

It is not surprising that a nitrogen analyses taken in October was not

Table II—Results of Soil Tests—October, 1935

		State of Fertility *												
		First replication			Second replication			Third replication			Total 3 rep.			Sum or
Plot No.	Treatment	N	P	K	N	P	K	N	P	K	N	P	K	index
1	Check	H 2	H 2	VL 5	M 3	M 3	VH 1	M 3	VH 1	H 2	8	6	8	22
2	O-P-K	VH 1	VH 1	VH 1	L 4	VH 1	VH 1	M 3	VH 1	VH 1	8	3	3	14
3	N-O-K	M 3	M 3	M 3	H 2	H 2	H 2	H 2	H 2	VH 1	7	7	6	20
4	N-P-O	VH 1	VH 1	VL 5	VH 1	VH 1	L 4	H 2	VH 1	VL 5	4	3	14	21
5	N-P-K	H 2	H 2	L 4	H 2	VH 1	VH 1	VH 1	VH 1	VH 1	5	4	6	15
6	2N-P-K	H 2	VH 1	VL 5	H 2	VH 1	VH 1	VH 1	VH 1	VH 1	5	3	7	15
7	N-2P-K	H 2	H 2	VH 1	M 3	VH 1	VH 1	H 2	VH 1	VH 1	7	4	3	14
8	N-P-2K	M 3	VH 1	VH 1	M 3	H 2	VH 1	H 2	VH 1	VH 1	8	4	3	15
9	Check	H 2	VH 1	L 4	M 3	VH 1	VL 5	H 2	VH 1	VL 5	7	3	14	24

* VH (Very High)—1; H (High)—2; M (Medium)—3; L (Low—4; VL (Very Low)—5.

closely correlated with the yields of vegetables which were all harvested before the middle of August. This accounts for the one, apparent, large discrepancy between the soil analyses and yield records. Similar nitrate tests taken during the growing season provide a very accurate indication of available nitrates and correspond very closely to the actual yields, provided other fertilizing materials are not limiting growth. In the work at Columbus more and more use is being made of quickly made tests of both soils and plants, to check with plant appearances and yield records.

It is evident from the results of yield and fertility tests, that these plots offer an excellent laboratory for the growth of vegetables deficient in either of the fertilizing elements, nitrogen, phorphorus, or potash. It is hoped that it will be possible in the near future to determine the effects of these deficiencies upon the food values and keeping properties of vegetables.

In order to make sure that starvation symptoms are due to one and not more fertilizing materials, it is necessary to add two of the three materials in each instance. This is illustrated by plots 2, 3, and 4 of the Columbus tests. As a matter of fact, this is the simplest and most accurate type of fertilizer test to determine the crop needs on any soil. The application of only one fertilizing material seldom enables the investigator to draw intelligent conclusions from the results.

1 CK	2 O-P-K	3 N-O-K	4 N-P-O	5 N-P-K	6 2N-P-K	7 N-2P-K	8 N-P-2K	9 CK
1 CK	4 N-P-O	5 N-P-K	6 2N-P-K	7 N-2P-K	8 N-P-2K	2 O-P-K	3 N-O-K	9 CK
1 CK	6 2N-P-K	7 N-2P-K	8 N-P-2K	2 O-P-K	3 N-O-K	4 N-P-O	5 N-P-K	9 CK

The actual arrangement of the plots is also important. The plots at Columbus are arranged as indicated above.

Such an arrangement permits a variance analysis. For example, the

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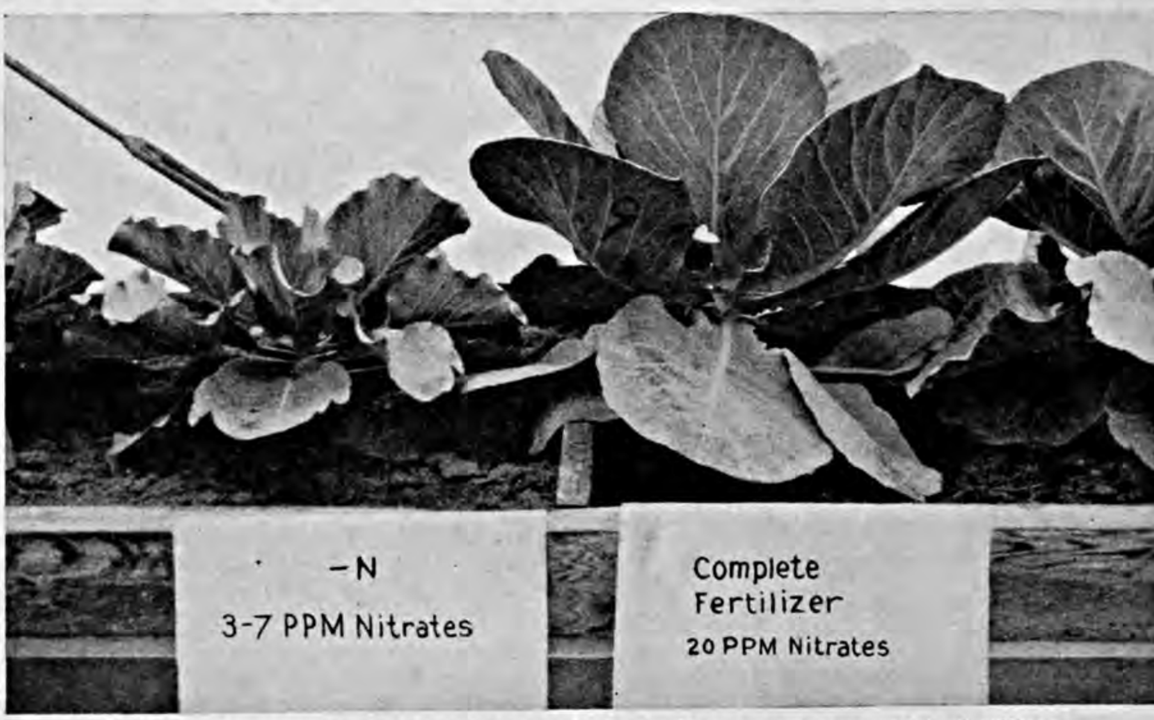

Cabbage showing the contrast between lack of nitrogen and a complete fertilizer.

Quality Yields Make Cash Crops Pay

By Arthur O. Braeger
Wisconsin College of Agriculture, Madison, Wisconsin

SUITABLE soil and high fertility are two of the main things to consider in growing special or cash crops, according to F. L. Musbach and C. J. Chapman, soil specialists at the Wisconsin College of Agriculture. High acre yields are necessary whatever the crop may be, but this is especially true of truck crops because they have a higher labor cost than most others.

Truck crops as a class do not have extensive rooting systems and, therefore, lack foraging ability in getting food. Then too, a healthy, vigorous, growing plant is less subject to the ravages of disease and insects. Plenty of available plant food is, consequently, a first necessity.

Consider Soil and Crop

In selecting the fertilizers, Professor Chapman brings out the fact that both the crop and the soil must be considered. Certain soils have definite fertilizer needs. Peat soil, for example, is unbalanced, as it contains large amounts of nitrogen but usually is very deficient in potash and, in most cases, deficient also in phosphoric acid. In limestone sections, peat soils get some lime by seepage from the surrounding upland; but in other sections, such soils are usually quite acid.

Dark colored, upland soils in certain parts of Wisconsin originally contained a large amount of nitrogen, much of which has been lost through years of intensive cropping. Too, the nitrogen may be locked in such a form as to become available very slowly. Best yields of truck crops are not secured unless some nitrogen is included in the fertilizer mixture.

Sandy soil represents an extreme condition in that potash is of first importance. Where the potash hunger has been satisfied, phosphate is also necessary in order that maximum crop yields may be secured.

"What may be said regarding the fertilization of cabbage also applies to other leafy vegetables, such as spinach, cauliflower, and lettuce," Professor Chapman explains. "In general, these crops are heavy feeders of nitrogen. The nitrogen requirement must be supplied either through the use of stable manure, the plowing under of legumes for green manure purposes, or the application of commercial fertilizers carrying adequate amounts of this element.

"Cabbage is also a rather strong feeder of potash. The fertilizer should include phosphate in order to balance up the available supply of plant food so necessary for best crop yields.

"Where cabbage is grown for kraut, no particular effort is made to control the size of the head, and for this reason, liberal amounts of nitrogen can be used. The size of the head may be controlled somewhat by the distance of setting, but of course, variety is the important factor. When the crop is grown for market the smaller head is

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Deciduous Orchards Need Plant Food

By George P. Weldon
Pomologist, Chaffey Junior College, Ontario, California

THE need for fertilization of fruit trees has been recognized for a long time in some branches of the fruit industry. Perhaps no other fruit growers have systematized the practice of fertilizer application better than the citrus growers in California. No grower of any of the citrus fruits would think of attempting to produce a crop without applying plant food in some form or other, at least once each year.

The deciduous fruit growers, as a whole, have not recognized the necessity of fertilizing their orchards. For example, the apple growers and peach growers throughout the country are applying very little fertilizer and seem to have gone on the theory that there is somewhat of an inexhaustible supply of plant-food materials in the soil. Because of the deep rooting of the trees, they feel that the necessary elements of growth will be brought up from below, and that while annual crops would necessarily have to be fertilized, fruit trees will get along very well without fertilization. Here and there we find orchardists who have experimented with fertilizers and who have proven the desirability, if not the necessity, for applying certain plant-food elements for the tree to feed upon.

When we consider that fruit trees are grown on a great variety of soils where the fertilizer needs are variable, it is not strange that standard practices for the fertilization of the different kinds of fruit trees have not been developed. There is need for experimental work on a broad scale, and much of this work has been attempted in the past and is going on at present in connection with projects of the various state and federal government experiment stations throughout the country. Some of these experiments have definitely shown a great need, others have perhaps been more or less negative in their results, but, on the whole, they have emphasized that the fruit grower must fertilize his trees or he cannot expect to get maximum size, the best quality, or the greatest production.

Grower Can Help Self

While the various state and federal experiment agencies are usually entrusted with most of the experimental work in the fertilization of orchards, growers can do much for themselves. However, it is true that the average grower is not of an experimental turn of mind. His training has been along entirely different lines, and he cannot expect to get the results that would come from those men who have made a careful study of experimental technique and everything that goes with the work of getting results through experimental effort. Therefore, we find that whatever standard practices may be followed in different places, they are very largely the result of experimental effort on the part of men employed by state and federal government agencies.

There are numerous formulae for commercial fertilizers that are used in the fertilizing of orchards. Sometimes these may not be of the best because of a lack of experimental work, but in most cases they at least result in much good when applications are made in proper quantity and at the proper time. Most of these formulae call for nitrogen, and usually in addition, the other two very essential elements of plant food, namely, phosphoric acid and potash. These three elements in combination, which the grower knows as a complete fertilizer, are in most cases preferred to single elements. Much of the experimental work in the future will necessarily be directed toward finding out what combinations of these three elements will give the best results with the different kinds of fruit trees on varying types of soils.

The writer has been interested for many years in experimental work in the fertilization of peach trees. One experiment which covered a period of five years and which was finally terminated by the removal of the orchard gave some very interesting and important data. These data were published in 1933 in circular No. 7 of the Chaffey Junior College, Ontario, California. This experiment, as well as other tests which have since been made, indicate that peach trees, like citrus trees, make a wonderful response to fertilizers.

It was found that even in soil that

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Left: Block of 3-year-old Babcock peach trees which were not fertilized. Right: Block of trees from the same orchard, which were fertilized for 2 years.

Left: Tree from a block of Babcock peach trees which received no fertilizer. Right: Tree from a block which received an 8-16-6 mixture for 2 years.

Fertilizer efficiency tested at the Sandhill Experiment Station. The cotton on the left received 30 lbs. of potash; check plot on the right.

Experiments Reveal Soil Deficiencies

By A. B. Bryan

Clemson Agricultural College, Clemson, South Carolina

SOUTH CAROLINA is very fortunate in having at its Sandhill Experiment Station one of the best locations in the country for studying fundamental problems in the economical utilization of commercial fertilizer. This station is in the heart of the Sandhill belt which stretches through the state between the Piedmont and Coastal Plains areas and extends northeast well into North Carolina and southwest into Georgia. The soil at the Sandhill Station, which varies from Norfolk loamy sand to Norfolk sandy loam, is one of the best situations in the country for studying response of crops to fertilizer materials, in the opinion of Dr. H. P. Cooper, agronomist of the South Carolina Experiment Station. "It is not possible," Dr. Cooper explains, "to secure very high crop yields on these Norfolk soils, but more fundamental information on crop nutrition can be secured than on almost any other type of soil; and after all," he reminds us, "the object in experimental tests should be to secure such fundamental information rather than to secure very high yields from the experimental plots."

The research work with fertilizers at the Sandhill Station includes a number of fertilizer experiments with cotton and other field crops, fruits, vegetables, and special crops. A summary account of the more important of these tests, with stress on practical results, is given below.

In tests to determine the effects of the time and rate of applying potash to cotton, the treatments have been continued on the same plots for four years. Potash applications were made at the rates of 15, 30, 24, and 60 lbs. per acre under these conditions as to time of applying: (1) All before planting, (2) half before planting and half at chopping, (3) all at chopping. All plots received the equivalent of 600 lbs. of a 5-10-0 fertilizer mixture in addition to the potash and were side-dressed with 15 lbs. of nitrogen. In other words, the plots received the equivalent of 500 lbs. of 5-10-0 (check plot), 5-10-2.5, 5-10-5, 5-10-7.5, and 5-10-10.

The data show that there is very little difference in the yields from the various times of applying potash fertilizers, either all before planting, one-half before planting and one-half at chopping, or all at chopping. The yield of seed cotton increased with the rate of potash fertilizer added. The data suggest that for the conditions of this experiment one might expect one lb. of potash to produce 14 to 20 lbs. of seed cotton, or that one lb. of muriate of potash or its equivalent would produce 7 to 10 lbs. of seed cotton, depending upon the rate of application. On the basis of these experiments an investment ranging from around 60 cents to $2.40 in potash fertilizer produced around 100 to 280 lbs. of lint cotton, respectively. At 10 cents per lb. for cotton this would be around $10 to $28 per-acre increase in lint cotton. The value of the seed should pay for harvesting and marketing the additional yields from the use of potash fertilizers.

In an experiment, started in 1932 to determine the residual effects of potash on cotton, muriate of potash was applied broadcast at the rates of 100, 200, and 400 lbs. per acre. There were two plots of each treatment. Six hundred lbs. of a 7.5-10-0 were applied annually to all plots, but no additional potash has been applied since 1932. The soil type was Norfolk sandy loam to Portsmouth sandy loam.

Results from a 3-year average, 1932-1934 inclusive, show there was an increase of 44.1, 75.2, and 87.8 per cent from 100, 200, and 400 lbs. of muriate per acre respectively, over no-potash plots.

Some very interesting facts have been brought out in a source-of-potash test, especially as to the growth response of cotton to soluble magnesium

Rate and source of potash in lbs. per acre	Average yield seed cotton per acre		Increase from lime	
	Unlimed	Limed	Lbs.	Per cent
No potash	203	174	–29	–14.3
240 manure salts	824	1,189	365	44.3
100 muriate of potash	754	1,067	313	41.5
100 sulfate of potash	1,015	1,330	315	31.0
100 sulfate of potash-magnesia	1,125	1,335	210	18.7
100 sulfate of potash plus 69 magnesium sulfate	1,122	1,359	237	21.1
100 sulfate of potash plus 138 magnesium sulfate	1,170	1,444	274	23.4
Average yield	887	1,128	241	27.1

salts and dolomitic limestone. This test covered 4 years, 1931-1934. The average yields secured from the various limed and unlimed plots are tabulated in the table.

All limed plots received an application of around 1,500 lbs. of dolomitic limestone in the spring of 1931. The plots received the equivalent of 800 lbs. of a 4-8-0 fertilizer before planting, plus the potassic fertilizers indicated, and were side-dressed with 32 lbs. of nitrogen per acre. A cover crop of American winter peas has been planted each year. Since there was very little growth of peas on the unlimed area, this should be taken into consideration in interpreting the yield data.

The average yields from the no-potash plots were very low, being 203 and 170 lbs. of seed cotton for the unlimed and limed plots, respectively. The lime on the no-potash plot caused a slight decrease in yield, but where liberal applications of potash were made, there was an increase from the use of lime ranging from 210 to 365 lbs., or 18.7 to 44.3 per cent, in the yield of seed cotton. The relatively high yields on the unlimed plots which received magnesium sulfate suggest that a deficiency of available magnesium may be limiting the yields on this soil. The unlimed plots which received sulfate of potash-magnesia and those which received sulfate of potash plus 69 lbs. of magnesium sulfate, produced 1,125 and 1,122 lbs. of seed cotton, respectively, or a difference of only 3 lbs. The average yield from the unlimed sulfate of potash plots was 1,015 lbs., which is 110 lbs. of seed cotton per acre less than was produced from the sulfate of potash-magnesia plots. The unlimed plots receiving sulfate of potash plus 138 lbs. of magnesium sulfate produced 1,170 lbs. of seed cotton per acre, which is an increase of 155 lbs. of seed cotton over the plot which received sulfate of potash without magnesium. The increased yields of 110 and 155 lbs. of seed cotton per acre might be attributed to the amounts of magnesium added in the magnesium sulfate.

The limed plots receiving potash produced from 210 to 365 lbs., or 18.7 to 44.3 per cent, more seed cotton per acre than the unlimed plots. The limed plot which did not receive any potash produced 29 lbs., or 14.3 per cent, less than the unlimed plot. It

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The cotton plot on the left received 400 lbs. of muriate of potash in spring, 1932; check plot on the right.

Fertilizers and Farm Chemurgy

By Dr. J. W. Turrentine

President, American Potash Institute, Washington, D. C.

PLACING chemistry at the service of agriculture, as epitomized by the Farm Chemurgic Council, is the development of ideas long entertained and applied by the Federal and State Governments and various industrial groups, all with a view to agricultural betterment. In the growing of industrial crops, the same principles apply as in the growing of food crops, with the important addition that in the former, crop standards will receive more attention, as the manufacturer quite probably will be much more exacting in his requirements than the casual purchaser of food. This is already being demonstrated, notably by tobacco, and those crop - feeding methods that influence quality will have to be given more intensive study in the Farm Chemurgic program than heretofore.

In this program, the carbohydrates predominate—starch, sugar, oil, and cellulose. While in the growing of the plant the three crop food elements, nitrogen, phosphorus, and potash, are required, and where deficient must be supplied to obtain an economic return, it is generally recognized that potash has particular functions peculiar to itself that both aid the plant in reaching full maturity with complete fruition and improve the quality of that fruit.

Thus, through cellulose development, it lends rigidity, and through the thickening of cell walls it promotes disease and pest resistance of the plant and the keeping qualities of the fruit. Its presence in plant juices reduces frost damages, and through its aid in nitrogen assimilation it promotes early maturity. Potash has won for itself the name of "the quality element," and as such will require full consideration in the growing of standardized industrial products.

Role of Potash

But outstanding among the roles which potash plays is the promotion of carbohydrate synthesis. Dr. Lipman, in his past researches, has shown conclusively the relatively excessive removal of potash by many of the important field crops. In the Midwest one hears the slogan, "A pound of potash to the bushel of corn." The literature contains data establishing the role of potash in increasing the starch content of the potato, the yield of corn per acre, the increase in the oil content of the cotton seed, and the development of cellulose fibre in the plant stem. Twenty-one million acres of corn for power alcohol means a tremendous yield of carbohydrate. This would require a potash supply in excess of that of any other crop food, connoting the wisdom, if not the necessity, of centering this proposed industry in areas where the soils already contain an abundance of this essential element or are accessible to artificial sources.

Modern chemical and bio-chemical

methods have now been developed and are rapidly winning nation-wide acceptance, whereby the crop foods that are actually available for crops during the immediate growing season, as contrasted with those present but locked up in non-available forms, can be quickly determined and correlated with crop response with satisfactory accuracy. These methods represent a most important contribution by the agricultural chemists as affording a means whereby one can determine in advance of planting the crop food present, and knowing the crop requirement, predict the quantities of each that must be added to obtain an economic return.

Soil Surveys

Such surveys are eloquently illustrated by the recent one of Professor Bray of the University of Illinois, who has analyzed the principal soil types of his state and charted them on the state map, showing areas of potash abundance and potash deficiency. What is needed is a similar map for the agricultural areas of the United States, not only for potash but for the other crop foods as well, including lime, magnesia, and sulfur. Such a map would be invaluable as showing logical areas for Farm Chemurgic enterprises, as likewise for the activities of crop-food distributors.

It is idle to contemplate the establishment of industrial enterprises with a view to permanence, depending on farm crops to be raised on soils that are already showing crop-food deficiencies without full regard for sources of fertilizer supply deliverable at feasible costs. That American soils are registering crop-food (particularly potash) deficiencies, in reduced yields and even in various, easily recognized physiological symptoms, such as cotton rust and wilt in the South and corn lodging in the Midwest, is now common knowledge.

It is also amply demonstrated that the farmer neglects the vital subject of soil fertility during periods of low crop prices, while during periods of high prices he shows an entire willingness to expend a goodly share of his meagre surplus for this nationally important purpose. The Farm Chemurgic enterprise must, therefore, rely for its existence upon soils of high fertility or must contemplate a price to be paid which will provide a surplus for fertilizer purchase. Otherwise the farmer reverts to peasantry and the industrial plant closes its doors.

In other words, it is just as important and perhaps more fundamental for the Farm Chemurgic Council to concern itself with soil fertility as with chemical utilization, for the two are indissolubly linked together. As a permanent plan for a stable agriculture, one is just as important as the other.

There is no known method of building up crop-food supplies of phosphates and potash other than that of applying them to the soil as commercial fertilizer. Nitrogen may be synthesized into usable forms, but not phosphates and potash. With the removal of any crop from the field where grown, the supply is diminished. Even that which goes to the farmer's barn suffers an attrition however carefully the barn wastes are conserved for soil fertilization. Once they leave the farm they are rarely, if ever, returned. They must be resupplied from artificial sources.

Know Problems

It would appear, therefore, to be a proper function of this Council in its study of agricultural fundamentals to give full consideration to this subject of fertilizer supplies, to inform itself fully as to the individual ingredients, their sources and composition, the ratios in which they are mixed and why, the items which make up their

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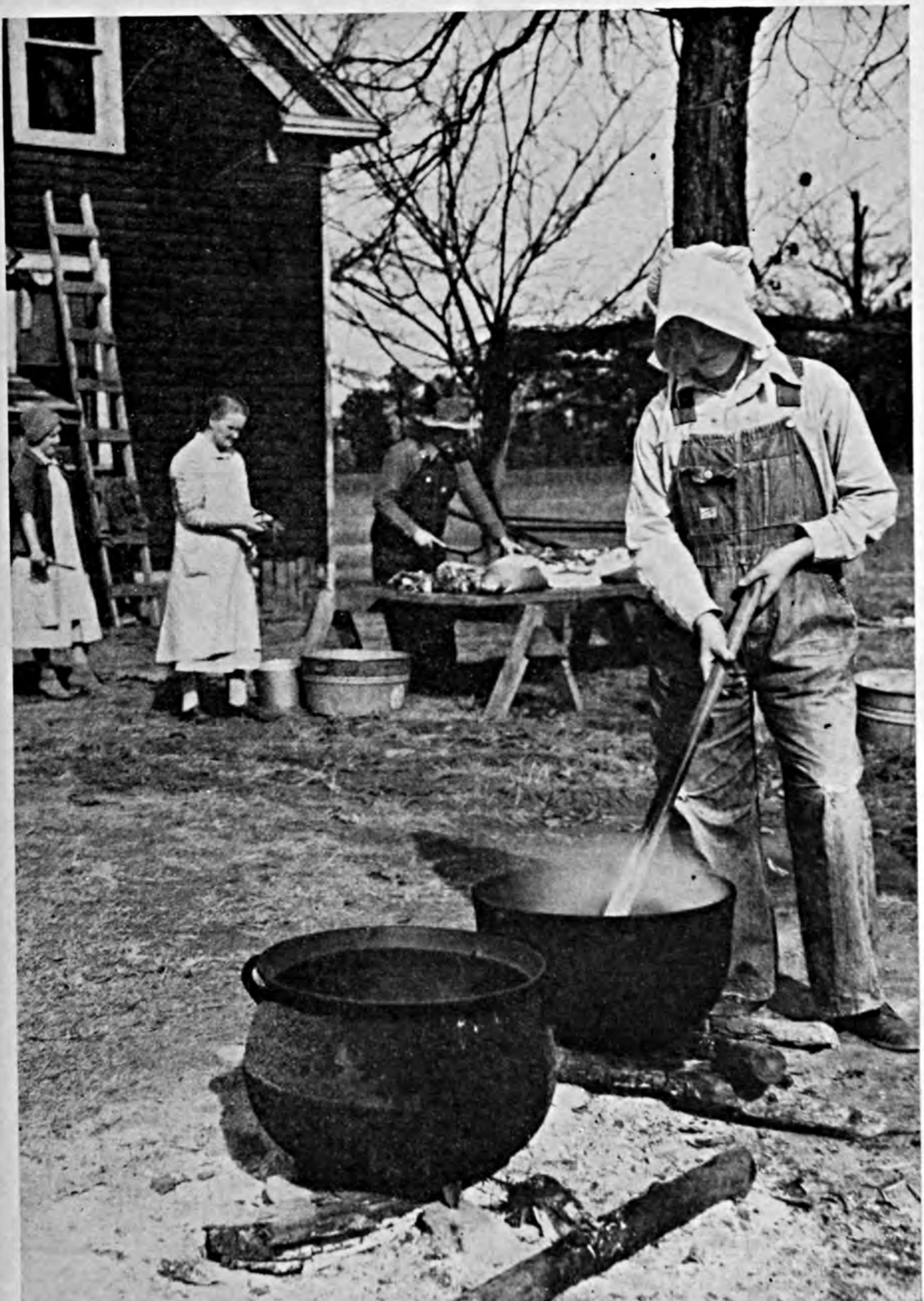
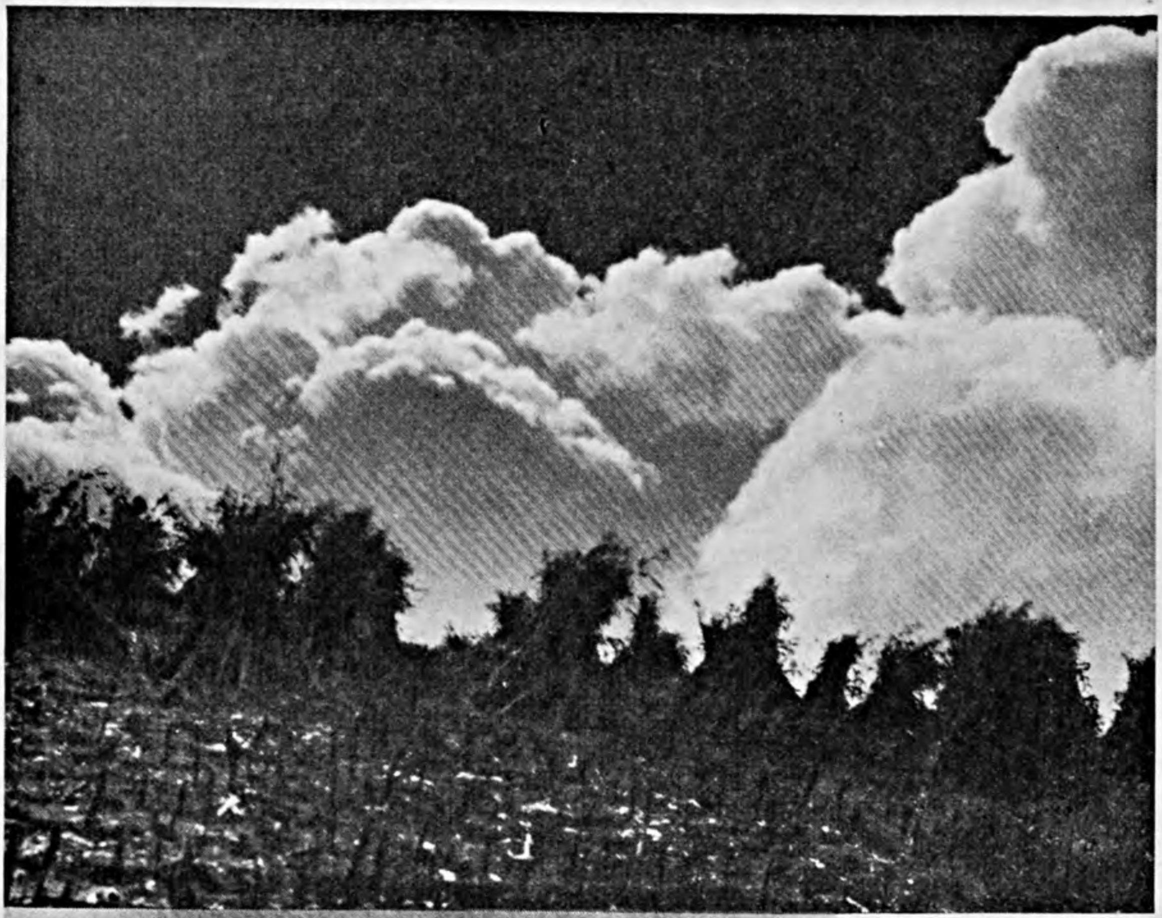
PICTORIAL



A JOB FOR EVERYONE WHEN HOG-KILLING TIME ROLLS AROUND.

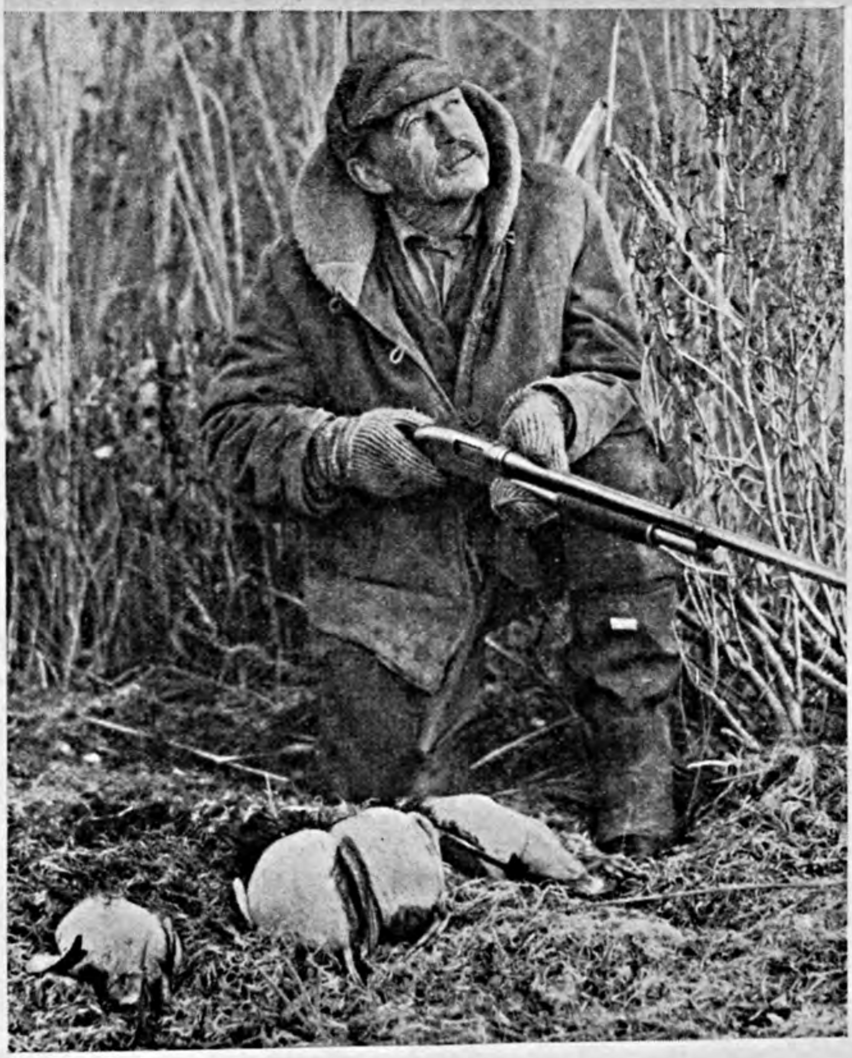


November

Shadows

November
High Lights

Above: The city tourist sometimes cusses weeds.



Left: The cows were milked early this morning.

The Editors Talk

Looking Backward

With the harvest season practically over in most sections of the United States, we find the year 1936 presenting a more cheerful picture than it did earlier in the growing season. There is a general consensus of opinion that the present small crop will have a considerably greater purchasing power than the larger crop of 1935. The prospects for an improvement in farm income may be explained by the fact that the average prices farmers are receiving for all products produced are approximately 16.9 per cent higher than a year ago. The purchasing power of farm products has improved throughout the year until in August and September it was higher than at any time since 1920 with the single exception of 1925.

Total farm income for the first nine months of 1936 reached $5,434,000,000. This compares quite favorably to the $5,451,000,000 for the 10-year average from 1926 through 1935 and is a vast improvement over the $4,830,000,000 for the same period in 1935. The Bureau of Agricultural Economics has estimated that the total farm income for 1936 will amount to something in the neighborhood of $7,800,000,000, representing an increase of approximately $800,000,000 as compared to last year.

Agricultural economists have pointed out before that increases in farm income beyond a certain minimum level result in purchases of goods used by the farmer way out of proportion to the increase that actually occurs in farm income.

We cannot expect farm prices to remain in their present favorable position unless other industries are enjoying the same relative prosperity that agriculture has enjoyed. The demand for agricultural products must be coupled with the ability to pay before it can be felt in the general upturn of prices. The gradual increase in farm prices together with the increase in consumption of fruits and vegetables indicates quite clearly that consumer purchasing power is increasing. City people react to an increase in their income very much the same way as farmers do.

According to the Bureau of Labor Statistics, the income of the laborers as measured by the industrial pay roll has increased greatly since 1935. In the selected industries surveyed by the Bureau of Labor Statistics, weekly pay rolls in September of this year were approximately $32,000,000 greater in September 1935. For six consecutive months in this year gains in aggregate employment have been registered. This increase in pay rolls and in employment is largely due to the great increase in demand for nearly all manufactured products and services.

It must be admitted, of course, that a large part, perhaps the largest part, of the increased price of agricultural products has been due to curtailment of production as a result of the unfavorable growing conditions. However, it also must be admitted that economic conditions throughout the world are better and that without greater consumer purchasing power in our own country, price increases, such as have been registered during the past year, would not have been possible. It cannot be expected that prices will remain at these same high levels with a great increase in volume of agricultural production. However, the recession probably will not be due to depression levels.

From the standpoint of the fertilizer industry, with farm prices higher, general business conditions improving, and the psychological attitude of the farmer better, there should be increased purchases of fertilizer. This is just what has happened. Sales of fertilizer in the 17 states reporting tag sales have increased about 10 per cent as compared to the same period in 1935. Present indications point toward total sales for the calendar year 1936 of approximately 6,800,000 tons, an increase of about 600,000 tons over 1935. Perhaps the most encouraging fact of all in the fertilizer industry is that the increase in sales is not merely a temporary spurt, but part of a general revival in business conditions throughout the United States.

Give Thanks

A new, 1936 Thanksgiving approaches. What a contrast it draws to the first celebration held three hundred and fifteen years ago by the Plymouth Colonists. Our lives, our ambitions, our destinies so different, one feels a reverence for an institution which outlives generations in order to join hands with the present.

The first Thanksgiving was an innovation. Formerly, they had held days of fasting and prayer; this was to be a festive occasion, a time for joy and gratitude. The Pilgrims were grateful that their lives had been spared to them, that there was food for the approaching winter. Theirs was a problem of developing a new land. The same staunch qualities are needed today, but our energies are directed through different channels. We are concerned with conserving the soil, conquering disease, harnessing science. Ours is a problem of repairing.

In spite of differences, we share the same generous impulse which prompted fifty-five white settlers to invite ninety Indians as their guests. The custom of preparing baskets for the less fortunate, that they may enjoy the feeling of well-being that should be everyone's heritage on this occasion, has become as much of a tradition as spreading our own tables with turkey and pumpkin pie. Even more significant is the fact that Thanksgiving is the only religious celebration in which all creeds participate.

Perhaps the farmer, because of his closer partnership with Nature, understands more truly the significance of the harvest season. A silo filled with forage, a well-stocked cellar, a corn bin up to the brim, this is the very stuff out of which Thanksgiving is made.

The year may not have dealt each of us his measure heaped up and overflowing with those things he has earnestly sought for, but the spiritual measuring rod remains the same. Shaking himself of superficial sentiments, anyone can achieve that moment of inner serenity which comes not of wanting, or understanding, but rather from experiencing human gratitude. Ask the question, What am I grateful for on this Thanksgiving of 1936? Is there one who cannot find an answer, remembering that it is not an inventory of how much he has, but rather, how much of sincere appreciation he feels for what he has.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

Pennsylvania Agricultural Experiment Station Bul. 331, entitled "The Absorption of Plant Nutrients in Relation to the Production of Pennsylvania Cigar-Leaf Tobacco," contains a comprehensive report of results from the 3-year rotation plots on the Roseville Experimental Field in Lancaster county, by J. J. Thomas, D. E. Haley, and Otto Olson. These investigations were inaugurated for the purpose of studying "the absorption of nitrogen, phosphorus, and potassium by tobacco plants during their growing season as modified by field treatment and other environmental conditions and, further, to seek a possible correlation between the total intake of these three important elements to the yield and quality of the crop as measured by the production of 'wrappers,' 'fillers,' and 'seconds'."

Summarizing the results based on one year's work, preliminary investigations in 1934 indicate that the absorption of nitrogen, phosphorus, and potassium is rather closely correlated with the amount of these elements at the disposal of the plants. While the highest percentage of wrapper leaf and also the smallest percentages of both fillers and seconds were produced from a treatment of 10 tons of manure in conjunction with 1,000 pounds of 3-8-16 per acre, the authors state that the best application of fertilizer from the standpoint of yield and quality appears to be 1,000 pounds of 6-8-12 per acre. An application of 1,000 pounds of 3-8-12 per acre appears desirable where additions of manure are used for cigar-leaf tobacco, data show. The method of applying fertilizer to the row showed evidence of being superior to the broadcast method.

"The Movement of Salt (Alkali) in Lettuce and Other Truck Beds Under Cultivation," Agr. Exp. Sta., Tucson, Ariz., Bul. 152, *May* 15, 1936, *W. T. McGeorge and M. F. Wharton.*

"The Effect of Fertilizers and Cropping Upon the Nature and Amount of Electrodialyzable Bases in the Soil with Particular Reference to Potassium," Agr. Exp. Sta., Newark, Del., Bul. 200 *(Tech.* 17), *May* 1936, *G. M. Gilligan.*

"Relation of Phosphorus to Growth, Nodulation and Composition of Soybeans," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 243, *Aug.* 1936, *Theron B. Hutchings.*

"Tobacco Fertilizer Recommendations for 1937," *Agr. Exp. Sta., State College Station, Raleigh, N. C., Agron. Infor. Cir.* 101, *July* 1936.

"A study of the Availability of Ammoniated Superphosphate and Various Unusual Phosphatic Carriers by Means of Vegetative Pot Tests," Agr. Exp. Sta., Kingston, R. I., Bul. 256, *June* 1936, *Basil E. Gilbert and Frederick R. Pember.*

Soils

A thorough evaluation of the many fundamental principles and practices for maintaining the soils of Washington in a high state of productivity is presented in Ext. Bul. 218, State College of Washington, "Pertinent Points Concerning Soil and Its Management," by S. C. Vandecaveye. Soil drainage and alkali conditions, water-holding capacity of the soil, proper tillage, suitable crop rotations, regular replacement of organic matter and application of plant nutrients to supply the deficiencies, are considered. Moisture conservation is of great importance in many sections of this state. The author points out that some suitable crop rotation for general farming in the humid and irrigated sections is essential to maintain the productive capacity of the soil. Intertilled crops, small grains, and grass or legumes grown in given order best fulfill the requirements. An excellent table denoting the principal sources of materials that supply organic matter, such as farm manures, green manure crops, and crop residues, and showing their composition in terms of plant nutrients, is given.

Pertaining to the use of fertilizer for potatoes, sugar beets, mangels, turnips, and carrots, it is stated that average soils respond to applications of from 80 to 100 pounds of nitrogen per acre; and on soils deficient in available phosphorus and potassium, from 50 to 70 pounds each of phosphoric acid and potash in addition to nitrogen give satisfactory results. The author advises supplying part of the nutrients with 6 to 8 tons of manure per acre and the rest as commercial fertilizer. Annual applications of 40 to 60 pounds of nitrogen per acre are suggested for pasture and lawn grasses, and also 50 pounds each of phosphoric acid and potash per acre when needed. Small grains grown in suitable rotation where proper use of manures and crop residues is made should produce profitable returns from an application of 20 to 40 pounds of nitrogen per acre. Other crops and their fertilization are discussed.

"Soil Changes Resulting from Nitrogenous Fertilization, A Lysimeter Study," Agr. Exp. Sta., New Haven, Conn., Bul. 384, June 1936, M. F. Morgan.

"Agricultural Conservation Program for New Hampshire—1936," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 186, Apr. 1936.

"Soil Erosion in New York," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 347, Apr. 1936, F. B. Howe and H. R. Adams.

"Liming Ohio Soils," Agr. Ext. Serv., Ohio St. Univ., Columbus, Ohio, Bul. 177, June 1936, Earl Jones.

"A Glance at the Problem of Alkali Soils," Agr. Exp. Sta., Logan, Utah, Leaf. 71, Mar. 1936, D. W. Pittman.

"Soil Erosion, Archer Field Station," Agr. Exp. Sta., Laramie, Wyo., Bul. 208, Oct. 1935, A. L. Nelson.

"Soil Survey of the Tucson Area, Arizona," U.S.D.A., Washington, D. C., Series 1931, No. 19, F. O. Youngs, A. T. Sweet, A. T. Strahorn, T. W. Glassey, and E. N. Poulson.

"Soil Survey of Randolph County, Indiana," U. S. D. A., Washington, D. C., Series 1931, No. 18, W. H. Buckhannan, M. E. Waggoner, F. E. Barnes, and W. J. B. Boatman.

"Soil Survey of the Gallatin Valley Area, Montana," U. S. D. A., Washington, D. C., Series 1931, No. 16, William DeYoung and L. H. Smith.

"Soil Survey of Franklin County, North Carolina," U. S. D. A., Washington, D. C., Series 1931, No. 21, W. A. Davis, E. F. Goldston, and C. H. Wonser.

"Soil Survey of Washington County, North Carolina," U. S. D. A., Washington, D. C., Series 1932, No. 8, W. A. Davis and K. V. Goodman.

"Soil Survey of Putnam County, Ohio," U. S. D. A., Washington, D. C., Series 1930, No. 40, Earl D. Fowler and T. C. Green.

"Soil Survey of Putnam County, Ohio," U. S. D. A., Washington, D. C., Series 1930, No. 41, Arthur E. Taylor, J. G. Steele, and W. S. Mozier.

"Soil Survey of Craig County, Oklahoma," U. S. D. A., Washington, D. C., Series 1931, No. 24, A. C. Anderson, A. W. Goke, O. H. Brensing, R. E. Penn, and C. B. Boatright.

"Soil Survey of Falls County, Texas," U. S. D. A., Washington, D. C., Series 1932, No. 7, M. W. Beck.

"Soil Survey of Hardeman County, Texas," U. S. D. A., Washington, D. C., Series 1932, No. 9, E. H. Templin and T. W. Glassey.

"Soil Survey of Nansemond County, Virginia," U. S. D. A., Washington, D. C., Series 1932, No. 6, R. E. Devereux, Edward Shulkcum, and G. W. Patterson.

Crops

A presentation of genetic history for each of the major crops and livestock groups and a critical survey of superior strains make up the main section of the United States Department of Agriculture "Yearbook of Agriculture, 1936." In former years about half the yearbook was comprised of agricultural statistics, while only a few pages are devoted to these data in the present book, leaving a separate volume to include the usual detailed tables. The articles cover corn, small grains, sugar beets and sugar cane, cotton, flax, tobacco, and the major livestock classes. The book "is devoted to exploring a single subject—the creative development of new forms of life through animal and plant breeding," Secretary Wallace states in the foreword.

"Annual Report of Extension Service" for Fiscal Year July 1, 1934, *to June* 30, 1935, *with Report of Field Activities for December* 1, 1934, *to November* 30, 1935, *Agr. Ext. Serv., Little Rock, Ark., Cir.* 355, *Feb.* 1936, *Dan T. Gray, Director.*

"4-H Club Manual in Gardening," Agr. Ext. Serv., Little Rock, Ark., Cir. 359, *Feb.* 1936, *William G. Amstein.*

"Native and Exotic Palms of Florida," Agr. Ext. Serv., Gainesville, Fla., Bul. 84, *June* 1936, *Harold Mowry.*

"Georgia Farm Accomplishments." Report of the State Agricultural Extension Service for 1935, *Agr. Ext. Serv., Athens, Ga., Harry L. Brown, Director.*

"Report of the Director for the Year Ending June 30, 1935," *Agr. Exp. Sta., Lafayette, Ind., J. H. Skinner, Director.*

"Report of Moses Fell Annex Farm, Bedford, Indiana, June 1936," *Agr. Exp. Sta., Lafayette, Ind., Cir.* 219, *June* 1936, *H. T. Reed and H. G. Hall.*

"Annual Report for the Year Ended December 31, 1935," *Agr. Ext. Div., Col. of Agr., Lexington, Ky., Cir.* 283, *Thomas P. Cooper, Dean and Director.*

"Raspberry Culture in Kentucky," Agr. Ext. Div., Lexington, Ky., Cir. 235 *(Revised), Apr.* 1936, *A. J. Olney and W. W. Magill.*

"Fifty-first Annual Report of the Maine Agricultural Experiment Station," Agr. Exp. Sta., Orono, Me., Fred Griffee, Director.

"Quality Hay Pays Good Dividends," Agr. Ext. Serv., Orono, Me., Bul. 220, *Apr.* 1936, *A. K. Gardner and Oscar L. Wyman.*

"Maine Agriculture," Agr. Ext. Serv., Orono, Me., Bul. 224, *June* 1936, *Stacy R. Miller.*

"The Relation of Physical Properties and Chemical Composition of Red Clover Plants to Winterhardiness," Agr. Exp. Sta., College Park, Md., Bul. 391, *Jan.* 1936, *Glenn A. Greathouse and Neil W. Stuart.*

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 19, *No.* 1, *Aug.* 1936.

"Annual Report of Cooperative Extension Work in Agriculture and Home Economics 1935," *Ext. Dept., Miss. St. Col., State College, Miss., J. R. Ricks, Director.*

"Home Vegetable Gardens for the Yazoo-Mississippi Delta," Agr. Exp. Sta., State College, Miss., Bul. 311, *May* 1936, *E. A. Currey.*

"A Compilation of Experimental and Other Data on Corn Planting and Cultivation," Agr. Exp. Sta., State College, Miss., Bul. 312, *May* 1936, *C. F. Clark.*

"A Compilation of Experimental and Other Data on Sweet Potato Varieties and Cultural Practices," Agr. Exp. Sta., State College, Miss., Bul. 313, *June* 1936, *C. F. Clark.*

"Growing Cowpeas for Hay," Agr. Ext. Serv., Columbia, Mo., Leaf. 42, *Mar.* 1936, *Ide P. Trotter.*

"Sow Lespedeza in Corn," Agr. Ext. Serv., Columbia, Mo., Leaf. 43, *Mar.* 1936, *C. A. Helm.*

"Fifty-sixth Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-eighth Annual Report of the New Jersey Agricultural College Experiment Station for the Year Ending June 30, 1935," *Agr. Exp. Sta., New Brunswick, N. J., Jacob G. Lipman, Director.*

"Some Studies of the Degree of Maturity of Peaches at Harvest in Relation to Flesh Firmness, Keeping Quality, and Edible Texture," Agr. Exp. Sta., New Brunswick, N. J., Bul. 606, *June* 1936, *M. A. Blake and O. W. Davidson.*

"Garden Roses," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 342, *Feb.* 1936, *E. A. White, L. A. Massey, and W. E. Blauvelt.*

"Meeting the Mineral Needs of Farm Animals," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 350, *Apr.* 1936, *L. A. Maynard.*

"Experiment Station Progress for the Four-year Period July 1, 1931, *to June* 30, 1935," *Agr. Exp. Sta., Fargo, N. Dak., Bul.* 286, *Nov.* 1935, *H. L. Walster, Director.*

"Corn Culture in North Dakota," Agr. Ext. Serv., Fargo, N. Dak., Cir. 140, *Mar.* 1936, *William Widakas and P. J. Olson.*

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXI, No. 182, *Sept.-Oct.* 1936.

"Methods of Growing Strawberries, Dewberries, and Blackberries," Agr. Ext. Serv., Stillwater, Okla., Cir. 133 *(Rev.* 1936), *Club Series* 3, *D. C. Mooring.*

"The Panhandle Bulletin," Panhandle Agr. & Mech. Col., Goodwell, Okla., No. 59, *Mar.* 1936, *Harley A. Daniel and Quentin Williams.*

"Ladino Clover for Western Oregon," Agr. Exp. Sta., Corvallis, Ore., Sta. Cir. 117, *May* 1936, *H. A. Schoth.*

"Fiber Flax in Oregon," Agr. Exp. Sta., Corvallis, Ore., Sta. Cir. 118, *May* 1936, *Brittain B. Robinson.*

"Growing Fall and Early Winter Vegetables," Agr. Ext. Serv., Corvallis, Ore., Ext. Bul. 487, *Apr.* 1936, *A. G. B. Bouquet.*

"Forty-eighth Annual Report of Rhode Island State College Agricultural Experiment Station," Kingston, R. I., Con. 483, *June* 1936, *George E. Adams, Director.*

"Forty-seventh Annual Report, 1934," Agr. Exp. Sta., Knoxville, Tenn., C. A. Mooers, Director.

"Extension Work in Agriculture and Home Economics—Some Accomplishments in 1935," Agr. Ext. Serv., Blacksburg, Va., Bul. 141, May 1936, John R. Hutcheson, Director.

"Department of Agriculture—Immigration of Virginia," Richmond, Va., Bul. 340, Aug. 1936, and Bul. 341, Sept. 1936.

"Green Manure or Cover Crops in Western Washington," Agr. Ext. Serv., Pullman, Wash., Ext. Bul. 223, Apr. 1936, Maynard S. Grunder.

"Peppermint Oil Production in Washington," Agr. Ext. Serv., Pullman, Wash., Ext. Bul. 227, June 1936, O. Johnson and J. C. Snyder.

"Canawa—A New Variety of Soft Red Winter Wheat," Agr. Exp. Sta., Morgantown, W. Va., Bul. 272, June 1936, R. J. Garber and L. S. Bennett.

"Kingwa Soybeans," Agr. Exp. Sta., Morgantown, W. Va., Bul. 273, June 1936, R. J. Garber.

"Gladiolus Growing," Agr. Ext. Serv., Madison, Wis., Sten. Cir. 171, Feb. 1936, J. G. Moore.

"Growing the Jerusalem Artichoke," U. S. D. A., Washington, D. C., Leaf. 116, June 1936, Victor R. Boswell.

"Production of Sauer Ruben," U. S. D. A., Washington, D. C., Cir. 389, May 1936, Harry E. Goresline and Lawrence H. James.

"Variety Tests of Sugarcanes in Louisiana During the Crop Year 1933-34 and Summary of Annual Results 1926-34," U. S. D. A., Washington, D. C., Cir. 395, May 1936, George Arceneaux, I. E. Stokes, and C. C. Krumbhaar.

"A Method of Harvesting Grapefruit to Retard Stem-end Rot," U. S. D. A., Washington, D. C., Cir. 396, July 1936, J. R. Winston.

"Goldenseal Under Cultivation," U. S. D. A., Washington, D. C., Farmers' Bul. 613, Oct. 1914 (Rev. 1936), Walter Van Fleet.

"Cover Crops for Soil Conservation," U. S. D. A., Washington, D. C., Farmers' Bul. 1758, July 1936, Walter V. Kell and Roland McKee.

"Food Plants of the North American Indians," U. S. D. A., Washington, D. C., Misc. Pub. 237, July 1936, Elias Yanovsky.

"Irrigated Crop Rotations in Western Nebraska, 1912-34," U. S. D. A., Washington, D. C., Tech. Bul. 512, May 1936, Stephen H. Hastings.

"Studies of the Culture and Certain Varieties of the Jerusalem Artichoke," U. S. D. A., Washington, D. C., Tech. Bul. 514, May 1936, Victor R. Boswell, C. E. Steinbauer, M. F. Babb, W. L. Burlison, W. H. Alderman, and H. A. Schoth.

Economics

Those of us interested in the problem of land utilization will find T. E. LaMont's treatment of the subject in Cornell Bulletin No. 642, "The Economic Study of Land Utilization in Broome County, New York," well worth reading. Broome County is located in southeastern New York and because of its location, climatic conditions, soil, topography, and elevation, it is an interesting area from the standpoint of the student of land utilization. It has a land area of approximately 705 square miles surrounding the city of Binghamton, which with the incorporated villages of Johnson City and Endicott provide a market for milk, eggs, vegetables, and other farm products.

The first settlements were made in Broome County about 1785, and with these first settlements a great experiment in land utilization was started. Each farmer had to obtain a living for himself and his family or move elsewhere. By 1900 the land in farms had increased to 417,000 acres or about 92% of the total county area. After most of the marketable timber had been sold, farmers had to depend largely on their agricultural products for a living and for the maintenance of their buildings.

From 1900 to 1935 approximately 71,000 acres disappeared from farms. Assuming that 20-30,000 acres were taken by the growth of the urban area, 41-51,000 acres became abandoned land. This land was abandoned because the experience of farmers taught them that it did not pay to farm it. Only 83% as much land was farmed in 1935 as in 1900.

The land in the County has been classed under four general headings. Land in class 1 is primarily adapted to forestry and recreational use and is not suited for farming. Land in class 2 is more intensively used, but there are large amounts of idle land and a great many abandoned farms. The size and condition of the buildings and crops being grown indicate that in general the land is better adapted to forestry and recreational uses than to agriculture. Classes 3 and 4 are better adapted to permanent agriculture, however class 4 is more suited to intensive farming than class 3. It was found that the condition of the buildings in any region was a good indication of the productivity of the land and the returns from farming.

The writer points out that the reforestation of the land in classes 1 and 2 would be desirable because it would reduce the severity of disastrous floods. The land in these classes will not support a satisfactory standard of living and the reforestation will prevent people from losing time, money, and courage trying to farm land which never should have been cleared. It will prevent the sale of this land to inexperienced people who are not familiar with its quality; it will reduce the cost of credit and farm insurance to the farmers on land in classes 3 and 4 because they will not have to pay the losses incurred in classes 1 and 2.

The purchase and the reforestation of land in classes 1 and 2 will reduce the expenditures for roads in these areas and make possible the closing of some schools. It is further pointed out that in a thickly populated state like New York the planting of trees on such land will provide the people of the state with needed areas for hunting, fishing, and other recreations. It will provide future generations with supplies of timber. The reforestation of idle land will make Broome County a more attractive place in which to live.

"Florida Citrus Costs and Returns," Agr. Ext. Serv., Gainesville, Fla., Citrus AE 5, Apr. 1936, R. H. Howard.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., No. 15, Aug. 1936.

"Agricultural Economic Facts, Basebook of Iowa," Agr. Exp. Sta., Ames, Iowa, Sp. Rp. No. 1, Apr. 1936, Lauren K. Soth.

"Commercial Fertilizers, Commercial Feeds, and Agricultural Liming Materials," State Insp. Serv., Univ. of Md., College Park, Md., Control Series No. 159, Aug. 1936.

"Cost of Producing Farm Products in North Carolina," Agr. Exp. Sta., State College Station, Raleigh, N. C., No. 305, June 1936, R. E. L. Greene.

"General Bulletin, 537, Fertilizer Report for 1935," Pa. Dept. of Agr., Harrisburg, Pa., Vol. 19, No. 5, July 1, 1936.

"Agricultural Statistics, 1936," U. S. D. A., Washington, D. C., Yearbook Statistical Committee.

Fertilizers and Farm Chemurgy

(*From page* 22)

costs to the farmer, the distances they have to be hauled, and the influence of concentration on delivery costs.

While nitrogen is available from many coke ovens strategically located with respect to agricultural areas and is deliverable in high concentrations and therefore at relatively low transportation costs from nitrogen fixation plants, the farmers east of the Rocky Mountains are largely dependent on phosphates derived from Florida and Tennessee and on potash from California, New Mexico, and Europe. It is obvious that their delivery costs aggregate a very large sum, financed ultimately by the consumer of farm crops. It is equally obvious that this sum is to be reduced with increase in concentration of the commodities shipped.

Through the infallible ingenuity of the American chemist, we are now in an infinitely better position to cope nationally with the universal problem of soil restoration than ever before in agricultural or industrial history. Through this ingenuity we have seen agricultural nitrogen reduced in price to its unprecedented level of $1.25 per unit and potash to 45 cents per unit.

Potash thus becomes the cheapest

of the three major plant foods and in price far below the average of commodities which the farmer buys and sells. From the low nitrogen concentration of 16 per cent in sodium nitrate and 20 per cent in ammonium sulfate, we now have cyanamid of 22 per cent, urea of 46 per cent, ammonium nitrate dissolved in liquid ammonia of 55 per cent. A large tonnage of nitrogen now reaches the farmer as a constituent of superphosphate. Potash is now abundantly available in concentrations as high as 62 per cent; phosphates are obtainable in concentrations as high as 47 per cent. Mixtures containing as high as 40 per cent plant food are now being purchased in considerable tonnages—although unfortunately the 12 per cent grade still predominates—all contributing with increasing concentration to a proportionate decrease in delivery charges.

Recent technological researches point the way to even more concentrated and quite possibly even cheaper products. If the industrialist of the future, relying upon farm crops for raw materials, must pay a price which includes fertility maintenance, he must concern himself with the cost of the fertilizers required therefor.

Method of Application

Vitally affecting the economic returns from expenditures for crop food is the manner in which the fertilizer is applied to the crop. The fertilizer-placement studies of various agricultural agencies now effectively centered in the Soil Improvement Committee have shown definitely that the manner or method of placing the fertilizer may easily exceed in importance the ratio or even the quantity of fertilizer applied.

For Maximum Results

The excellent new fertilizer drills which the manufacturers of farm implements now offer the farmer provide the precise location or placement of the fertilizer which is required to yield maximum returns. It is of the utmost importance that these machines find wider usage, a fact obviously recognized by the Farm Chemurgic Council as attested by the cooperation, by invitation, of the representatives of these manufacturers.

In conclusion, chemistry, if effective in the service of agriculture, must be applied as vigorously in the replenishment of soil fertility, not only for its maintenance but for its elevation to the highest level in terms of economic production and the protection of the growing crop and from the ravages of insect and diseases, as in the perfecting of the technology of utilization. Much excellent work is now on record in the literature. The nation is equipped with many excellent laboratories, State and Federal, manned by an incomparable personnel of agricultural specialists offering information, advice, and services of the highest order. The Farm Chemurgic Council can perform a great service in promoting researches where information is lacking in translating existing data into the language of the industrialist, and in placing the whole at the service of private initiative.

A man saw a baby deer at the zoo, and asked a keeper what the animal was called.

The keeper replied, "What does your wife call you every morning?" And the man replied, "Don't tell me that's a skunk!"

Mose: "Ah sho' is glad Ah wasn't King Solomon."

Rastus: "Whaffer yo' has dat 'pinion?"

Mose: "Huh, huntin' up washin's foh one wife keeps me plenty busy."

Christmas Trees From Canada

OTTAWA, Canada.—In addition to supplying her own needs, Canada is an important source of Christmas trees for the United States, and as usual at this time of the year representatives of established Christmas tree dealers are visiting eastern Canada to contract for supplies to be delivered shortly before Christmas.

Notwithstanding the increased sale of potted trees and rather costly artificial plants in the eastern United States, the regular seasonal demand for trees cut in the Provinces of Nova Scotia, New Brunswick, and Quebec has shown a decided increase during the past two seasons. Christmas trees from eastern Canada find a market in most of the large cities of the eastern United States that may be reached without prohibitive freight charges. In 1935 shipments totaled 3,573,642 trees, valued at $364,135.

In eastern Canada the favorite trees for Christmas are young firs or spruce about 10 feet in height. Cedar, hemlock, juniper, and pine of tender growth are also used when the most favored species are not readily available. The spicy odor of the balsam fir, and its short, flat, lacquered leaves of dark green, which render it easy to decorate, make it particularly suitable for use as a Christmas tree.

Barberry Control Since 1660

ALTHOUGH concentrated effort to control the common barberry bush, host plant to more than 140 races of wheat stem rust, was not undertaken in this country until 1918, the first law providing for barberry control was passed by France in 1660, more than 200 years before scientific knowledge definitely connected rust damage with the plant.

The oldest legislation in this country, passed by Connecticut colonists in 1726, proved ineffective. The act said "the abounding of barberry bushes is thought to be very hurtful . . . they do occasion, or at least increase, the blasts on all sorts of English grain."

After an unprecedented loss of nearly 185,000,000 bushels of wheat from rust in 1916, the Bureau of Plant Industry started a cooperative project for the destruction of barberry in 13 states. The work was transferred to the Bureau of Entomology and Plant Quarantine when this bureau was founded in 1933. Four more states have been added to the list and in the past three years emergency funds have been used.

Department of Agriculture officials estimate that more than 41,000,000 barberry plants have been destroyed in the 17 states since the work was started in 1918. Rust damage figures, especially for local outbreaks, have dropped. In the first five years that the control measure was in effect the estimated annual damage fell to about 50,000,000 bushels. During the third five years, 1928 to 1933, the estimated annual damage amounted to only 11,500,000 bushels.

Last year saw a renewed outbreak of rust throughout the Midwest with the estimated loss placed at 100,000,000 bushels. The factors of the 1935 epidemic were a combination of weather conditions favorable to rust survival during the winter and its subsequent development and spread. On the other hand, an unusual set of drought conditions delayed favorable crop growth so that rust spores were carried over practically all of the Wheat Belt prior to the time the grain matured. This combination of circumstances may rarely be expected.

From Poverty Grass To 4-Ton Alfalfa Crop

IF you want good grass, give it food. That is the timely suggestion of the Soil Conservation Service. Even the best of grass seed will not give good results if the soil is lacking in the necessary plant nutrients, the service says, and this goes for lawn grass or for pasture grass on eroded hillsides in the country.

Grass can be—and is—starved, just as an animal can be starved. Furthermore, neither a dirt farmer nor a scientist is likely to produce a miracle grass that will thrive on subsoil or other infertile soil unless certain plant-food elements are present.

A 10-acre field on the H. A. Studor farm in Ohio was in poverty grass for many years. The soil was Muskingum silt loam, lying on an average slope of about 20 per cent, and was eroded until only a thin layer of topsoil remained. Liming, fertilizing, seeding to sweet clover, timothy, and oats, controlled grazing, and then seeding to alfalfa, built up this field within five years to where it yielded well over 4 tons of alfalfa per acre.

The remarkable results on this field led to the investment of approximately $10 per acre for material to improve a similar 50-acre tract. Within two years a heavy stand of sweet clover was obtained on these impoverished, eroded areas.

Test Cotton in Highways

THE use of cotton-fabric reinforcement in the surfacing of low-cost bituminous roads is being studied thoroughly by the Bureau of Public Roads of the United States Department of Agriculture. Sections of experimental road are being constructed in cooperation with the highway departments of Alabama, North Carolina, and Tennessee. Surfacing will consist of different types of bituminous construction, using three grades of cotton fabric. For comparison, the engineers will build similar sections without cotton fabric.

Careful records will be kept of tests of materials, construction methods and costs, and maintenance costs.

In addition to these special cooperative experiments, state highway departments are constructing many other road surfaces, using fabric reinforcement furnished through the cotton-diversion program of the Department of Agriculture. Construction and maintenance costs and other pertinent information from these experiments will be furnished to the bureau for a comprehensive study of the value of cotton fabric in bituminous road construction.

The experiments will necessarily extend over a period of years, since the primary purpose is to determine the relative durability, life, and cost of the different sections under actual traffic and weather conditions. A report will not be issued until there are indications as to the relative merits of the different sections.

Neglected Opportunities

By E. R. Jackman

Agronomist, Oregon State Experiment Station, Corvallis, Oregon

IT IS a common thing for growers to say with some bitterness that it is markets they need above all. And this is of course true, but it is also true that many individual growers are developing markets and making money by supplying things out of the ordinary.

The American farmer has the most initiative and the most ingenuity perhaps of any class of people in the world, but with all of this there is one entire group of products which he has overlooked—the native forage plants of North America. Nearly all of our plants of which seed is commercially available are importations, but west of the Mississippi the overwhelming proportion of the land area is used for grazing, and its cover is entirely of native plants.

Native Plants Best

Our plant explorers have combed the frozen steppes of Siberia, the high plateaus of Africa, and the Andes for suitable grasses, but isn't it likely that in the end it will be found that our native plants are the ones best suited to the region? The native grass cover has been destroyed on millions of acres by plowing and has been partly ruined on other millions by the wrong kind of grazing. Now with the AAA's inspired urge, there are thousands of farmers and stockmen who would like to get the native grasses back again.

Just to mention a few—there is western wheat grass (*agropyron smithii*). This is the famous blue joint of Colorado and Montana. For some conditions it is the outstanding grass and the best to use for reseeding. In 1935 seed was produced in commercial quantities for the first time. If developed, a market would exist for carloads of it. Slender wheat grass, another native, has a few devotees growing seed, but the western wheat grass has a much wider adaptation than slender wheat. It is a variety which will withstand alkali to some extent, will hold soil, will maintain stands on areas which flood in the spring and become deserts in the summer, and is a grass good for both hay and pasture. It will withstand overgrazing much better than the bunch grass types.

Other Demands

Then there is another wheat grass, blue bunch wheat grass (*agropyron spicatum*), a wonderful dry-land grass. Many stockmen would trade their last shirts for ranges restocked with bunch grass. But no one grows seed. In the Pacific Northwest, Idaho Fescue is a rather wonderful dry-land grass, but no seed is available. Both of these grasses produce seed readily, and with some strains, at least, there are no fancy tricks to learn in harvesting. The sheepmen's favorite from Canada to California is little bluegrass or Sandberg's bluegrass. Any growers? None.

To skip lightly to Kansas and neighboring states, how would one buy some bluestem grass seed, either big bluestem or little bluestem? There is not much information about them as seed producers, but surely they make seed somewhere in the United States.

There are dozens of others: Mountain brome grass, June grass, alkali rye grass, Nevada bluegrass, violet wheat grass. Some of the browse plants of Texas and New Mexico would probably expand into other areas, if those who want them could only buy seed.

Opportunities for pioneering are not yet gone in America.

Quality Yields Make Cash Crops Pay

(*From page* 15)

given preference, since the trade is willing to pay a higher price for cabbage with small, solid heads. The fertilizer mixture used should contain plenty of potash, which tends to make the crop head up."

The amount of fertilizer which can be used economically on cabbage will depend on the price which can be anticipated for the crop. Under the more intensive systems, where cabbage as well as other leafy vegetables are grown for early market, it will be found economical and profitable to use high-grade mixed fertilizers containing about 4 to 6 per cent of nitrogen, 8 to 12 per cent of phosphoric acid, and 6 to 10 per cent of potash. From 600 to 1,200 pounds per acre may be used, depending upon the general state of fertility of the soil.

Where manure is used, the amount of fertilizer may be reduced from 400 to 600 pounds per acre, and mixtures relatively higher in phosphate should be used.

Method of application will depend largely on the amount of fertilizer used, Chapman points out. Where the crop is grown in rotation with clover and stable manure is applied, only small amounts of commercial fertilizer will be needed. This can be applied with an attachment to the cabbage setter in amounts from 200 to 400 pounds per acre with fairly good results.

Where large amounts are used, 500 to 1,200 pounds or more, the fertilizer should be applied broadcast or in the row before setting the crop and worked in the soil thoroughly by disking and harrowing. It is important that fertilizer where applied broadcast or in the row be worked into the soil as deeply as possible.

Onions require a loose, friable, and well-drained soil, well supplied with lime and containing an abundance of readily available plant food.

The kind and amount of fertilizer to use depends, in a large measure, upon the natural fertility of the soil. In general, the black sandy and muck soils are quite lacking in potash. Onions as well as other bulb and root crops are rather heavy feeders of potash, and for this reason high-potash fertilizers are advised.

The lighter colored, sandy loam responds to fertilizers containing large amounts of nitrogen. Mixtures similar to a 6-15-12, 5-8-7, or 4-8-6 make a fairly well-balanced fertilizer for onions.

On the darker colored loams and sandy loams, smaller amounts of nitrogen are advised. For the peat and muck soils the mixture should contain phosphate and potash in the ratio of one to one, or even one to two. Such combinations as 0-20-20, or 0-15-30 are suggested. It may be advisable to use a small amount of nitrogen as well. Growers have found that the use of liberal amounts of phosphate and lime tends to control the trouble known as "thick neck" or scallion.

Where commercial fertilizers are used as a source of plant food alone, the application should be made at the rate of from 1,000 to 1,500 pounds per acre. The fertilizer should be applied broadcast and should be well worked into the soil before planting. This is important in onion culture since the surface inch of the soil is kept in a dry mulch condition most of the season. The top-growth of onions does not shade the ground to any extent, nor does the root system of the onions feed in the upper layer of soil as in the case with crops where the ground is completely shaded and kept moist.

Fertilizers for onion sets should contain smaller amounts of nitrogen than would be used for table onions. Too much nitrogen will result in heavy top-growth. Many growers are using mixtures which carry equal percentages of phosphoric acid and potash with little or no nitrogen, such as 3-20-20 or 0-20-20. Lime should be applied if the soil is acid.

Sugar Beets

The sugar-beet crop requires a fertile soil in good physical condition, according to Professor Chapman. The bulk of this crop is grown on heavy silt loam and clay well supplied with lime. Sandy soils, peat soils infested with weeds, and poorly drained soils are not suitable.

For best yields, well-drained soil in good tilth, amply supplied with the essential plant-food elements, is necessary. Wisconsin growers have found that even where considerable manure is used, commercial fertilizers may also be applied to good advantage. The kinds and amounts to use, of course, depend somewhat on the soil and the system of farming. Phosphate and potash are essential, and in a good many cases some nitrogen may be used profitably.

Mixtures such as the 2-12-6 or 3-18-9 are commonly used, but others carrying more potash will probably be better, such as 3-12-12, 3-15-12, or 3-20-20. On muck soils phosphate-potash fertilizers like the 0-20-20 or 0-15-30 may be used instead of complete fertilizers. However, a small amount of nitrogen is frequently desirable on these soils.

Fertilizers may be applied broadcast or in the row at the time of drilling the seed. When applied in the row, 200 pounds per acre are about the most that can be used without injuring the seed or causing delay in the plants coming up. The ideal way is to place the fertilizer alongside the seed row rather than in contact with the seed or directly above it.

From 400 to 500 pounds an acre where applied with a broadcast machine or a fertilizer drill are recommended. The fertilizers should be worked well into the soil.

Peas thrive on well-drained loam and silt loam soil as well as on the heavier, dry clay loam. Good surface drainage is essential, as losses from root rot may result on poorly drained soils. On light sandy soil the crop suffers during the dry weather, causing the plants to wilt and dry up before harvesting.

Peas belong to the legume family and have the ability to extract nitrogen from the air. Inoculation is important, not only to secure a more uniform vine growth but also an increased yield and better quality of canned product. Inoculants are put up in the form of jelly, liquid, and granular substances. The one coming into most favor at the present time is the jelly culture.

A fertile soil is essential for getting good yields and good quality of peas. On acid soils, liming is necessary. Phosphate fertilizers are to be used first, and in most cases potash is also needed. Nitrogen is beneficial, especially on heavy soils which warm up slowly in the spring.

An application of about 300 to 400 pounds an acre is generally used. In sections where land has been long cropped or where soil is "late" in the spring, complete fertilizers are advised, such as 2-16-6, 2-16-8, 2-12-6, 3-14-6, 4-24-12, and 3-18-9. Preferences should be given the higher grade mixtures.

The effects of fertilizers on yield and quality have been studied in Wisconsin. Peas grown on a heavy silt loam fertilized with phosphate gave an increase in yield of 136 pounds per acre. When 8 per cent potash was added in the mixture, there was an increase of 88 pounds over the phosphated plot. The complete fertilizer, 2-16-8, gave an additional increase of 59 pounds above that of the 0-16-8.

In judging quality, tenderness and flavor are the two most important points. In judging fertilized peas against unfertilized peas, phosphate alone was responsible for an increase of 5 points over the blank; potash with phosphate, 10 points; and the complete mixture 14 points over the unfertilized ones. It is quite evident that fertilizers improve both yield and quality. In this study, the effect on quality was more important in actual profits than was the increase in yield.

Professor Musbach points out that whether fertilizers may be used profitably depends on the effect on yield as well as on quality. It is only by securing weights from fertilized as well as unfertilized sections and grading and scoring the product that a definite statement can be made. Then too, the residual effect of fertilizers on the new seeding should not be overlooked. Often, this may be of as much significance as the effect on the pea crop.

Experiments Reveal Soil Deficiencies

(*From page* 20)

is generally recognized that a heavy application of lime may reduce the availability of potash in the soil. This effect is often observed where cotton follows such crops as alfalfa, for which the soil has been heavily limed.

Farmers should not be unduly concerned over a theoretical consideration of the effects of lime on the availability of potash in the soil, advises Dr. Cooper, suggesting that the practical thing to do is to lime strongly acid soils and apply the potash fertilizers necessary in the economical production of crops.

Striking are some results in the way of growth response of cotton to calcium in calcium sulfate and to dolomitic limestone in a 3-year source-of-phosphorus test.

All plots received a fertilizer application equivalent to 1,000 lbs. of a 4-8-4 mixture. Nitrogen was applied to all plots at the rate of 40 lbs., either as the nitrogen in the phosphate fertilizer or in the form of ammonium sulfate. Approximately one-third of the nitrogen was applied under the crop, except in the case of the di-ammonium phosphate plots, and the other two-thirds in two side applications. The basic slag and rock phosphate plots received an amount of phosphoric acid which cost approximately the same as that applied to the superphosphate plots. An application of approximately 1,500 lbs. of dolomitic limestone per acre was made in the spring of 1932. A cover crop of rye was grown each year. The application of lime to the plots receiving the mono-ammonium phosphate and di-ammonium phosphate had a marked effect upon the yield of cotton. The average yields on the unlimed plots were 276 and 201 lbs. of seed cotton, respectively, whereas the yields from the limed plots were 298 and 601 lbs. of seed cotton, respectively. There has been a decreased yield each year on the unlimed plots, whereas the yields on the limed plots are among the highest in the entire test. The addition of calcium sulfate to the mono-ammonium phosphate and di-ammonium phosphate plots, in amounts approximately equal to that contained in the superphosphate, produced a marked increase in the yields of seed cotton.

Mono-ammonium phosphate plus calcium sulfate on the unlimed plots gave an increase of 307 lbs., or 111 per cent, and di-ammonium phosphate plus calcium sulfate gave an increase of 346 lbs., or 172 per cent. These figures suggest that there is a marked deficiency of available calcium in this soil for the production of cotton. The unlimed basic slag plots produced 702 lbs. of seed cotton, which was the highest average yield in the test. The limed basic slag plots have produced less than the unlimed plots. These data indicate that basic slag contains sufficient lime for the production of cotton on this soil.

There has been a consistent increase in the cotton yields on the unlimed rock phosphate plots, which would suggest that the calcium in rock phosphate material is available to the cotton plant. There was only a slight increase from lime on the rock phosphate plots. The marked increase of 401 lbs., or 348.7 per cent, from lime on the no-phosphorus plots is further evidence that calcium is one of the major factors in the nutrition of the cotton plant on this particular soil. The cotton plant is tolerant of relatively high soil acidity, but it is apparently very seriously affected by a deficiency of calcium under the conditions of this experiment.

Potash and Lime

The growth response of several different crops to applications of lime materials and potash is being tested at the Sandhill Station in studies begun in 1933 on Norfolk sand. Crops included in the tests were corn, sorghum, sudan grass, pearl millet, soybeans, peanuts, velvet beans, crotalaria, and cotton. Four series of plots have been treated as follows:

1. 500 lbs. of 4-8-8 fertilizer.
2. 500 lbs. of 4-8-8 fertilizer and 1 ton of dolomitic limestone.
3. 500 lbs. of 4-8-0 fertilizer and 1 ton of dolomitic limestone.
4. 500 lbs. of 4-8-8 fertilizer and 1 ton of basic slag.

The limestone and basic slag were applied in 1933, and the fertilizer is applied annually. In addition to the mixed fertilizer under the crops, ammonium sulfate is added as a top-dressing.

Among the non-legumes sorghum, sudan grass, and corn showed a marked response. Velvet beans and crotalaria did not show a marked response to lime, whereas peanuts, soybeans, and cowpeas did show a significant response.

Cotton showed the largest relative response to potash, while cowpeas and soybeans showed considerable response, but velvet beans, pearl millet, crotalaria, sudan grass, peanuts, and sorghum did not show any marked response.

Dr. Cooper's comment on this matter is of interest and value. He says: "These latter crops are very probably capable of securing relatively large quantities of potash from the soil, and where the entire crop is removed from the soil certain crops following them may show a marked deficiency of potash. Such crops as sorghum, sudan grass, pearl millet, and velvet beans under certain conditions, are considered by farmers to be hard on the soil. The ill effects of such crops on the soil are very probably related to their capacity to remove relatively large quantities of such materials as potash and calcium from the soil, which results in a deficiency of these constituents for succeeding crops."

Deciduous Orchards Need Plant Food

(*From page* 17)

was not very well supplied with organic material, commercial fertilizers gave a very striking benefit. This benefit was manifested in the growth of the trees as well as in the production. In this experiment some studies were made of the effect of nitrogen alone, since California soils are usually deficient in this necessary element of plant food. Because of this deficiency there is almost always a very ready response in growth of any kind of plant to which nitrogen is applied. The orchardist is interested in having young trees make the maximum growth during a season and prior to the time when they come into bearing, and the young trees can be very greatly benefited by frequent and very heavy applications of nitrogen.

Developing Fruit

After trees have attained their growth and have come into full bearing, the concern of the fruit grower is more in connection with the development of a large crop of high quality fruit than it is in vegetative growth; thus while nitrogen alone may be all that will be necessary to apply to the orchard up to the time of bearing, the necessity for the other two elements becomes apparent after the orchard comes into bearing.

In the case of older trees it was found that nitrogen, when applied alone, darkened the foliage very materially; it induced satisfactory growth but delayed ripening. The color of the fruit on trees thus treated was always poor in comparison to that of trees receiving a complete fertilizer and even to those trees which were not fertilized at all. The reason for the inferior fruit on trees treated with nitrogen alone is not well understood. Some think that the heavy growth of the foliage and the resultant shading has a tendency to prevent color and delay maturity. I am of the opinion, however, that this explanation is inadequate, and that the real explanation lies in the fact that the trees need something besides nitrogen to increase production and ripen the fruit.

Need Complete Fertilizer

It was found also that a combination of nitrogen and phosphoric acid gave splendid results in growth and production. The area of the particular orchard which had this combination, where the experiment was carried on for five years, gave the best growth and the highest production of any other areas. The fruit did not have the best color and the size was not as satisfactory as that of the fruit where complete fertilizer was used. It was evident that nitrogen and phosphoric acid combined in a formula were not altogether satisfactory.

The results of these tests have convinced me that it is necessary not to depend upon nitrogen alone, although in the case of young trees before they bear, very good results may be attained. Likewise it is not best to depend on a mixture of nitrogen and phosphoric acid alone, although growth and production may be quite satisfactory, but that the third element of a complete fertilizer formula, namely, potash, is very desirable.

We have used the following formulae with very good results: 5-10-15, 4-8-3, 6-8-2, 8-16-6. Mature trees on soils such as we have been working with, or the light, sandy loam type, do well when about 10 pounds of any one of these formulae are applied per tree. In the case of the first formula which was used in the 5-year experiment, this amount was applied each season for three consecutive years after the trees came into bearing. It is possible that there was more potash than necessary in this formula for best results, and finally the conclusion was reached that either an 8-16-6 or a 6-8-2 fertilizer would be more suitable under the conditions obtaining in this orchard.

In all fertilizer tests made in bearing orchards, growth of trees, production, and quality of fruit must be taken into consideration. There is no question about the effect of nitrogen in producing growth, and if it is only growth that is desired, one would need only to think in terms of this element; but when quality and production are also taken into consideration, everything points toward the necessity of using phosphoric acid and potash along with nitrogen. What I have said applies mostly to the fertilization of peaches. Other deciduous fruits would, no doubt, respond equally as well to fertilization. There would probably have to be different amounts of these three fertilizer elements used in combinations suitable for each particular fruit.

The experimental work with fertilizers in deciduous orchards has just begun. The citrus growers have made more progress and in some localities have settled down to more or less standard practices as has already been indicated. It is hoped that enough experimentation may be carried on among the deciduous growers of the country in the next few years so that better practices and more certain results will be forthcoming.

Ohio Checks Fertility Needs of Vegetables

(*From page* 14)

standard error between the average yields of plots 4 and 5 in the beet test is 22.5. The average difference of 69 pounds per plot is highly significant, because it is far more than two times the standard error of 22.5.

It is especially interesting to find such large and significant yield differences in the Columbus tests. When the tests were started, the writer was advised that no yield differences would be secured because of the extremely high state of fertility of the entire area included in the experiment. It was with some misgivings therefore, that the tests were started. Nevertheless, this particular area was finally selected because vegetables require a very fertile soil for maximum yields, because of the very great apparent uniformity of the plot, and because of the great need for a field laboratory

Potash deficiency demonstrated by tomato plants grown in sand and peat.

Beet Plant grown in sand and peat, showing the result of potash starvation.

where vegetables that were unquestionably starving for one and only one of the three fertilizing materials, nitrogen, phosphorus, and potassium, could be secured in quantity.

The contemplated tests involving these starved vegetables are only started, but the close correlation between yields, fertilizer treatments, and rapidly made soil and tissue tests indicates the value of these tests even on soil that appears fertile. These tests should be used far more in determining which soils are most fertile and to indicate more definitely what fertilizers to apply and what not to apply for the maximum yield of vegetables.

Fertilized Legumes Pay Big Profits

(*From page* 10)

Especial attention should be given to the fertilization of permanent pasture seedings. Proper fertilization at the outset means longer life for the legumes in the mixture and for the Dutch clover which should form an important part of the permanent pasture stand. Working these materials into the soil is essential wherever feasible.

It is a well-known fact that phosphorus is fixed rather quickly when applied as a top-dressing and that it does not penetrate the soil to any appreciable depth. Potash has more penetration than phosphorus, but even this element is quickly tied up and does not reach most of the feeding roots of alfalfa and the larger clovers. Tests for available potash on Greenland plots that receive the equivalent of 1,200 pounds of muriate of potash annually do not indicate a penetration of more than 6 inches in depth! This fact rather reverses previous ideas that have been held concerning potash and mean that the fertilizer should be worked into the soil where possible, or top-dressed annually where this is impossible.

Too often farmers apply lime and believe that the fertility requirements of legumes have been satisfied. The soil reaction should be kept at a suitable level for these various crops, of course, but sometimes farmers exhaust their funds with lime and leave no money for the fertilizers which are necessary for optimum growth. Lime to the proper reaction is advisable, but rather than over-lime some investment should be made for the other essentials in legume production.

Potash in our trials with alfalfa, red and alsike clover has paid a handsome profit in every case. It has stimulated yields, added to the length of life of the alfalfa crop, perpetuated sweet clover in pastures, and aided in keeping volunteer clover in permanent hay mixtures.

Phosphorus is essential and combines with potash in making success with clovers sure. It is especially important to work this substance into the soil before seeding. Nitrogen can be depended upon to aid legumes, and should always be used if manure is not abundant.

Fertilizing legumes should be more often practiced, for if properly done this is one of the most profitable ways to use fertilizer.

The Last Round-up

(*From page* 6)

days of Colantha Fourth's Johanna. Being tired of bulls in the ring and out, he took me over to the Alamo for a "last stand" at his expense. Not even Davy Crockett shot straighter than he did, somewhat in these terms:

"Don't let 'em kid you! Elders, exhorters, and deacons are numerous and voluble in dairy circles, in contrast to the extreme reticence characteristic of horticulturists or bee keepers. They are strong for the old-time religion which has been preached in the cow yard ever since the days of jug deliveries, fly-speck custard, and the hand-skimmer. The bosses of old bossey have not in any large numbers come to think in a national way yet, being held by milky tradition and stem-winding oratory to a state of localized and regionalized provincialism. Yanking udders being a domestic issue, the product has curdled into sectionalism. Of course the big buyers have had sense and shrewdness enough to chain themselves together from state to state and region to region, so the general result looks like a string of beads—the string being the big processing and distributing elements and the beads being the isolated and unrelated producer groups. Maybe there's nothing wrong in that, but it's deucedly deadening to producer-initiative, as I see it.

"So far the main expressions of progress which have come to the relief and betterment of dairy farming have drifted down from scientific and educational centers directed through the two dominating forces of the industry —the cheer leaders of breed promotion and the gas salesmen on the cooperative highway.

"But farmers who led in the cooperative parade up milk lane have usually not been marchers in the breed-weed-feed contingent. You can look long and hard for the same men who repeat pedigrees to become enthusiastic supporters of one-man-one-vote and patronage dividends. These have been two distinct entertainment features, and each barker says he has the greatest show on earth for dairymen. Yet a few dairymen have stood pat and attended neither.

"The cow-operators play to one crowd, and the co-operators attract another, and seldom do we see one man broad enough to accept both. On the whole they have been grand old race courses for speedy but single-track minds.

"THE cow-operators have puffed out their cheeks blowing hard into the bladder of larger production, with the advantages chiefly on cost-saving rather than safe marketing. But even on this there is some tongue wagging, for what follower of bred-for-production will keep fewer cows when he has any empty stanchions? The general direction is not only for better milk, but tons more of it. The big shows have catered too much to fine points and score cards. To offset this one breed at least has started parish shows on country standards so as to come closer to the silo and the soil, with less emphasis on the artful jockey who can juggle his way from royal scrub to purple ribbon by a little shining, back-pinching, trimming, and kindred monkey business. The best way to get somewhere with farm breed promotion is to get folks acquainted with the kind of cows that pay over a pail by seeing them in their relaxed, cud-chewing moments, rather than all dolled up for a killing.

"As for the cooperators, they dug in locally and did a fair job of it, but most of them were too competitive to set up strong interstate systems. So the result is that the dairy industry became the world's strongest in organized numbers and details, and yet the weakest in program or unity. They got into a habit of routine thinking.

"If anybody had nerve to say that quality pooling arrangements or an inter-regional dairymen's contract plan would reduce inequalities and improve average net returns to producers as a whole, the poo-bahs howled them down. No English nonsense here!

"When the little milkers get restless, the big milkers just turn on the old bogey music, light up the shooting gallery, and beckon the boys all over to take pot shots at the tin varmints gliding across the target. There you are, gents! Slug 'em with pizen! Here are the enemies to vanquish! So they blaze away at the Canadian treaty, Brazilian nuts, the coconut cow, foreign devils, and outrageous ole ping pong! Another decoy meets its death, and the well-greased wheels of politics and diplomacy fetch up another in its place. Well, anyhow, most of the fellows are getting their money's worth out of the game so I should worry!"

I ventured the remark that dairymen were against the theory of scarcity which has been used to bolster up farm income in other lines. Wasn't that a fact?

"AGAIN you are subject to correction," concluded my obliging supersalesman. "You too have been listening out of only one ear, I see. The trustees of the industry claimed they were scandalized by the antics of the hog boys and the wheat threshers in regard to limiting output. But all the same they favor the highest sort of tariffs and the most absolute kind of regulation of competitors, which has for its sole objective the keeping of production scarce enough to maintain good prices. They are not quite so frank and crude about their way of doing things, that's the only difference."

And so, in addition to sore hoofs and a headache, the only outstanding opinion I derived from dairydom's galaxy of glory is that it seems to be a clean and conservative outfit, not in need of wholesale reform perhaps, but maybe a little renovation. After all, that same conclusion just about fits all the rest of us, so I am not making too much of my discovery.

NO BARGAIN

Lawyer to colored client: "Well, Hank, I can probably get you a divorce, but it will cost you $50."

Hank: "Fifty dollars, boss?"

Lawyer: "Yes, that includes court fees and other expenses."

Hank: "Well, boss, I guess I don't want no divorce. There ain't $50 difference between dem two wimmen."

Two girls were walking along the street.

"Oh," said one, "your bloomers fell."

"Thanks," said the other, "I might have lost them."

"And you just bought them, too," replied the first girl as she picked up the package and handed it to her friend.

FIGURES OF SUM

"John, dear, I'm to be in amateur theatricals. What will people say when I wear tights?"

"They'll probably say I married you for your money."

Bill, while swimming at a bathing resort, met a friend who introduced him to his wife who was in bathing. A week later Bill found himself seated opposite his friend's wife on a trolley car. He bowed. She looked puzzled for a moment and then exclaimed: "Oh, how do you do? I didn't recognize you with your clothes on."

She left the car at the next corner.

The fair young debutante was surrounded by an admiring crowd of officers at the colonel's ball. Mamma was standing near by, smiling complacently at her daughter's social success. This discussion was over the quarrel of the day before between two brother officers.

"What was the 'casus belli?' " asked the fair debutante.

"Maud!" exclaimed Mamma, in a shocked voice. "How often have I told you to say stomach?"

A chemist of naturally retiring disposition was recently introduced for the first time to the first tee at the Wilmington Country Club. Before a generous gallery he swung a clean whiff.

"My Gawd!" he exclaimed, "this is the hell of a tough course."

CONSEQUENTLY

A pair of newly-weds had tipped the porter generously on boarding the train to keep that fact a secret. The next morning, noticing the many knowing looks cast in their direction, the angry groom called in the porter to account for his treachery.

"Lawsey, boss," he replied, "I didn't tell 'em; they asked me if you was jus' married and I sez no, they're jus' very good friends."

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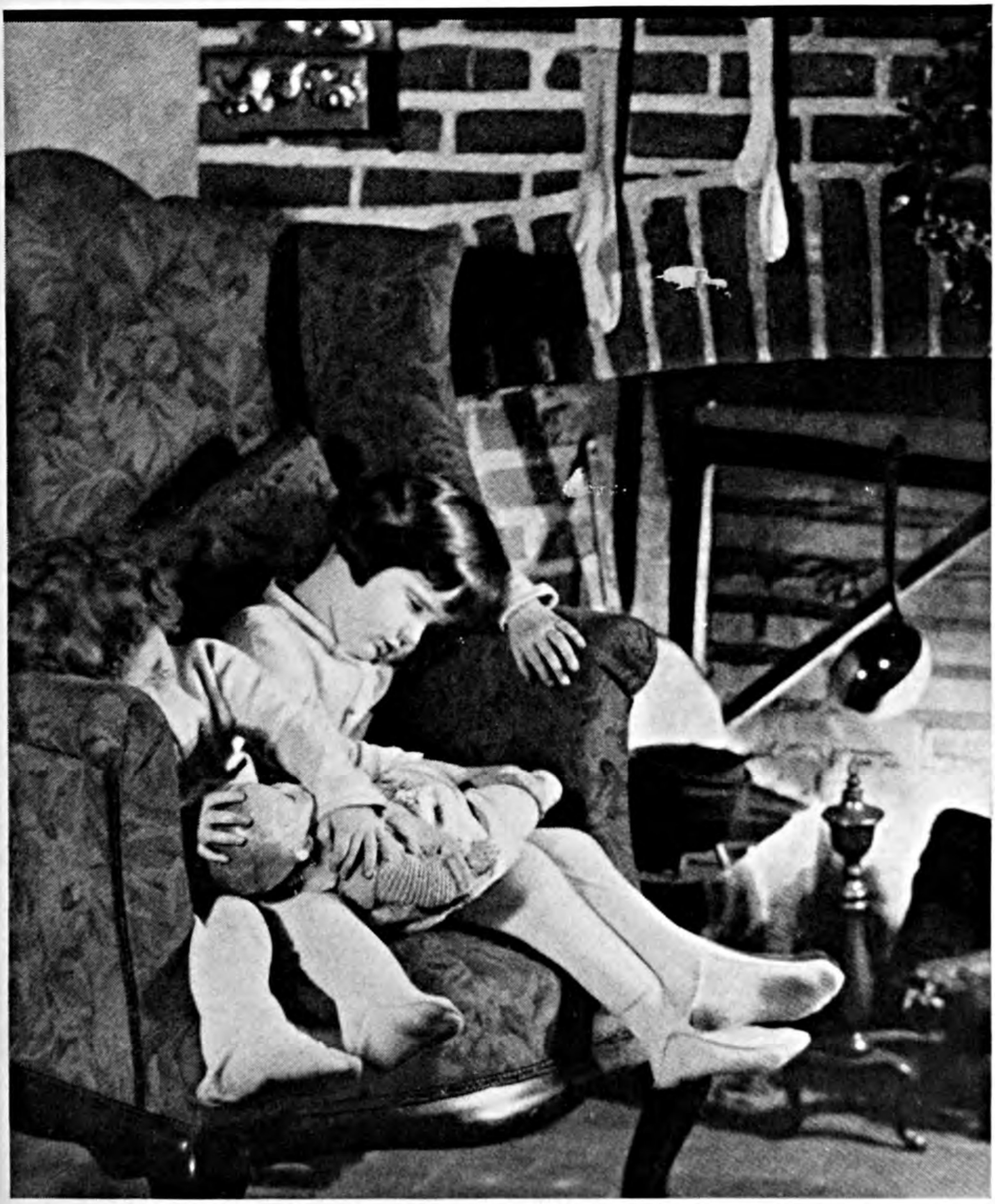

The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XXI NUMBER TWO

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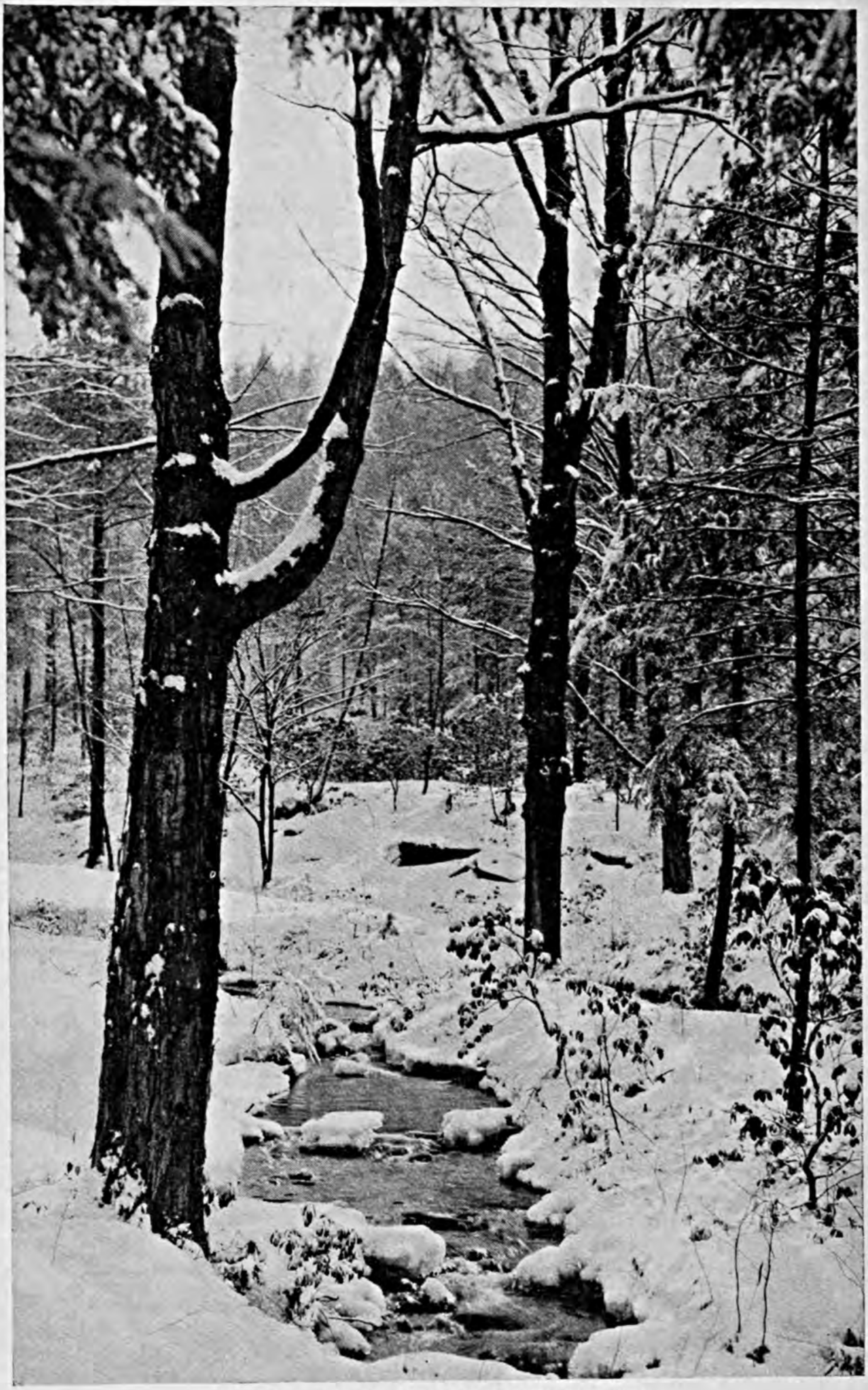

THE PEACE AND REPOSE OF THE SEASON

Better Crops with PLANT FOOD

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The Happy Huskers' Holiday

Jeff McDermid

THIS has been a delightful holiday season for that well-established bucolic fraternity of Corn Corners, known as the Happy Huskers' Club. In several years of personal contact with its membership, I can testify that there has seldom been quite so jolly a spirit pervading the group as governs it now.

Good humor follows them in their late fall tasks of shredding, barn choring, and steer feeding; and even penetrates into the more savory environs of the culinary cloisters, where their ruddy wives pluck geese, stew cranberries, and mix puddings in anticipation of the usual effect which bitter winds have on agricultural appetites.

The golden glow hovering about the Corn Corners Happy Huskers traces to the treat in store when they hold the annual Yuletide-New Year festival at the district school—an event to which the whole community turns as surely as a calf to the milk pail, but I hasten to add, with a trifle more evidence of generosity and party manners.

For this time the committee has staged a glorious new idea, a sort of Christmas remembrance done in original style in pleasant yet bantering tribute to some of the moving spirits of the countryside who have done yeoman service to the great agrarian cause. But before dipping into the details as hatched up by the ingenious plotters, let us acquaint ourselves with the officers of the Happy Huskers'

Club and relate some highlights of its history.

For a decade the chairman of the club, known as the Top Tassel, has been none other than "Prolific" Hastings, who by the way is a bachelor. The club custodian and keeper of the scroll, rustling in autumnal winds, has always been "Early" Leaming, whose home is adjacent to the meeting place and who keeps things shipshape in advance of every conclave. Neal Paymaster is the treasurer of the Happy Huskers, and being a descendant of Aberdeen, he is a far better retainer than a diffuser of the dividends.

Every club worth the name must have a sergeant at arms, and so for time immemorial this duty of dignity has reposed in the safe keeping of the august "Kernel" Krug, widely known for his large and popular family. The board of directors, who really sometimes direct a few things, consists of Y. D. Reid, old "Silver" King, Flint Longfellow (no relative of the poet), "Purebred" Casey, Bumper Murdock (some traveler by the way), D. R. (Drought Resistant) Reese, and T. E. (Two Ear) Piedmont.

I am sure you will agree, if you are really up to snuff on such things, that with this aggregation in charge, the affairs of the Happy Huskers are well on the road to recovery, whichever way you may have voted. In none of the ancient and honorable annals of American "planting-prudence" has there been a set of officers more fitted to keep things well cultivated. In fact, we might even nominate them for the hall of fame, if there were a hall big enough.

SCANNING the archives of the club over the denim-clad shoulders of Early Leaming, I am able to advise you that the name the club now bears is not its original one. In fact, this commonsense cognomen has only emerged within the past year or so. I shall digress to point out from the minutes kept by Leaming himself, by just what processes they arrived at this final selection.

"Away back when" this club was organized (as all farm societies must be, of course, or the talking talents of some folks would go for naught) the title they bore was a stilted one. It must have come from some old McGuffey reader or a wall motto left in a legacy and discovered in an attic. It smacks of rugged individualism and is as independent as wind-pollination itself.

FROM 1920 to 1930, to be exact, they called themselves the Corn-u-copia or Horn of Plenty Club. Then, because of certain adverse economic situations of which we have a remote recollection, the title was voted on in 1931 and altered to Corn-u-burnia or Horn of Dilemma Club. During the next three seasons it was found advisable to shift again, this time to Corn-u-contract or Horns to Hook 'Em Club. Then, after Neal Paymaster had handed out a few helpful checks, and a series of big dry spells "advented" among them, the cronies made one more quick repair job, calling themselves the Corn-u-needa or De-Horned Club.

About that time one of the neighborhood girls came home from college imbued with the modern idea of simplicity in literary architecture and the removal of cupolas, etc. So the women took a hand and vowed they would strike unless the menfolks came back to Yankee common sense. Hence we have again the kind of club name we can all endorse, at least because we can all pronounce it. A unanimous vote was taken by the lodge, and "Happy Huskers" it will be forevermore, and then some!

Now this same helpful lassie, Silky Krug, is also almost entirely responsible (because of her normal school courses) for the program which the club is about to spread upon your holiday horizon. And with good fortune before us, we may be able to repeat other better ones in months to come, as time and season dictate.

Together with Zea Mays, another bright daughter of the Happy Husk-

ers, Silky set up a Christmas tree in the schoolhouse with the help of the neighborhood boys. It was trimmed with braided husks strung together and dipped in dyes, and they added cobs covered with glue and sprinkled with tinsel set upright on the branches like tall candles.

THEY had little Nubbin Hastings dressed up like a gnome to hand out the various 10-cent-store presents, drawn in the form of a lottery, tickets being given out with each tray of eatables. The small group of invited honor guests came late and found seats toward the front reserved for them right near old Grandpaw Murdock.

After the harmonica band had rendered as many pieces as everybody could stand, Prolific Hastings cleared his husky throat and said it was their privilege, after many years of obligations to "certain sterling citizens," to be in a position to leave with each one a fitting testament of regard and devotion.

"I NOW request Hybrid Johnson to step up here like the good county agent he is and get his just deserts."

Meanwhile, Early Leaming bobbed up on the platform with a parchment made out of ironed corn shucks pasted together and brush-lettered in water colors. In fact he had a heap of these separate testimonials tied with ribbon ready to give each of the guests. Turning to Hybrid, he read the first quotation, prefacing his remarks with the information that the girls had got all these sentiments from the Bible—just to make sure that those in the audience would recognize their source. "If you have anything to say afterwards, do it then or forever hold your hosses," declared Leaming, as he read:

From Joel, Chapter Two: "And the floors shall be full of wheat, and the fats shall overflow with wine and oil; and I will restore to you the years the locust hath eaten, the cankerworm, and the caterpillar. . . . And ye shall eat in plenty and be satisfied."

Accepting the scroll, Hybrid smiled and said: "My only reply is a genuine thanks for this warm sentiment, indicating that I have labored to help you farm better. But my only criticism is that perhaps county agents nowadays devote a little more time by comparison to organization and marketing work among farmers instead of so much production. But, on the other hand, some of them have gone a little too far afield in economics and let the fundamentals sort of worry along alone. I'll try to do both."

After each party received his trophy, the Happy Huskers arose and shouted their fraternity yell:

(*Turn to page* 44)

Fig. 1—A fertilized field in Saskatchewan showing what happened when one drill width was left unfertilized.

Fertilizer Distributors For Seed Drills

By Dr. R. E. Neidig and R. S. Buckman
Calgary, Alberta, Canada

Editor's Note: The accurate distribution of fertilizer in small quantities especially is a problem in such areas as the newer fertilizer areas in the West. Therefore any information of machines which will distribute less than 100 pounds per acre is of interest.

A COMPREHENSIVE experimental program carried out on the Canadian prairies during the years 1927 to 1930 by Industrial Companies, governmental agencies, and farmers proved that fertilizers, when drilled in directly with the seed, not only produced profitable increases in yield, but usually produced higher quality cereal crops in years of early fall frosts, and rusts. An earlier maturity of 6 to 10 days for wheat, and 8 to 14 days with barley, was readily secured. The selection of earlier maturing varieties, combined with proper fertilization, lessened the danger of loss in lowered grades of cereal crops. Experimental work also proved conclusively that under Canadian conditions fertilizers drilled in with the seed were more effective than broadcasting. In fact, due to climatic conditions, fertilizers broadcast often failed to show effects until the following year, and even then they did not produce as good results as when fertilizers were drilled in with the seed.

After proof of the economic value of fertilizers was established in 1930, grain prices receded to such low levels that many farmers who desired to use fertilizers were unable to purchase new combination fertilizer and grain drills to replace their ordinary drills, many of which were in good repair. In eastern Canada combination grain and fertilizer drills were made for low analysis fertilizers; these distributed between 200 to 1,200 pounds per acre. Western Canadian prairies, because of long freight hauls, demanded a concentrated high-analysis fertilizer in order to lower the cost of plant food and enable the farmer to use it even in years of low grain prices. It was evident that to enable the farmers to use fertilizers, an attachment capable of accurately distributing fertilizers at the rate of from 30 to 40 pounds per acre would be necessary before their use would be wide-spread.

Some conception of what these small applications of high grade fertilizers really mean when distributed in the soil can be gained from the fact that using an ordinary application of 35 pounds per acre, the amount of fertilizer fed is less than one-half ounce per 100 feet of seed run, corresponding to about a thimblefull per one rod row evenly distributed.

There were no combination fertilizer and grain drills owned by the western farmers, whereas practically everyone who grew grains at all had a seed drill; and although thoroughly convinced that fertilization had become necessary for successful cropping, the high initial outlay required in discarding the seed drill and replacing this with a combination drill deterred many from using fertilizers.

From all sides came insistent demands for a fertilizer attachment which could be applied to an ordinary grain drill, and which would apply fertilizer similar in principle to a grass-seed attachment sowing grass seed. Some farmers even tried putting fertilizer through the grass-seed feeds, but it was soon found that this was no more successful than mixing the fertilizer with the grain. In neither case was the mechanism capable of handling fertilizer, and it was apparent that an entirely new mechanism would have to be built if a suitable attachment for the ordinary grain drill was to be successful for applying high-grade fertilizers.

New Mechanism

This problem was first taken up seriously by The Consolidated Mining & Smelting Company of Canada, Limited, in 1931, because it was felt if any real headway was to be made in the distribution of fertilizers to the already fertilizer-hungry Canadian prairies, a market would have to be assured sufficient to induce makers of seed

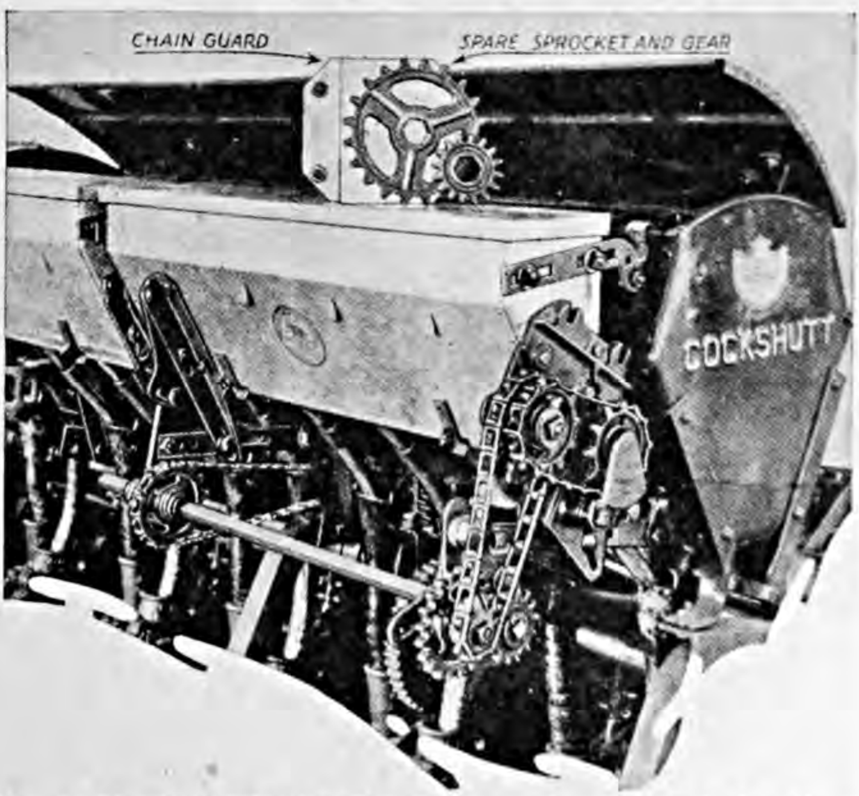

Fig. 2—New fertilizer distributor which can be attached in less than an hour to any make of seed drill without the use of special adapting parts.

drills to consider manufacturing fertilizer attachments suitable for mounting on their existing drills.

This company had not progressed far until the magnitude of the problem became apparent. One attachment to fit the larger number of different makes of drills and the various sizes and styles in which these machines were made appeared to be an almost impossible task. By the spring of 1932, however, an attachment had been developed capable of being fitted to any make or size of seed drill. True, it carried a separate set of adapting parts to suit every drill; it was heavy and cumbersome, but it distributed fertilizer better than any other machine on the market at that time, and between 1,200 and 1,500 of these were placed in service that year.

Adjustments Made

The machine was mounted forward of the grain box, which necessitated replacing the ribbon grain tubes with new ones carrying a cup with an entry for the fertilizer tube. Complete with fertilizer the machine added between 550 and 600 pounds to a 20-run seed drill, and in consequence some users complained of the added weight and the neck-yoke load on horse-drawn drills.

In 1933 this attachment was redesigned and made adaptable to the rear of the grain box, the adapting parts for the drill were greatly simplified, and the machine made much more weatherproof.

There was no reduction in weight, but as it was mounted behind the grain box the complaint of added weight to the necks of the horses was removed. However, it still required about a full day to alter the drill and mount the attachment thereon. This type of machine was marketed in 1933 and 1934, and although a great saving was effected to the user over purchase price of a new combination drill, it was felt that a simpler, less cumbersome machine, and one which could be sold lower in price, was necessary before real progress could be made in a more universal use of fertilizers.

During these years continued experimental work had been going on both on fertilizers and on attachments to distribute them. In the case of the former, processes were developed

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Fig. 3—An unfertilized drill width in a fertilized barley field in southern Alberta.

Pasture or Forest?

By Ford S. Prince

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THE northeast is a tree country. After the trees are cut, grasses grow naturally, but it is "the hay and pasture belt" only if conditions are right and when man interferes with the processes of nature.

When these natural processes are allowed to proceed in a normal way without human hindrance, bushes, shrubs, and trees begin to inhabit the landscape. And possess it they will, unless the human element enters the picture.

Trees and bushes are deeper rooted than the cultivated or natural grasses and clover, and they are able to survive and thrive at a fertility level upon which hay and pasture plants will starve to death. If left to her own devices, mother nature, by reforestation, even builds up the fertility of the soil by accumulating from the litter in the upper layers of the soil what these trees have brought from the subsoil strata, so that when the next crop of timber is cut the soil will again produce good crops.

This process of reforestation presents a constant struggle to the farmers of the region. It is particularly evident in pasture management where shrubs and bushes are most likely to get a foothold because of lack of mowing and other control measures.

"How can I get rid of the bushes in my pasture?" This is a question that has been asked by hundreds of farmers who have evaded the soil fertility angle to the matter, believing that cutting in August or in the dark of the moon is the answer. Or perhaps they hope that some mysterious chemical will be evolved which will kill the shrubs and stimulate the grass to better growth. The latter is within the realm of possibility, of course, but cutting in August or any other month is a palliative that only staves off the evil day when the job will have to be done all over again.

Prevention and Control

The simplest way to prevent shrubs and brush and other weeds from gaining a foothold in a good pasture is to stimulate the grass to luxuriant growth with fertilizer and let the cows do the mowing. The easiest way to control brush after it has started is to eradicate it in some manner and simultaneously fertilize the sod, so that proper fertility is established for the grasses and pasture clovers. Under this situation it may be well to keep a weather eye upon the bush survivors to see that they do not again occupy the center of the stage. This may mean repeated cutting until the bare spaces in the areas where the shrubs stood are again filled in with pasture plants, so that natural control will be secured.

If the brushy pasture is tillable, plowing may be the easier method. But bushes will come again unless their appearance is intercepted by proper soil fertility after plowing and reseeding. This means frequent fertilization.

Just as it is with business, or stock market values, or beef cattle prices, there is a natural cycle in progress here with respect to this matter. The easiest thing to do is to allow brush to grow. To prevent this is more difficult and less well understood.

If the farmer is to maintain a good pasture he must take a stand, for the

The first phase of pasture deterioration, with junipers scattered on the grass area.

balance of fertility is always against the soil. Even though cows are fed heavily upon grain while on pasture, their droppings are not evenly spread, and the organic substance of the manure never becomes incorporated with the soil. Where the droppings lie the grass is not eaten, and the remainder of the pasture area suffers for want of the elements the cows remove in the grass they eat.

Starved Roots

Overgrazing is another major cause of pasture deterioration. When pastures are constantly overfed the root systems of the better species are not properly nourished and fail to support a luxuriant top growth. This presents an opportunity for weeds of all sorts to come in with little competition, and once they become established they persist because livestock refuse, in most cases, to eat them.

Because of overgrazing and declining fertility, desirable plants, such as Kentucky Blue Grass and White Dutch Clover, gradually disappear. With the discontinuance of the clover the soil becomes less productive, bent grasses are replaced by poverty grass, and then hardhack, sweet fern, junipers, and other shrubs make their appearance. In the shelter of these bushes, birch and larger species gain a foothold; then comes pine in white pine areas, or spruce and fir in locations where these species are adapted, or hardwood species in situations best suited for them.

Thus by various gentle stages the pasture reverts almost imperceptibly to forest. So gradual is the change that farmers usually do not fence off these areas where the trees have come in, but allow their cattle to range over the fields as before, even though little feed is there to reward them for their physical efforts in getting it.

Whether these reforested areas should be fenced and the cows confined to fields in which grazing is better becomes a problem of economy, and should be answered by the dairyman from the standpoint of his cows. It may be difficult to figure out the answer immediately in terms of dollars and cents, but a fair approximation can usually be made by keeping account of the expense for feed during the summer months. Unfortunately, on many farms the outlay for summer

Junipers on the increase in spite of the heavy soil which gives a remarkable response to fertilizers and is ideal for pasture grasses and White Dutch Clover.

feed is practically as great as it is in the winter. This is especially true on farms where no attempt has been made to get better pastures and can lead to but one conclusion, that the pasture is no longer a pasture, but a woodlot, even though it may be an incipient one.

When should the woodlot be fenced? What is a woodlot? What is a pasture? These are important questions on many farms where bushes and trees have encroached upon the area of grass that is available to the cows. It may not be necessasry to formulate a definition of what constitutes a woodlot or to draw a distinction between the pasture and the woodlot, but it is vital for the farmer to recognize pasture deterioration and to do something about it for the benefit of his cows and for his own financial gain. On a reasonably good sod an expense for fertilizer is more justifiable than for feed, because it is more profitable.

Perhaps it might be well to allow the forester to tell what constitutes a woodlot. So far as a pasture is concerned, it may well be defined by carrying capacity—at least this factor will probably determine whether a top-dressing schedule will be sound from the financial point of view on pastures that cannot be easily worked. If they are tillable, free from stone and bushes, that is quite another matter, for organic matter and fertilizers can then be incorporated easily with the soil.

On rough pasture land it appears that if the carrying capacity is less than one cow to 4 acres, the economy of top-dressing is doubtful. With that carrying power, a top-dressing schedule can be depended upon to double the pasturage the first year, or bring it to one cow to each 2 acres. With repeated efforts in this direction the carrying capacity should be further increased.

To encourage desirable grass and clover species it is necessary in the beginning to use a complete fertilizer, just to make certain there will be no limiting element to militate against the success of the procedure. The most popular fertilizer for this purpose presents a 1-2-2 ratio in a 4-8-7, 4-8-8, or the double strengths of these materials in amounts sufficient to carry from 20 to 40 pounds of nitrogen and twice that amount of phosphoric acid and potash. The exact amount to apply should be governed by the need for feed and by the extent to which deterioration has progressed. Economy rules that the thinner sods should receive smaller quantities until some improvement is noted.

Junipers fairly covering the ground, with pines coming in in the shelter of the shrubs.

Watch Response

Further top-dressings should be governed by the response secured from the initial application both in amount and formula. If the original treatment stimulates the Dutch Clover to a thick stand, future nitrogen applications may be cut down or eliminated on farms where an extra June flush of feed is not desired. If the soil is not heavy enough to produce Dutch Clover, the nitrogen content of the fertilizer should be maintained or increased to a 1-1-1 ratio, or a nitrogen carrier may be used in alternate years with a 1-2-2 fertilizer ratio in the others.

Practically all these northeastern soils are sour and should eventually be limed. Whether a farmer limes his pasture in the beginning of his improvement program will depend upon his financial position. If funds are available, lime should be applied in amounts not to exceed 1 ton of ground limestone per acre. But if there are funds but for one operation, fertilizer should represent the first purchase.

There are a limited number of situations in New England and many outside where a good job of pasture improvement can be accomplished by using lime and superphosphate. On such soils the potash availability is probably high, and the clover which is stimulated helps the grass because of its nitrogen accumulation power. Over most of New England and in certain

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What Makes the Red Hills Red

By T. S. Buie

Regional Conservator, Soil Conservation Service, U.S.D.A.

ANYONE can see while driving through the Piedmont that erosion is the destroyer of the rolling lands of the South. The greater part of the topsoil already has been carried away, and where deep gullies are not present they are rapidly forming. As the topsoil gets thinner and the gullies deepen, crops and profits become smaller and smaller. Then families go broke and must abandon their farms. Gullies and abandoned homes seem to go together, for where gullies are found, usually abandoned homes are nearby.

It would be interesting if by some magic stroke we could turn back the flight of time and find ourselves in the days of 2 centuries ago when this was virgin country.

Terracing is practiced by this Virginia farmer. The picture shows a terrace channel being finished with a plow.

The exploitation of virgin land was then just beginning. Cities were springing up along the coast. Always when cities grow, as these did, some of their inhabitants tire of congestion, look for an outlet, a place where they can stretch their limbs and build anew. These adventuresome souls are happy only when they can take nature's offerings and construct new farms, new towns.

From settled areas of the Coastal Plain these restless souls journeyed upstream by boat and afoot until in the Piedmont they met similar adventurers from the North who traveled by wagon train from Pennsylvania and Virginia until they found a country to their liking. From these two sources, where an increasing population encouraged movement to new areas, came the Piedmont stock of the Carolinas, Georgia and Alabama. There were some among these first settlers who took the trouble to describe in writing what they saw. These early writers pictured the virgin Piedmont as a country of rolling hills covered with forests of sparkling clear streams, of extensive glades and meadows. Indians and game ranged the countryside, content with nature's bounty. For ages unknown they had occupied the land without so much as inducing the ruination of 1 acre. The Indian never cleared more than a small patch of the fertile bottomland.

Not so the early white settlers. As Will Rogers said, "they took their gun, axe, and plow and carved their homesites from the wilds."

Gun, axe, and plow. Think for a moment of those three instruments of human ingenuity. They have been the arch enemies of virgin country. A gun to shoot the game, an axe to chop down the trees, a plow to lay the soil open and a prey to erosive forces.

The level areas, the glades near the streams, were the first to be cultivated. Such fields were extremely productive, but as families grew up and more families moved in, that type of soil was insufficient to support the population. Less suitable areas were cleared and put into production.

General William Richardson Davie described the situation as it existed in those days in an address to the South Carolina Agricultural Society. As President of the Society he said on December 8, 1818:

"A large proportion of this extensive and once fertile range of country has been cleared for cultivation, in a kind of succession extremely unfavorable to the preservation of its fertility. The means of the first settlers were generally confined to their own personal efforts. Removing the timber and fencing the land were an appalling effort to a single individual. A few acres, commensurate only with the demands of immediate subsistence, were cleared; these were cultivated until they were nearly exhausted, when another effort was made, and another field added. When this was also worn out, they had recourse again to the woods, and no means were used to preserve the new additions from exhaustion or to restore the old-worn-out land."

Forced Westward

Branches of many Southeastern families moved westward as soils became too badly eroded to produce a livable income. Few are the old families of the Carolinas which 50 to 150 years ago did not divide with some members moving west.

So the falling rain on unprotected fields has been one of the factors to send families on until the new land is practically exhausted.

Those settlers could and did treat their fields like we treat an old pair of shoes. They just discarded them when they wore out. That was pos-

Bench terraces on steep Georgia hillsides, together with the practice of strip-cropping, prevent soil losses from erosion.

sible because new land was abundant. Now it isn't possible. We can still get good new shoes but we can't get good new land. And many of us can't even get new shoes because our land doesn't produce the wherewithal.

be paid for with the proceeds of a cotton crop. Each farm was a self-contained unit, self-supporting, which meant the planting of abundant areas of feed and hay crops and pastures, with the amount of cotton limited

Strips of close-growing crops between strips of cultivated crops prevent washing on hillsides and have proven successful in combating the erosion problem. This is a South Carolina field strip-cropped with wheat and cotton. The strips follow the contour of the land.

to that in which the lint could be separated from the seed by hand.

It is certain that erosion started as soon as the first hillsides were cleared. That is accelerated erosion, the type that cuts gullies and carries away the fertile topsoil. Of course, ever since this earth of ours has been in existence, erosion has been going on. This has been a very slow process described as geologic erosion. By this process soil forms and is removed so slowly the change scarcely can be observed. It is estimated that it takes about 600 years for nature to make an inch of topsoil in the Piedmont by this process, yet that's as fast as the topsoil would wash away under natural conditions. In other words the soil doesn't wash away any faster than it's built up until man comes in with the axe and the plow.

Fortunately for the sake of the soil, the type of agriculture practiced by our colonial ancestors by necessity was of a subsistence nature. Food for the landlord and slaves as well as feed for the livestock was the first necessity. There were no trains or trucks to transport corn and hay from the Midwest or fruits and vegetables from Florida—even had there been a Midwest or Florida as we know them—to

A little later in our history the cotton gin came along to stimulate the clearing of new land. The gin made it possible to produce and handle a much greater quantity of cotton. Farming became more of a commercial venture and enterprise from which money could be made, rather than a manner of living. So the hillsides were put into cultivation, first the very gentle slopes, then the steeper ones. A place had to be found to plant cotton.

Cotton Is King

Cotton was crowned King in the Southland many years ago, and his true followers have paid homage to him. Fortunes have come to those who handled and marketed cotton as well as to those who produced it. Like human rulers King Cotton made many demands upon his subjects. The eroded fields of our fair Southland bear silent testimony to the homage exacted by this King. The farmers of today, faced with declining yields of their chief cash crop, realize at what cost this system has been followed.

For a long time many southern farmers have had the idea that cotton is easy on the soil. It removes just a little plant food they say, because the greater part of the plant is turned back to the soil. This is a great fallacy, particularly on sloping fields. Even if the cotton lint itself removes but a comparatively small amount of plant food, erosion takes a vast quantity as it washes away the topsoil left unprotected after cotton-picking time. Still worse, gullies eat into fields, their tenacles spreading like the tributaries of a stream, leaving ugly scars and useless fields. If the loss were restricted to plant food it would be much easier to replace. You can buy plant food in a sack. But topsoil is formed only through the long, slow processes of nature and cannot be restored to a field when once lost.

What makes erosion such a problem in the South? First the physical character of the soil itself. A friable soil, once the protective cover is gone it washes easily, gullies form, and the sides crumble. There falls annually 200,000 cubic feet of water on every acre every year. Most of that water runs off the surface. In the Piedmont country it flows 500 feet downward in a distance of 100 miles. And finally cotton and other clean cultivated crops are grown extensively. Vast acreages are left entirely unprotected through the winter months, the period of heaviest rainfall.

Left: On this land CCC workers have built brush dams for the control of gullies. Eventually trees and vegetation will help nature rebuild. Right: Kudzu or "porch vine" used to stabilize gullies and on badly eroded fields also provides excellent forage. Since it is a legume it enriches soils that are very erodible.

A few recognized the dangers of erosion almost 100 years ago. Writing in 1843 Ed Ruffin called attention to the loss of soil from cultivated fields and suggested methods for reducing this loss. But if we observe the gullied hillsides, abandoned farms, and deserted colonial mansions that once sheltered the fairest of the South, then we must conclude few took action against the forces of erosion.

Problem Demands Attention

Sons of the South have been praised for their bravery. The hardships undergone following the invasion of armies is well known. But the invading soldier destroyed only that which had been produced or developed. His destruction was temporary compared to the destruction caused by erosion. He did not destroy the very means to produce and develop.

Yet we should not be too severe in the criticism of our ancestors who first lived in the Piedmont section. They didn't realize what damage they were beginning. They knew always that they could move on to new land as soon as the old failed to produce good crops. Furthermore, but for their bravery and hard work the country could not have been developed.

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Give Peat Soils Required Potash

By Arthur O. Braeger

Wisconsin College of Agriculture, Madison, Wisconsin

LACK of potash, not lack of water, limits crop yields on marsh soils, according to A. R. Albert, soils specialist at the University of Wisconsin. Detailed fertilizer trials conducted by Albert at the Coddington Sub-Station in Portage County during the past 14 years give proof of the need of potash on these peat soils.

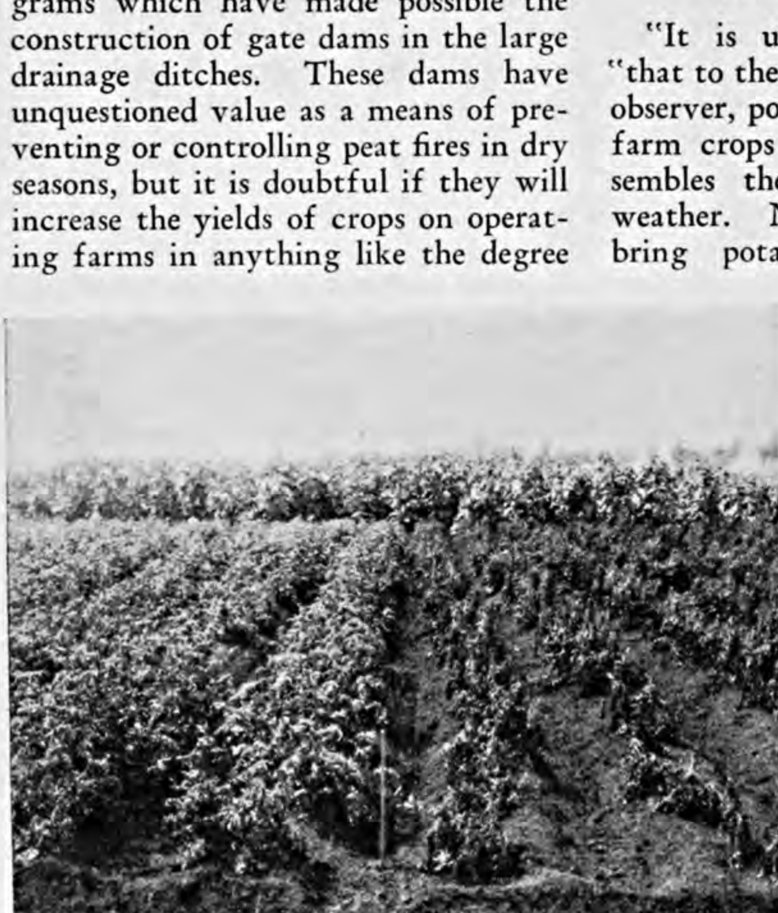
Farmers located on drained marsh soils in central Wisconsin have taken great interest in the work-relief programs which have made possible the construction of gate dams in the large drainage ditches. These dams have unquestioned value as a means of preventing or controlling peat fires in dry seasons, but it is doubtful if they will increase the yields of crops on operating farms in anything like the degree numerous farmers hope for, declares Mr. Albert.

Many local people are counting on the dams to raise the water table of the soil during the dry periods, and thus supply plants with needed moisture. It must be recognized, however, that the limiting factor on these soils is almost invariably a lack of potassium rather than inadequate moisture, Mr. Albert points out.

Potash First Essential

"It is unfortunate," he explains, "that to the inexperienced or untrained observer, potash starvation gives many farm crops an appearance which resembles the effects caused by dry weather. No amount of water will bring potassium to these potash-hungry soils, and only disappointment will follow a program of expecting the new dams to make possible the desired increases in crop yields. Potash fertilization is the first essential for successful farming on these drained marsh soils, and there is no alternative for such fertilization."

Mr. Albert tells about his tests with sunflowers at the Coddington Substation in the following: "With sunflowers, the yield



Fertilized and unfertilized potatoes after a light frost in fall.

Corn and soybeans grown in deep peat soil on the farm of James Isherwood, Portage County. Left: No fertilizer. Right: 100 lbs. muriate of potash per acre applied in rows.

during the past 5 years has averaged 1,499 pounds of air-dry crop materials per acre on the unfertilized plats, whereas the yield has been doubled (3,031 pounds per acre) when 150 pounds of 50 per cent potash have been applied once every four years in the crop rotation. When an additional 150 pounds of potash fertilizer were added (thus making a total of 300 pounds every four years), there was another large increase, or a total yield of 4,733 pounds of air-dry crop material per acre.

"In this same rotation the potash applications have not only strikingly increased the yields of sunflowers, but the yields of oats have been increased from less than 2 bushels per acre on the check plats (which never received fertilizer of any kind) to 41.6 bushels per acre with the 150-pound application of potash, and 49.5 bushels per acre for the 300-pound application. The rotation is for four years, with the plats being in mixed timothy and clover for two years following the oats."

"Hay yields have increased. They have averaged 1,129 pounds on unfertilized plats, 2,308 pounds on the plats getting 150 pounds potash fertilizer during the four years, and 2,806 pounds where 300 pounds of potash fertilizer were used."

According to Mr. Albert, tests with phosphate fertilizers in addition to potash have revealed marked benefit from superphosphate applied for sunflowers, and some increases in yields of oats and hay. The superphosphate was added once during the 4-year rotation at a rate equivalent to 64 pounds of phosphoric acid per acre. Sunflower dry forage yields were thereby increased from 4,733 pounds per acre to 5,608 pounds. Rock phosphate has shown little benefit on oats or sunflowers, but it is somewhat more effective than superphosphate for hay crops. Phosphate fertilizers applied without potash have shown no benefit. Adding lime to the marsh soils on the Coddington Sub-station has had no effect on crop yields.

Conform to Rotation

Based on this experience of 14 years, Mr. Albert points out that the fertilizer plat experiment has now been modified to conform to the rotation which seems to be the best adapted to the deep peat soils in this area.

1. Sunflowers (Giant Russian) for silage, drilled in rows to a stand of 5 to 7 inches between plants.

2. Oats (Wis. No. 7) drilled at ½ to 1 bushel per acre in late May with a seeding of reed canary grass at 4 to 6 pounds per acre broadcast before the disks. The seed bed is prepared without plowing and all seedings rolled. In case of failure of reed canary grass seeding in oats, it is resown after oat harvest or/and again just before

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Alabama's "Garden Spot"

Baldwin County

By L. O. Brackeen

Editor, Agricultural Extension Service, Auburn, Alabama

IN LESS than 50 years Baldwin County, Ala., has grown into one of the leading "garden spots" of America, and indications are that the development has just begun. Truck crops and vegetables are produced by the acres, tons, and trainloads for consumption throughout the eastern half of the United States.

It was about 1890 that sawmills began to make serious inroads on the great pine forest of the county, and it was about 1900 when the real settlement began. Today most of that great forest is gone, and big fields of irish and sweet potatoes, green corn, beans, cucumbers, cabbage, radishes, turnips, peppers, early onions, asparagus, parsnips, and other truck and vegetable crops have taken its place. Too, there are fields of cotton, peanuts, soybeans, cowpeas, and velvet beans, as well as a few big orchards of Satsuma oranges, pears, and other fruits. Herds of beef and dairy cattle, hogs and sheep, and flocks of chickens also thrive in the county.

During this rapid development a most earnest, energetic, and thrifty population has been established. Among the citizens are native Americans, Swedes, Norwegians, Danes, Germans, Hungarians, Englishmen, Scots, Bohemians, Italians, and Greeks.

A Bright Future

Indications are that Baldwin County will make even greater progress during future years than it has in the past. There are at least seven reasons for this: (1) Farmers continue to settle in the county; (2) new land is being developed and improved; (3) farmers are learning to produce two to three crops per year on the land; (4) higher yields are being obtained by the use of the proper kind and amount of fertilizers and legumes; (5) better planting seed are being used; (6) more and better work stock are being used; (7) modern equipment is being put into operation.

Farmers find that crotalaria improves their land and increases truck-crop production.

Fields of fine truck crops, such as the cabbage field above, have supplanted the great pine forests of the county.

That the population is increasing and new farms are developing are indicated by the large number of farmers who move into the county from other parts of the state and nation and establish homes every year. Real estate agencies are very active. The possibilities of further developments are shown by the fact that only 8 per cent of the land is in cultivation, while 35 to 40 per cent of it is fertile and suitable for truck crops.

Successful Rotations

Much of the land produces two or three crops during the same year. The irish potato crop is planted in January and February in 3-foot rows. In April a row of corn is planted in every other potato middle, and then when the potatoes are harvested in May and June a row of velvet beans, cowpeas, or soybeans is planted in the middles not planted to corn. Hogs and cattle are turned into the fields to eat the beans and peas after the corn is harvested. Soybeans are often left to make seed for sale and for planting the following year.

Many small operators produce and harvest a crop of potatoes and then plant the land to corn interplanted with either velvet beans, cowpeas, or soybeans. Often two crops of potatoes are produced on the same land the same year. After an early crop of irish potatoes is harvested and marketed, a crop of late sweet potatoes is produced for consumption in the southern states. A crop of cucumbers followed by a crop of sweet potatoes is another method of growing two crops on the land in one year.

A large acreage of the land is planted in summer legumes each year. There are two big advantages to growing legumes; they improve the soil and furnish valuable grazing for the cattle and hogs in the fall.

During the past two or three years farmers have learned to grow crotalaria for improving their lands and increasing their truck crop production. That the crop offers unusual possibilities is shown by facts established at the Gulf Coast substation at Fairhope:

"Two and a half tons of crotalaria turned in 1932 gave an increase of 23 bushels of potatoes for 1933; 8 tons of crotalaria turned in 1933 gave 45 bushels increase in yield of potatoes in 1934; and 13 tons turned in 1934 gave 78 bushels increase in yield of potatoes for 1935.

"Two and a half tons of crotalaria turned in 1932 gave only 5 bushels increase in yield of beans in 1933; 8 tons of crotalaria turned in 1933 gave an increase of 66 bushels of beans in 1934; and 13 tons of crotalaria turned in 1934 gave an increase in yield of 103 bushels of beans in 1935."

Farmers have made rapid progress in finding out what are the most profitable fertilizers to use under various truck crops. To assist them in this work the Gulf Coast Experiment Station was established at Fairhope in 1930 and has made some interesting developments since that time.

For years it has been the established practice for farmers to fertilize their irish potatoes with 4-10-7 and to side-dress with about 200 pounds of nitrate of soda per acre. The experiment station has found that the most profitable fertilizer for irish potatoes is about 1,500 pounds of 4-10-6 or 4-10-7. "The average production following an application of 1,500 pounds of the fertilizer was 150 bushels per acre," says Professor L. M. Ware, head of the horticulture and forestry department of the State Experiment Station. "Figuring potatoes at $1 per bushel, the returns were $110.44 above cost of fertilizer and seed."

"It appears that 600 to 800 pounds per acre of a 4-10-7 fertilizer are best for the early sweet potato crop in south Alabama," according to Professor Ware. "For the late crop, about 300 to 400 pounds of 4-10-7 fertilizer should produce a very satisfactory yield." For years Baldwin County farmers have been applying 1,000 to 1,400 pounds of 4-10-7 per acre.

For Best Returns

Despite the fact that the Alabama Experiment Station recommends only nitrogen for field corn throughout the state, experiments at the Gulf Coast station show that green corn responds nicely to phosphorus and potash. In fact, the results indicate that the most profitable returns from corn in the Gulf area are made when about 800 pounds of 8-10-6 or 1,000 pounds of

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Careful grading of sweet potatoes help to move a crop on selective markets.

The Drought and Its Effects on Corn Prices

By E. N. Bressman and L. H. Bean

United States Department of Agriculture

"PRICE" is a magic word. Regardless of other factors, such as quantities produced and purchasing power, most growers emphasize prices to the exclusion of all other factors. When corn is 10 cents a bushel they know that conditions are bad; when corn is a dollar a bushel it is claimed that conditions are good, regardless of what the net returns may be. Doubtless, the size of the corn crop is the most important factor in determining its price.

Naturally, everyone desires to know what corn production will be in 1937 in this country. No one knows for certain what the 1937 production, and hence the price, will be, but we are in an unusual situation that allows one to make an unusual forecast.

The difficult time to make a prediction is when things are running along on an even keel. The 1937 price of corn will come in a cycle of great price fluctuations. It is in these great fluctuations that one can with some assurance predict what might happen. A look at the record reveals that there have been only two other situations in the history of corn production and corn prices during the past 40 years like that of 1936. An examination of those situations is very suggestive as to what is likely to transpire in the way of production and price for 1937.

Ordinarily, the variations in corn production from year to year do not exceed 500,000,000 bushels; but in 1901 the corn crop was nearly 1,000,000,000 bushels less than the crop of 1900; and in 1934 the corn crop was again approximately 1,000,000,000 bushels less than in 1933. The 1936 crop reduction was approximately 800,000,000 bushels.

It would probably be a very safe guess that the 1937 crop will not be as low as that of 1936, and while there can be no assurance that 1937 will not be a drought year, the experience after the 1901 and 1934 crop failures would tend to support a forecast of a considerably increased production for 1937. The increase in the 1902 corn crop over the small crop of 1901 was nearly 1,100,000,000 bushels, more than offsetting the decline of the previous year. The increase in the 1935 crop over that of the small crop of 1934 was nearly 900,000,000 bushels, not quite making up for the reduction of the previous year.

1937 Crop Forecast

These two upsets, the only ones in 40 years with which the 1936 situation may be compared, suggest the possibility of a corn crop in 1937 approximately as large as that in 1935 or 1933.

If the 1937 corn crop should turn out to be approximately 1,000,000,000 bushels greater than that of 1936, what is likely to be the course of prices during 1937? On this question, too, the experience of 1901 and 1902 and 1934-35-36 are informative. Ordinarily, the price of corn is affected by a number of factors, but when the supply of corn changes as abruptly as it did on these particular occasions, the variation in supply becomes the predominant factor in the course of prices, and we tend to get a fairly typical price behavior that corn producers may find of use in making their plans for 1937.

Corn Prices

Let us examine first what happens to the course of corn prices during the year when the crop is abnormally reduced as it was in 1901 and 1934. In January, 1901, the price of corn was, of course, dominated by the size of the crop produced in 1900 and then being marketed. The crop that affected the January, 1901, prices was approximately 2,650,000,000 bushels. That good-sized crop kept the price of No. 3 yellow corn at Chicago—adjusted to the present level of commodity prices—at 52-54c per bushel in January and February, 1901. The seasonal rise in corn prices raised them to slightly over 60 cents in April, May, and June. Then came the drought of 1901, and the price of corn rose to an 80-cent level by August and remained there during August, September, and October, and eventually reached close to 90 cents in December, 1901. From December, 1901, to July, 1902, the price of corn hovered around the 85-cent level.

Now take the history of corn prices as it developed during the 1934 drought. In January, 1934, the price of corn was dominated by a corn crop produced in 1933 which amounted to 2,350,000,000 bushels. The price of No. 3 yellow corn during the months of January to May, 1934, inclusive, hovered around a level of 53 cents. Then came the drought of 1934 and by August of that year the price of corn at Chicago reached the 80-cent level, remained there during August, September, and October. By December it reached an average for the month of 97 cents, and from that point on, declined to an 86-cent level during the months of March through July, 1935.

In the 1901 and 1934 situations, similar to that of 1936, we had a price rise, produced largely by unusual drought conditions, of approximately 70 per cent between January and December of the drought year. What has been the experience so far in 1936? This year, the price of No. 3 yellow corn at Chicago averaged approximately 60-65 cents during the months of January to May. The drought lifted these prices to an average of $1.10 during the months of August and September. So far this year, then, the price of corn has risen a little over 80 per cent above the price which prevailed at the beginning of this year. This is not far out of line with the experience of the other 2 drought years. At present, current prices are relatively higher than in those other two situations.

Corn Markets

What did the corn markets do under the similar conditions of 1935 and 1902 when the corn crops recovered from the previous year's drought, and will the 1937 experience be similar to that of 1935 and 1902?

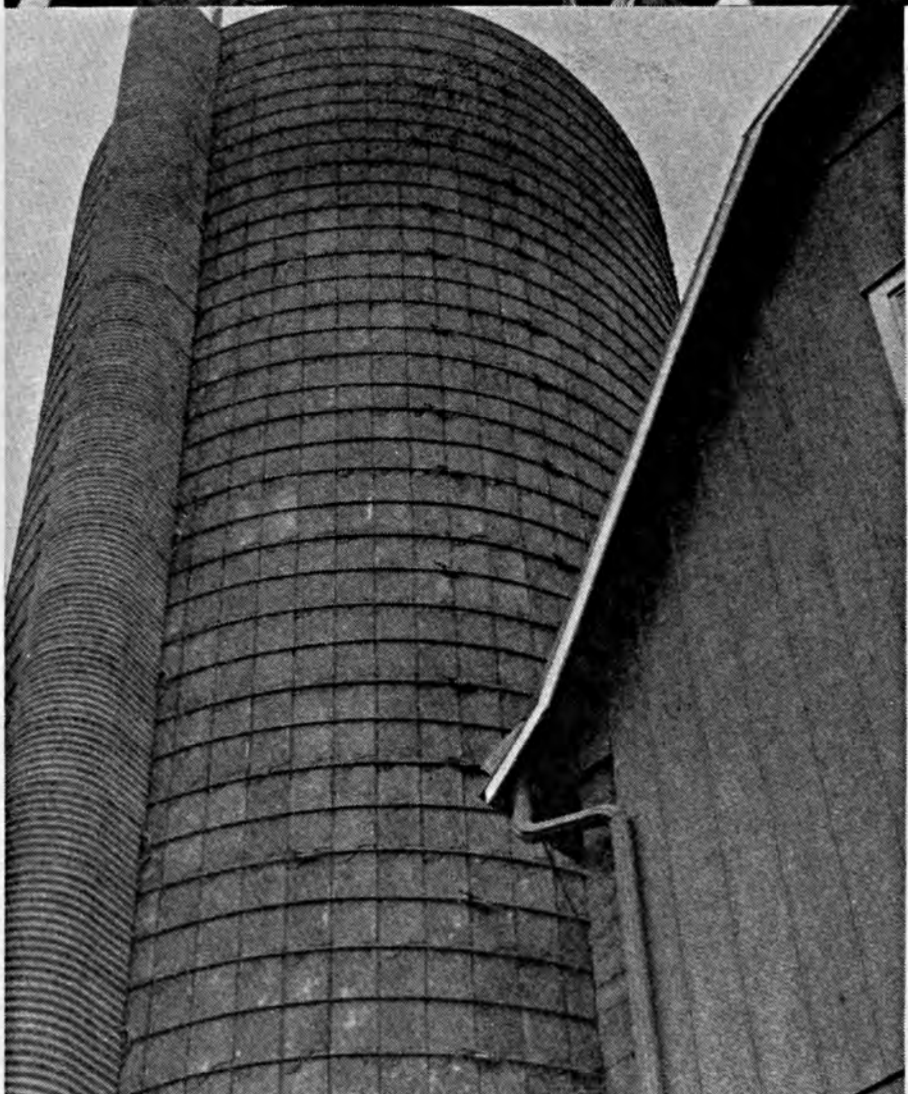
The small crop of 1901 established corn prices during the months of January to July, 1902, at approximately a level of 85 cents. The prospect of a good crop for 1902 brought about a gradual decline in corn prices from an average of 87 cents in January to an average of 55 cents in the following January, and prices remained at that level during the months of January to April, 1903. In other words, the impact of a large increase in production following a small crop amounted to a reduction of 32 cents per bushel, or roughly 35 per cent.

During the early months of 1935, the small crop of 1934 kept corn prices at a level of approximately 87 cents during the first half of 1935.

(*Turn to page* 38)

PICTORIAL

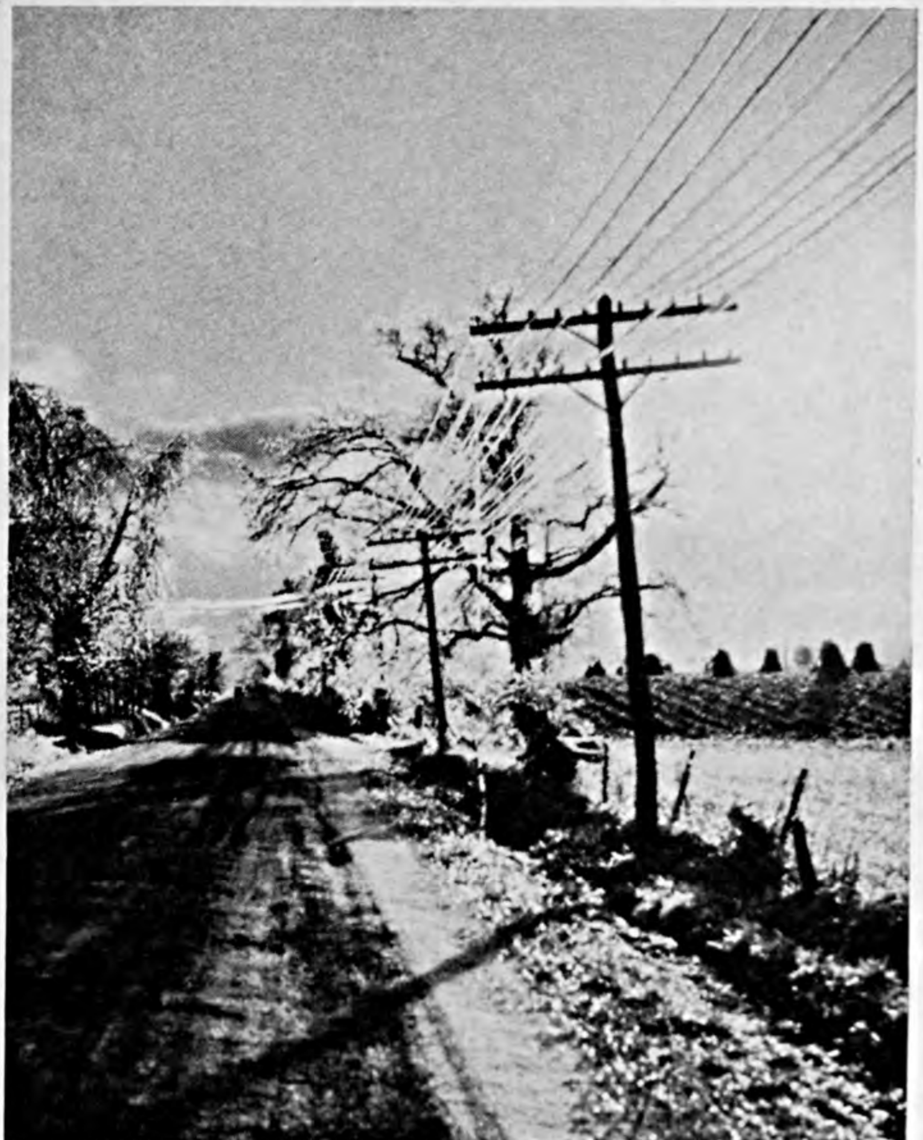
A STRAGGLER WENDS HIS WAY SOUTHWARD.



Above: Time out to think up a tall story on what got away.

Left: The silo stands—a fitting monument to the year's hard labor.

Right: In crystal, commonplace landscapes become picturesque.



Below: Too tired to wait until the lone cowboy made the rescue.

Unexpected snows make trouble in more ways than one.

The Editors Talk

Looking Forward

We are going into the new year in a very favorable economic position. Business is showing a much higher level of activity and a greater degree of economic balance, with the laboring class earning a higher rate of pay and more people working. At the same time our farm population is holding more money in its pockets than it has for a number of years.

Recovery, to be lasting, must be characterized by a fine degree of balance between industries. The tendency toward this balanced condition is a good indication of the return to a normal period and stability, with the likelihood that it will extend over the next four or five years.

The increase in agricultural production that would seem logically to follow within the year, must be accompanied by a relatively high level of consumer purchasing power, in order to maintain its present favorable position. Statistics show that employment has increased about 8.5 per cent and payrolls approximately 13 per cent in the past year. Not losing sight of the existence of the unemployment problem and the gaps yet to be bridged, conditions of wage earners, greatest consumers of farm products, are better than a year ago.

Interdependence is the basis of our economic system. With cash in his pocket the farmer will make a number of purchases that he has neglected for the last few years. These purchases are as important to the industry from which he buys as they are to him, for he is creating a market for industrial centers. The $7,800,000,000 he will receive from marketing this year will have its effect on increasing his markets next year. While farm production will undoubtedly increase in 1937, it is not expected to increase to the extent of upsetting the present favorable balance.

The 2-billion-bale reduction in the world supply of American cotton this year will give American cotton producers a decided advantage. They can increase their crop within limits, without a depressing influence on prices. The production of truck crops will probably be greater than in 1936, the record year, but with no signs of a let-up in demand, prices should be high enough to allow for a profit. Reduced supplies of late cabbage, Irish potatoes, and sweet potatoes will maintain these products at high levels through the winter, with the situation for spring vegetables promising improvement.

A continued improvement in the tobacco market seems in prospect, with types other than flue-cured showing the greatest strength. The increase in cigaret consumption will probably continue through 1937.

On the basis of present acreages, figuring normal yields, the 1937 wheat crop will be considerably in excess of domestic requirements. Wheat prices will very likely decline toward export levels for next season's crop. As a result of drouth and reduced feed supplies, the meat supply should be the lowest in years. This favorable position will tend to place livestock producers in a relatively better position than the cash grain farmers. The reduction in meat supplies will be due mostly to a very light cattle slaughter in 1937. Hog marketings will be from 10 to 15 per cent greater than in the two previous seasons. The number of lambs for feed this season will be greater than last year. Due to the shortage in beef, pork, and lamb, prices will hold steady.

Higher wages and cost of commodities used in production would tend to increase the cost of agricultural production in 1937. At the same time, farm values will continue to increase, and interest rates may rise from the present low levels. There will be no marked increase in machinery prices, and, although the prices for fertilizer will probably be slightly higher, the present favorable outlook for agricultural products will encourage the increase in consumption of commercial fertilizer.

Therefore, agriculture is closing 1936 and looking ahead to 1937 with more optimism than has been warranted in years. Let us add our hope that all may enjoy a happy and prosperous New Year.

Merry Christmas

The Christmas Spirit, now upon us, is as universal as it is personal. It may vary in degree with age and circumstance, but few can fail to react to the general good will and tradition of the season. Although some of these traditions are supposedly lost between the age of 7 or 8, they are fostered in maturer judgments, not only for the sake of the young, but as a symbol of the joy which comes in forgetting self by remembering loved ones and the less fortunate.

Daniel Webster once said, "If we work upon marble, it will perish. If we work upon brass, time will efface it. If we rear temples, they will crumble into dust. If we work upon immortal minds, if we imbue them with principles . . . we engrave on these tablets something which will brighten for eternity." Thus the Christmas celebration, teaching the principle of love and fellowship, rolls round each year, brighter and more colorful because of its eclectic personality. Each age, each generation has lent something of itself to perpetuate a beautiful idea. A pagan festival gave it ritual, Germany gave it the Christmas tree, Holland gave it Santa Claus, Belgium and France gave it the Christmas stocking, England gave it the "Merry Christmas" greeting, and Christianity gave it meaning. What will you give it?

In our country nothing will ever take the place of "'Twas the Night Before Christmas," Dickens' "Christmas Carol," and the hymns, "Joy to the World," "O, Little Town of Bethlehem," "Silent Night." We hear them sung by full choirs, by solo voices, by the faltering, thin treble of children, but we grope for the spirit behind the song and listen uncritically. This is the inheritance of a people.

There are other traditions which are the private possessions of each family, for Christmas is after all a day which belongs irretrievably to the family. To one group it will mean a Yule log and festive board for the reunion, to another a decorated fir tree and entertainment for friends and neighbors, to still another it means finding faith renewed by the unselfish generosity of others.

But it is within the individual that the ideal of Christmas must live. Customs and traditions are but the outward manifestation of "Peace on Earth, Good Will Toward Men." To be passively receptive of the bounty and good cheer is to miss the point. Speed the age-old tradition on its way, fuller and richer because of your joyous participation in it.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

A thoroughly practical plan for fertilizing grapes is outlined by F. E. Gladwin in New York State Agricultural Experiment Station Bulletin 671, entitled, "A Twenty-five Year Test of Commercial Fertilizers for Grapes." This station in 1909 began testing the three principal fertilizer ingredients, nitrogen, phosphorus, and potassium, to determine their relationships to Concord grape production on soils typical of about one-third of the Chautauqua and Lake Erie Grape Belt. A study of the results will also aid grape growers whose vineyards are located on different soil types.

All combinations of nitrogen, phosphoric acid, and potash have been highly profitable for the 25-year period, although the real gains have come from the nitrogen and potash, whatever the combination. The data suggest that at least 250 pounds of nitrate of soda can be applied profitably. It seems desirable to apply potash in the form of concentrated salts such as muriate or sulphate of potash, since similar quantities of actual potash in the form of kainit would be costlier. Muriate or sulphate of potash was applied at the rate of 200 pounds per acre, but the author states that possibly larger applications of potash would give increasingly better returns. Phosphoric acid has appeared of doubtful value, although it has greatly improved the growth of green manure crops in this vineyard. A certain amount of superphosphate applied at intervals of three or four years is advised. Nitrogen, phosphorus, and potassium or nitrogen and potassium were more effective than stable manure and stable manure with lime. Lime exerted a favorable effect on the growth of legumes used as green manures but apparently depressed the yield of both fruit and wood. Vineyards must be well drained and weeds must be controlled during the active growing season.

"Fertilization of Alfalfa on Alkaline Calcareous Soils," Agr. Exp. Sta., Tucson, Ariz., Bul. 154, Oct. 15, 1936, W. T. McGeorge and J. F. Breazeale.

"A Manganese Deficiency Affecting Beans," Agr. Exp. Sta., Gainesville, Fla., Bul. 300, Aug. 1936, G. R. Townsend and H. H. Wedgworth.

"Recommendations Made by the Louisiana Agricultural Experiment Station for the Fertilization of Field and Truck Crops in Louisiana, 1936-37," Agr. Exp. Sta., Baton Rouge, La.

"Artificial Manure Production on the Farm," Agr. Exp. Sta., Columbia, Mo., Bul. 369, Sept. 1936, W. A. Albrecht.

"Some Effects of Long-continued Manure, Fertilizer, and Lime Treatment on the Composition of Cropped Soils," Agr. Exp. Sta., New Brunswick, N. J., Bul. 604, June 1936, A. W. Blair and A. L. Prince.

"Minor Elements in Land Fertilization," Agr. Ext. Serv., N. J. Agr. Exp. Sta., New Brunswick, N. J., Ext. Bul. 173, Mar. 1936, Jacob G. Lipman.

"Phosphate for Alfalfa," Agr. Exp. Sta., State College, N. Mex., Bul. 239, Apr. 1936, H. N. Watenpaugh and Glen Staten."

"Machine Placement of Fertilizers for Snap Beans in Florida," U. S. D. A., Washington, D. C., Cir. 399, July 1936, G. A. Cumings, A. L. Sharp, J. J. Skinner, G. M. Bahrt, and G. H. Serviss.

Soils

R. H. Bray in Publication AG-356, Illinois Agricultural Experiment Station, "Potassium Availability in Illinois Soils," describes the practical interpretations of the total potassium content in the surface of the medium to poorly drained soils in the different areas of that state. A Potassium Content Map accompanies the publication and shows the potential available potash supply in soils by areas. The total potassium content of the soil is a valuable aid in determining its probable continued richness in available potassium. However, other facts in addition to the total potassium present must be known to predict safely the rate of supply of available potassium from the amount of total potassium, Professor Bray asserts. These facts have to do with parent potash minerals in the soils of the respective areas, the degree of weathering of the potash minerals, the relative rates of weathering of the potash minerals, the amounts of potash minerals in the soil colloidal material, the chemical nature of available potassium, and the amounts necessary for best crop results, the influence of the amounts of the other replaceable cations, and the amount of available potassium in each soil area.

It is suggested that soil tests should generally be made for soils in most areas, especially for those soils which do not produce satisfactory crop yields. It is also recommended that the status of the soil in regard to acidity and available phosphorus be determined before applying potash to any soil in any area.

"Hairy Vetch and Austrian Winter Peas for Soil Improvement," Agr. Exp. Sta., Auburn, Ala., Cir. 74, Aug. 1936, M. J. Funchess, Director.

"Terraces to Save the Soil," Agr. Exp. Sta., Urbana, Ill., Cir. 459, Aug. 1936, E. W. Lehmann and R. C. Hay.

"Clinton County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rep. 57, July 1936, E. A. Norton, R. S. Smith, and L. H. Smith.

"Chemical Analyses of Iowa Soils for Phosphorus, Nitrogen and Carbon: a Statistical Study," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 203, R. H. Walker and P. E. Brown.

"Soil Survey of Mobile County, Alabama," U. S. D. A., Washington, D. C., Series 1930, No. 42, B. H. Williams, G. A. Swenson, M. J. Edwards, A. L. Gray, J. F. Stroud, M. E. Stephens, Malcolm Croft, L. G. Brackeen, and M. E. Swann.

"Soil Survey of the Alturas Area, California," U. S. D. A., Washington, D. C., Series 1931, No. 23, E. J. Carpenter and R. Earl Storie.

"Soil Survey of Fayette County, Kentucky," U. S. D. A., Washington, D. C., Series 1931, No. 25, Howard Wm. Higbee and K. S. Venable.

"Soil Survey of Lee County, North Carolina," U. S. D. A., Washington, D. C., Series 1933, No. 1, S. O. Perkins and E. F. Goldston.

Crops

Of much interest to agricultural workers are two new publications on pasture fertilization and management. These are Louisiana Extension Circular 156 entitled "Louisiana Pastures" by R. A. Wasson, and Maine Extension Service Bulletin 223 entitled "Improving Maine Pastures" by Richard F. Talbot. In spite of the fact that these publications deal with widely different types of soils, climatic conditions, and types of herbage, it is significant that the fundamentals are recognized as being similar.

An important consideration, whether in the southern or northern area, is that the best combination of native grasses and legumes suitable to local conditions be used. Regardless of the differences in vegetative growth, the fertilizer requirements for the best growth are supplies of the essential nutrients at the right time and in the right place. Complete fertilizer together with lime if the soil is acid, best meets these requirements.

Among the important recommendations under Louisiana conditions is that 10 pounds Dallas grass, 5 pounds Carpet grass, and 5 pounds Hop clover per acre be included in the mixture and planted during the latter part of September or October. From 15 to 20 pounds of lespedeza planted about the 20th of February is also suggested. Soon after the lespedeza is planted, a broadcast application of about 300 pounds of a 4-12-4 fertilizer per acre is recommended. To sod the pasture with Bermuda grass is best accomplished by dropping the cuttings of Bermuda in small furrows at three-foot intervals, covering them with dirt and packing with hoe or foot. The pasture must be kept clean of weeds, logs, stumps, and the like.

A good permanent pasture in Maine should consist of the better native grasses and some clover. The fertilizer application for the first year should be from 500 to 800 pounds of 5-8-7 or ½ these amounts of double strength fertilizer (8-16-14 or 8-16-16) per acre. If considerable clover appears the second year apply 500 pounds of 5-8-7 (or similar analysis). For the third year if 75% or more of the sod is clover apply 300 to 400 pounds of an 0-10-10 per acre. If clover does not come in, it is suggested that applications of a nitrogen fertilizer should be used for the second and third years.

Many other valuable suggestions are offered in these two interesting publications.

"The Physiology and Control of Pecan Nut Filling and Maturity," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 62, June 1936, A. H. Finch and C. W. Van Horn.

"Length-diameter Relationships in Cotton Fiber" Agr. Exp. Sta., Fayetteville, Ark., Bul. 327, June 1936, O. A. Pope.

"Non-saccharine Sorghums," Agr. Exp. Sta., Fayetteville, Ark., Bul. 328, June 1936, C. K. McClelland.

"Pyrethrum Plant Investigations in Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 428, July 1936, C. B. Gnadinger, L. E. Evans, and C. S. Corl.

"Poisonous and Injurious Plants of Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 429, July 1936, L. W. Durrell and I. E. Newsom.

"Oat Production in Colorado, 1928-1935," Agr. Exp. Sta., Fort Collins, Colo., Bul. 430, July 1936, D. W. Robertson, Dwight Koonce, J. J. Curtis, and J. F. Brandon.

"Tobacco Substation at Windsor, Report for 1935," Agr. Exp. Sta., New Haven, Conn., Bul. 386, July 1936, P. J. Anderson, T. R. Swanback, and O. E. Street.

"Effects of Summer Cover Crops on Crop Yields and on the Soil," Agr. Exp. Sta., Gainesville, Fla., Bul. 301, Sept. 1936, W. E. Stokes, R. M. Barnette, and J. B. Hester.

"Crop Yields from Illinois Soil Experiment Fields, Including the Crop Season 1935," Agr. Exp. Sta., Urbana, Ill., Bul. 425, July 1936, F. C. Bauer, A. L. Lang, C. J. Badger, L. B. Miller, C. N. Farnham, and P. E. Johnson.

"The Soybean—A Plant Immigrant Makes Good," Agr. Exp. Sta., Urbana, Ill., Cir. 461, Sept. 1936, W. L. Burlison.

"Plums and Cherries," Agr. Exp. Sta., Lafayette, Ind., Bul. 212 (Rev.), Mar. 1936.

"Snap Beans for the Canner," Agr. Ext. Serv., Lafayette, Ind., Leaf. 183 (Rev.), May 1936.

"Forty-eighth Annual Report for the Year 1935. Part I. Report of the Director," Agr. Exp. Sta., Lexington, Ky., Thomas P. Cooper.

"Tobacco Diseases," Agr. Exp. Sta., Lexington, Ky., Bul. 362 (328 Rev.), Mar. 1936, W. D. Vallean and E. M. Johnson.

"Soybeans," Agr. Ext. Serv., Baton Rouge, La., Ext. Cir. 157, July 1936.

"Lespedeza," Agr. Ext. Serv., Baton Rouge, La., Ext. Cir. 158, July 1936, R. A. Wasson.

"Corn Growing for 4-H Club Members," Agr. Ext. Serv., Baton Rouge, La., Ext. Cir. 161, Mar. 1936, R. A. Wasson and B. W. Baker.

"Sugar Cane Variety Report for Season of 1935," Agr. Exp. Sta., Baton Rouge, La., Bul. 274, June 1936, C. B. Gouaux and E. C. Simon.

"Twenty-first Annual Report for the Year 1935," Agr. Ext. Serv., College Park, Md., T. B. Symons, Director.

"Peach Growing in Massachusetts," Agr. Ext. Serv., Amherst, Mass., Ext. Leaf. 146, Rev. Apr. 1936, John S. Bailey.

"The Field Station Journal," Agr. Ext. Serv., Amherst, Mass., No. 152, July 1936 and No. 153, Sept. 1936.

"Soybeans for Minnesota," Agr. Ext. Serv., Universty Farm, St. Paul, Minn., Sp. Bul. 134 (Rev. May 1936), A. C. Arny, R. F. Crim, and R. E. Hodgson.

"Growing Fall Gardens," Agr. Ext. Serv., Columbia, Mo., Cir. 349, Aug. 1936, R. A. Schroeder and T. J. Talbert.

"Soybeans in Nebraska," Agr. Ext. Serv., Lincoln, Nebr., Ext. Cir. 142, 1936, P. H. Stewart and D. L. Gross.

"Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1935," Univ. of Nev., Reno, Nev.

"Questions and Answers Relative to Tomato Production," Agr. Ext. Serv., New Brunswick, N. J., Ext. Bul. 174, Mar. 1936.

"Crop Production in Northeastern New Mexico Under Severe Soil-blowing Conditions," Agr. Exp. Sta., State College, N. M., Bul. 243, June 1936, John Carter, Jr.

"The Planting Value of Wheat Taken Di-

rectly from Farmers' Drills," Agr. Exp. Sta., Geneva, N. Y., Bul. 677, Aug. 1936, Willard F. Crosier.

"Annual Report of Agricultural Extension Work in North Carolina for 1935," Agr. Ext. Serv., State College Station, Raleigh, N. C., I. O. Schaub, Director.

"Crop Adjustment, Oklahoma's Opportunity for Soil Improvement," Agr. Ext. Serv., Stillwater, Okla., Cir. 307, Reprint, 1935, Gen. Series 82, L. W. Osborn.

"The Influence of the Stage of Maturity on the Chemical Composition and the Vitamin B (B_1) and G Content of Hays and Pasture Grasses," Agr. Exp. Sta., Wooster, Ohio, Bul. 576, Oct. 1936, C. H. Hunt, P. R. Record, and R. M. Bethke.

"Forty-eighth Annual Report for 1935," Agr. Exp. Sta., Knoxville, Tenn., James D. Hoskins, President.

"Forty-ninth Annual Report for 1935-1936," Agr. Exp. Sta., Burlington, Vt., Bul. 407, July 1936, J. L. Hills, Director.

"Department of Agriculture—Immigration of Virginia," Richmond, Va., Bul. 342, Oct. 1936.

"Thirteen Years' Results with Cover Crops," Agr. Exp. Sta., Morgantown, W. Va., Bul. 275, June 1936, G. G. Pohlman and H. O. Henderson.

"Tulips," U.S.D.A., Washington, D. C., Cir. 372, Mar. 1936, David Griffiths.

"The Choice of Crops for Saline Land," U.S.D.A., Washington, D. C., Cir. 404, July 1936, T. H. Kearney and C. S. Scofield.

"Foreign Agricultural Extension Activities," U.S.D.A., Washington, D. C., Ext. Serv. Cir. 243, June 1936.

"Directory of Activities of the Bureau f Plant Industry," U.S.D.A., Washington, D. C., Misc. Pub. 238.

Economics

In publication entitled, "Farm Buying and Industrial Recovery," the Agricultural Adjustment Administration has reported the results of a survey made to determine the effect of increased farm income upon the industrial centers of the United States. The information presented in the bulletin was developed through a study of more than a half million freight waybills and waybill abstracts in the freight auditors' offices of 16 railroads which handle approximately 75% of the traffic in manufactured commodities delivered to the agricultural regions.

There was a 58% increase in cash farm income in 1935 as compared to 1932. The extent to which this increase was coupled with an increase in shipments of manufactured commodities into the states where agriculture plays an important role in maintaining purchasing power provides a clue to the part larger farm purchasing power has played in maintaining the operation of mills and factories in the industrial regions.

The commodities studied were divided into four main groups according to the type and nature of their use. 1. Agricultural commodities used principally in farm production. 2. Domestic and personal commodities used principally in homes whether urban or rural. 3. Industrial and commercial commodities used principally in industrial and commercial activities. 4. General commodities used generally on farms, in homes, and in industry. The study began July 1, 1932, and ended June 30, 1935. The territory east of the Mississippi River and north of the Ohio and Potomac Rivers, comprising 16 states, was taken as the area of origin of the industrial shipments. About 75% of the manufacturing of the country is carried on in this area. The territory west of the Mississippi River and south of the Ohio and Potomac Rivers, comprising 32 states was taken as the area of destination of the industrial shipments. Approximately 70% of the agricultural cash income in the United States is received in this area.

Manufactured commodities shipped from the 16 industrial states increased 60.1% in the year ending June 30, 1935, as compared to the year ending June 30, 1933. Shipments in the agricultural group showed an increase of 165.2%. In this group, agricultural implements and machinery registered the greatest increase, 309.3%. The domestic and personal group increased 98.7%. Sewing machines and refrigerators led this group with an increase of 1,340.3% and 259.6% respectively. By far the largest group insofar as diversity and weight are concerned was the industrial and commercial group. Shipments of these goods showed an increase of 57.2% in year 3. The heaviest commodities in this group were steel and iron products which showed an increase of 86.7%.

Of special interest is the increase registered by the building and construction section in this group. Lumber and lumber products increased 32.9% and 53.1% respectively in years 2 and 3. Brick increased 25% and 34.7%, asphalt 2.2% and 29.8%. Shingles on the other hand decreased in both years showing a 35.5% decrease in year 2 and a 52.5% decrease in year 3. However, asbestos products, including asbestos shingles, increased 29.8% and 91.5% respectively in the same years.

Shipments of all commodities in the general group increased 31.3% and 51% in years 2 and 3 respectively when compared to the year 1. Automobiles showed a gain of 138.6% and 219.9% respectively.

We have often heard of the interdependence of one industrial group upon the other in our more or less complicated economic organization and the results of this study indicate statistically the truth of this theory. It is interesting to note that increases in agricultural income are almost immediately followed by increases in purchases by farmers of the products produced in the manufacturing centers of the country. In most instances, the increased purchases were greater than the actual increases in the farm income. Thus we see how essential it is that all groups participate in the improved conditions before we can expect any general revival in industry and trade.

According to a mimeographed report published by the North Carolina Department of Agriculture, Raleigh, N. C., "Fertilizers Sold in North Carolina From January 1, 1936, to July 1, 1936," total fertilizer sales for the first 6 months of 1936 amounted to 973,347 tons. Included in this total are 768,621 tons of mixed fertilizers, 199,407 tons of material, and 5,319 tons of customers mixtures. The most important grade sold during the period, based on tonnage, is 3-8-3 which constituted 336,440 tons of the total. The next most important grade was 3-8-5 which represented 165,375 tons of the total. Apparently 3-8-3 is losing in popularity as compared to the other grades, due to the fact that the rate of increase as compared to the first 6 months of 1935 is not as great as for other fertilizers. The rate of increase for all fertilizers was 21.3%, while the rate of increase for 3-8-3 was only 9.7%.

According to the "County Fertilizer Data: Mixed Goods and Materials," report of the State Department of Agriculture of Mississippi, 219,250 tons of fertilizer were sold in that state during the year ending June 30, 1936. This total consisted of 107,200 tons of mixed goods, 82,267 tons of nitrogenous materials, 25,056 tons of phosphate materials, and 4,726 tons of potash materials. By far the most important mixture was 4-8-4 which accounted for 94,708 tons of the total of mixed goods sales. The most important nitrogenous material was nitrate of soda which accounted for 45,025 tons total for that group. Sulphate of ammonia was second with 19,246 tons. The most important phosphate material was 18% superphosphate which accounted for 22,003 tons of the total. Muriate of potash was the most important potash material both from the standpoint of tonnage and from the standpoint of total K_2O, accounting for 2,551 tons of the total for that group of materials.

The Oklahoma Agricultural and Mechanical College reports that Oklahoma farmers used 3,944 tons of fertilizer in the 1935-36 season. The most popular grade in that state is 4-8-6 which accounted for 55.3% of the total. More than 60% of the fertilizer consumed in the state is sold in the following seven counties: Leflore, McCurtain, Muskogee, Oklahoma, Ottawa, Pittsburg, and Tulsa.

"The Back-to-the-land Movement in Southern Indiana," Agr. Exp. Sta., Lafayette, Ind., Bul. 409, Apr. 1936, H. E. Moore and O. G. Lloyd.

"Part-time Farming in Indiana," Agr. Exp. Sta., Lafayette, Ind., Bul. 410, Apr. 1936, F. V. Smith and O. G. Lloyd.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 16 and 17, Sept. and Oct. 1936.

"It Still Pays to Farm Well," Agr. Exp. Sta., Urbana, Ill., Cir. 458, July 1936, H. W. Mumford.

"The Future of Agricultural Adjustments in Kansas," Agr. Ext. Serv., Manhattan, Kans., Ext. Cir. 125, July 1936, B. W. Wright, Vance M. Rucker, and W. E. Grimes.

"Report of Analysis of Commercial Fertilizers," Dept. of Agr. and Immigration, Baton Rouge, La., Fert. Rep., Season 1934-35, Harry D. Wilson, Commissioner.

"Maine Agriculture in 1935: A Statistical Presentation," Agr. Exp. Sta., Orono, Me., Bul. 382, June 1936, Charles H. Merchant.

"Maryland Farm Credit Handbook. Part I. The Farm Credit Situation in Maryland. Part II. Credit and Services Available Through the Farm Credit Administration." Agr. Exp. Sta., College Park, Md., Bul. 396, May 1936, Ralph Russell.

"Economics of the Production and Marketing of Apples in New Mexico," Agr. Exp. Sta., State College, N. M., Bul. 242, June 1936, P. W. Cockerill and R. P. Callaway.

"Prices of Farm Products in New York State, 1841 to 1935," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 643, Mar. 1936, S. E. Ronk.

"An Economic Study of Part-Time Farming in the Elmira and Albany Areas of New York, 1932 and 1933," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 647, Apr. 1936, Kenneth Hood.

"An Economic Study of Land Utilization in Tioga County, N. Y., Cornell Univ. Agr. Exp. Sta., N. Y., Bul. 648, Apr. 1936, Paul B. Jones.

"Analyses of Miscellaneous Materials," Agr. Exp. Sta., Geneva, N. Y., Cir. 165, July 1, 1936, A. W. Clark.

"Analyses of Commercial Fertilizers and Cottonseed Meals for Spring Season 1935," State Dept. of Agr., Raleigh, N. C., Dec. 1935, Wm. A. Graham, Commissioner.

"Gin Damage of Cotton in Relation to Rainfall," Agr. Exp. Sta., State College Station. Raleigh, N. C., Glenn R. Smith.

"Analyses of Commercial Fertilizers," Agr. Exp. Sta., Clemson, S. C., Bul. 307, Aug. 1936.

"Studies in Vermont Dairy Farming. IX. The Champlain Valley During a Major Depression," Agr. Exp. Sta., Burlington, Vt., Bul. 405, July 1936, John A. Hitchcock and S. W. Williams.

"A Study of the Organization and Management of Farms in Grayson County, Virginia," Agr. Exp. Sta., Blacksburg, Va., Bul. 304, June 1936, J. J. Vernon, T. M. Dean, and H. W. Hawthorne.

"Rural Population Trends in Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 333, July 1936, Paul H. Landis.

"Rural Emergency Relief in Washington, With Attention to Characteristics of Rural Relief Households," Agr. Exp. Sta., Pullman, Wash., Bul. 334, July 1936, Paul H. Landis, Mae Pritchard, and Melvin Brooks.

"Trends and Desirable Adjustments in Washington Agriculture," Agr. Exp. Sta., Pullman, Wash., Bul. 335, July 1936, A. E. Orr, C. P. Heisig, J. C. Knott, and C. L. Vincent.

"Tons of Fertilizer by Grades Shipped Into West Virginia—1935," State Dept. of Agr., Charleston, W. Va., J. B. McLaughlin, Commissioner.

"Trends in West Virginia Agriculture," Agr. Exp. Sta., Morgantown, W. Va., Bul. 276, July 1936, F. D. Cornell, Jr.

"Wheat Requirements in Europe," U. S. D. A., Washington, D. C., Tech. Bul. 535, Sept. 1936, J. H. Shollenberger.

"Unshackling Our Export Trade," U. S. D. A., Washington, D. C., G-57, July 1936, Chester C. Davis.

Erratum: Under the Crops section of our August-September issue, a sentence in the abstract of Bulletin 208 of the Connecticut Agricultural Experiment Station read as follows: "Land in southern New England is too steep for tillage purposes and hence pastures should be permanent." This should have read: "In southern New England, there is an over-abundance of land too steep, too rough, or both, to justify tillage operations. Therefore, in most cases permanent pastures should be located on such areas."

Soybeans Remove Soil Power

AN ANNUAL application of from 500 to 1,000 pounds of 5-5-10 fertilizer per acre on land on which soybeans are grown each year is necessary if yields are to be maintained.

This fact, determined after 24 years of research at the University of Delaware Experimental Farm at Newark, Del., was stated before soils and crop experts attending the recent meeting of the American Society of Agronomy at Washington, D. C., by G. L. Schuster, professor of agronomy at the University of Delaware.

"Twenty-four years of investigational work at the University Experimental Farm have demonstrated that an application of 100 pounds of nitrate of soda, 250 pounds of superphosphate, and 75 pounds of muriate of potash per acre per crop is not sufficient to maintain the original crop yielding power of the soil," Schuster told the assembled agronomists.

He pointed out that the yield of soybeans at the end of the 24-year-test period from the plots treated with that fertilizer mixture was only two more bushels per acre than the yield from untreated plots at the beginning of the test.

Calculations made at the University of Delaware on the basis of plant food removed from the soil by a soybean crop averaging 30 bushels per acre indicated that an application of from 500 to 1,000 pounds of 5-5-10 fertilizer would be necessary to maintain the production power of the soil.

"Love Apple" First in Canning

ONCE called the "love apple," and grown mainly as an ornamental plant, the tomato now ranks first in the United States as a vegetable canning crop. As a vegetable crop it is led only by potatoes and sweetpotatoes.

When introduced into the United States from the American tropics about 1800, the tomato was thought to be poisonous because it is related to the nightshade plant. Other nonpoisonous members of the nightshade family are the eggplant, potato, and peppers.

About the middle of the last century canned tomatoes became an article of trade. The value of the annual crop is now estimated at more than $50,000,000, of which approximately $20,000,000 is spent for tomatoes by canners and manufacturers. Besides being canned, tomatoes are manufactured into soups, purees, catsups, and tomato juice. From 1,000,000 to 1,250,000 tons are grown annually for commercial purposes.

The industry is widely scattered over the United States, but Maryland, New Jersey, Virginia, Indiana, and California produce a large part of the crop for canners and manufacturers.

The tomato, like the potato, is the poor man's friend. It is not difficult to grow, it is not expensive, and can be served the year around, either fresh or canned. The ornamental "love apple" has become a utility vegetable, equally at home in a soup, a stew, a salad, in a dressing, or as that "homegrown" delicacy, tomato preserves.

Winter Strawberries And Where They Grow

STRAWBERRIES which appear in winter shortcakes probably originated in Florida. The first car-lot shipment of strawberries from west central Florida start on its way about the middle of December. Early berries from west central Florida continue to a peak in March, stopping entirely in April, says the Bureau of Agricultural Economics, which receives daily reports of strawberry shipments by rail, boat, and truck.

Texas usually ships about a carload in December and one in January. Louisiana in 1935 began in March with a mere 18 car lots, jumped to 1,399 car lots in April and back to 406 in May. Mississippi and Alabama, too, ship early strawberries.

North Carolina, with 2,399 car lots in 1935, heads the second early group of strawberry-growing states. Two-thirds of these came north by truck. Tennessee, which markets practically its whole crop in May, shipped 962 car lots in 1935. Virginia accounted for 1,139 car lots. Arkansas used to be in this group, but the drought of 1934 destroyed most of the strawberry beds.

April and May see a steady flow of strawberries from these "second early" states to markets where "home-grown" berries are not yet ripe. In May and June, states bordering the Mason and Dixon line appease the American appetite for strawberries. Maryland grows most of its berries on the eastern shore of Chesapeake Bay, and this past season shipped 1,182 car lots in trucks as compared with 228 car lots by rail or water.

The strawberry season changes abruptly in July. Late berries are available in the northern tier of states, particularly Wisconsin, and in California with a few car lots from Canada as the United States crop comes to an end. No shipments were listed for August 1935. California berries appear again on the west coast, however, in September, October, and November.

Prize-Winning Apples

OTTAWA, Canada.—Canadian apples, which are famous all over the world for their delightful flavor and fine quality, made a good showing at the Imperial Fruit Show at Liverpool, England, this year when Canadian exhibitors won 23 prizes. British Columbia growers won six first prizes, five seconds and two thirds, while Nova Scotia apples took seven firsts and three seconds. Ontario, Quebec and New Brunswick, the other Canadian provinces producing apples in commercial quantities, did not compete.

Apple growing in Canada dates back to the early pioneer days. History records the establishment of apple and pear orchards in the first settlements in Nova Scotia over three hundred years ago by French settlers, and the Annapolis Valley, made famous by Longfellow in his immortal poem, "Evangeline," has for many generations been one of the most widely known apple-producing sections in North America. In the Province of Quebec there are records of apples growing 300 years ago. In Ontario the first apple trees were planted about 1760, and in British Columbia about 1850.

The Canadian climate is well suited to the production of high quality apples, and the industry, originally intended to provide apples, apple cider and vinegar for home consumption has developed to such an extent that Canadian apples now find their way to practically all parts of the world. In 1935 the Canadian crop totalled 4,432,700 barrels, and exports to 44 countries included 2,541,217 barrels of fresh apples.

In the early days of apple growing in Canada little attention was paid to varieties; apples were just apples. Improvement in transportation and storage facilities, the development of export and home markets, and more knowledge gained of the market demand were accompanied by experimental and research work designed to develop the most suitable varieties and the best methods of growing and handling. There are now in Canada good varieties of apples with keeping qualities which enable them to be stored and made available for consumption through practically the entire year.

Pasture or Forest?

(*From page* 11)

other localities in the Northeast, potash appears to be as essential to pasture improvement as lime, and in many cases the clover-grass association does not provide ample nitrogen for the latter species. It is important for the farmer to learn how best to proceed to improve his pastures, and if the experimental data on the matter is not clear for his locality or soil type he can probably find out with a simple test of his own.

It is pertinent that brush species and forest will eventually dominate the soils of the region, if control measures are not adopted. Tillage, mowing, and heavy grazing are excellent methods of brush control. Because of lack of grass in the pasture, heavy grazing is not possible, and then brush gains a foothold, which starts the land again to forest. Lack of knowledge of underlying principles has cost the profitable use of much land that would otherwise have been good pasture. Since there is a shortage of pasture in the region, it appears important to apply land-use principles to the problem, segregate the better pasture land from the forest, and insure its perpetuation by proper fertility and management, and then keep the cows from the woodlot for the benefit of the animals as well as the reproduction and growth of the tree species there.

Except for those pastures that have been treated, all are on the down grade. There is still time to salvage much of the better land and keep it profitably in grass and clover species. From the standpoint of the continuation of a profitable dairy business in the Northeast, good pastures are essential.

The Irish foreman found one of his men sleeping in the shade.

"Slape on, ye idle spalpeen," he said, "slape on. So long as ye slape ye've got a job; but whin ye wake up, ye're out of wurrk."

Vacationist: "Any big men born here?"

Dare County Native: "Nope. Not very progressive 'round here; best we kin do is babies. Diff'rent in the city, I s'pose."

The Drought and Its Effects on Corn Prices

(*From page* 22)

The prospect of an improved crop in that year lured prices in August, September, and October somewhat below those of the first half of the year and then noticeably below during November and December. During December, 1935, the price of corn averaged 58 cents, compared with 92 cents in the previous January, a decline of 34 cents per bushel, or approximately 37 per cent. Again, we see that the corn markets behaved in almost the same manner in 1935 as they did 33 years earlier under similar conditions.

Apparently, an increase in the corn crop of 1,000,000,000 bushels following crop failure results in a reduction in corn prices of approximately 35 per cent. If the prices of corn during the coming winter should be roughly 90 cents per bushel, then corn producers, if they expect the 1937 crop to be 1,000,000,000 bushels greater than in 1936, had better anticipate corn prices 30-35 per cent lower in December 1937, than in December 1936.

Corn-Hog Ratio

Hog prices are determined primarily by what consumers are able to pay for pork. Ultimately, however, hog prices determine corn prices. This has developed what is commonly known as the corn-hog ratio. Ordinarily, the farm price of 23 bushels of corn is equal to the price of a 200-pound hog. In other words, the price of 11½ bushels of corn equals the price per hundred pounds for hogs. When hogs are $10 per hundred, as they were during a great part of last year, corn should be worth 90 cents per bushel. On this basis it will not be difficult to predict hog prices in 1937, particularly after weather conditions this spring are known.

What Makes the Red Hills Red

(*From page* 15)

As we wonder at the havoc wrought by the continuance of practices instituted in an earlier day, however, we must blame ourselves unless drastic and effective action is taken to protect this land.

Used Poor Land

Erosion and war are closely related. During the World War the urge to produce more food and fibre for our own and allied armies stimulated the cultivation of steeper slopes, gave erosion an even stronger foothold. The gradual slopes, the steeper slopes, and finally most any hillside that could give footing to a mule, were cultivated.

The solution of the erosion problem no longer lies in moving to new land—there is none. Now the land must be protected against further damage, must be rebuilt insofar as possible. This is the purpose of the program inaugurated by the Soil Conservation Service.

It is a nation-wide program, and on typical watersheds throughout the agricultural sections of the country the Soil Conservation Service has under way demonstrations of erosion control. Every known method for controlling erosion is being applied in these areas to show farmers what they may do on their own farms to protect their land.

There are 31 of these demonstration areas in Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi. Most of them are located in the Piedmont where erosion is most severe. Others are in the more rolling sections of the Coastal Plains and adjacent areas. There are also in this region 79 CCC camps assigned to the Soil Conservation Service actively engaged in erosion control work.

"Windsor Ruins." This 110-room mansion in Mississippi was built before the Civil War. Fertile land made such plantation homes; erosion results in their abandonment and decay.

Farmers on these demonstration areas agree to cooperate with the Soil Conservation Service in applying various methods of erosion control. New methods for erosion control are developed and applied in a coordinated program including engineering devices and vegetation.

Control Measures

In cooperation with the Extension Service, the Soil Conservation Service is encouraging farmers throughout the South to apply effective methods of erosion control on their own land.

Once a farm is surveyed and the correct practices to be applied on that farm are determined, cultivated fields on gradual slopes are terraced. The terraces carry excess surface water away slowly without giving it a chance to gain too much velocity. Water in rapid motion does the damage. If the motion can be reduced, little damage is done. It must not be thought that terraces are relied upon alone. They are supported by vegetation such as rotations, strip crops, and close-growing crops are planted wherever possible.

Steeper slopes that probably never should have been cultivated are planted to trees or devoted to permanent pasture. Man gives nature a hand in restoring her own protection against erosion. Cover crops are used to protect exposed soils through the winter when most rain falls, when soils are most vulnerable to the processes of erosion. Rotations embracing a maximum of soil building and close-growing crops are put into effect. Gullies are stabilized with grasses, kudzu, trees, and check dams. Erosion has removed so much fertility from many soils that fertilizers must be applied to insure the growth of cover crops.

Engineering Aspects

The construction of terraces involves further problems which the engineers are meeting effectively. Terrace outlets are made permanent with various devices, among the most important being vegetative treatment. The terraces themselves drain into outlet channels protected with grasses and check dams to make sure that these channels won't become gullies during some heavy rain.

Farmers on the demonstration areas are shown how they can alternate strips of close-growing crops with strips of clean-cultivated crops on sloping lands. This practice of strip-cropping greatly diminishes the susceptibility of the soil to washing.

As an incident to the program of soil conservation, wild life, the kind with wings or four legs, is given specific attention. The development of wild life is related to erosion control in that a number of erosion control practices may be modified slightly to encourage the habitation of quail and other desirable birds and animals. While attractive to wild life, vegetation need be no less effective in controlling erosion.

Economic Aspects

Economic aspects of erosion control are always kept in mind. For instance, the trees are chosen not only for their desirability in preventing erosion, but also for their utility.

Every interested farmer in the Southeast is being urged by the Extension Service and the Soil Conservation Service to visit one of the demonstration areas. Through observation, farmers can familiarize themselves with measures they can apply to protect their own fields. Through the use of these methods they can protect themselves against the realities that have already been faced by altogether too many families, having to move off a farm too badly eroded to be of any further use. The demonstrations are here for that important purpose, as a working area for specialists trained in erosion control. With the coordination of good cropping systems, forestry, grasses, and engineering practices, these specialists are striving to show all interested farmers and other persons that it takes more than a first mortgage to hold the land.

Give Peat Soils Required Potash

(*From page* 17)

freeze-up. If no stand is thus secured, reseeding is made the following spring.

3. Reed canary grass hay or seeding.
4. Reed canary grass hay.

Based on the Coddington results, Mr. Albert advises farmers on drained peat in central Wisconsin to apply 100 pounds of 50 per cent potash salts for

Sunflowers grown for silage on deep peat soil in central Wisconsin where frost hazard of corn is great. The field received the following treatment—Left: 8 tons manure, 145 lbs. triple superphosphate, and 150 lbs. muriate of potash. Right: No treatment.

Rye grown in deep peat soil on the Coddington sub-station farm. Left: No treatment. Right: Potash treatment.

each year of the rotation. The preferred practice is to apply 200 pounds per acre every second year or the entire rotational application to intensively cultivated crops. When the roughages fed to livestock are made up of crops grown where a normal supply of potassium is present, the manure produced has a potassium content which makes a 10-ton application equivalent, as potash fertilizer, to 200 pounds of 50 per cent potash. If crops have been potash-starved, the manure produced will have a very low potassium fertilization value.

Alabama's "Garden Spot"

(*From page* 20)

6-8-4 fertilizer are applied. The five-year average yield following these fertilizers was 82 crates per acre. At $1 per crate, the returns were $68.86 per acre above the fertilizer cost. The farmers have been using 400 to 500 pounds of a complete fertilizer for a number of years.

Experiments show that the highest yields of green beans are produced when fertilized with 800 pounds of 6-10-4 or 800 pounds of 4-10-4 supplemented with 100 to 120 pounds of nitrate as a side application. The yields following the 800-pound application were between 150 and 161 bushels per acre, and the returns above fertilizer and cost were between $140 and $150 per acre.

For many years the county has been a large producer of early cucumbers for shipment. Most of these are produced on tracts of land of from 1 to 5 acres, however, a few growers raise as many as 20 to 35 acres. The ordinary yield is from 300 to 400 crates to the acre. Most of the farmers fertilize their cucumbers with 1,500 to 2,000 pounds of 4-10-7. Some side-dress with 200 to 300 pounds of nitrate of soda.

The experiments show that the most profitable returns from cabbage are made where they receive 1,500 pounds of 12-10-6 fertilizer per acre. Only one-third, or 4 per cent, of the total nitrogen is applied at planting time, while the other two-thirds is applied as a side-dressing. The first application of nitrogen is usually ammonium sulphate, while the second application is nitrate. All phosphorus and potash are applied at planting time. "Another way of applying the correct amount of fertilizer is by using 1,500 pounds of a 4-10-6 or 4-10-7 at planting time and then side-dressing with 700 pounds of nitrate per acre." The average production following 1,500 pounds of 12-10-6 was 8.09 tons per acre.

Calculated at $20 per ton, the returns were $130.89 above the cost of fertilizer.

A total of 415 western mares have been bought by Baldwin County farmers within the past 2 years, reports E. E. Hale, county agent. A majority of the mares are being used to raise mule colts. Three good jacks have also been placed in the county. The mares and jacks have been shipped into the county on a cooperative basis and sold to farmers at cost.

"Modern equipment is being used extensively in the production of truck crops," according to Mr. Hale. "Farmers are equipping themselves with two-row planters and tractors equipped to cultivate and dig two rows at a time."

A very noticeable feature of Baldwin County farm land is the lack of stumps. As soon as a new field is cleared the stumps are dug out so that improved farm machinery can be used. Most of the land is practically level, therefore, soil erosion is not the problem that it is in other sections of the state and nation.

Fertilizer Distributors For Seed Drills

(*From page* 8)

whereby the final product was of a much more granular nature, and of a better drillability. Regarding attachments, an entirely new machine was developed, of greater simplicity, and much less weight, which allowed them to be marketed at a price far lower than any attachments heretofore, enabling even the smallest farmer to purchase. The new attachment is built to accurately distribute high-analysis, granular fertilizers.

Machine Now Adaptable

The new machine is entirely universal in that it can be adapted to any make of seed drill without the use of special adapting parts, and it does not require any change in the existing parts of the drill. It can be set up and attached to the general run of seed drills in less than an hour, and even more readily detached. The machine can be fitted either to the front or rear of the grain box, but in the former case, as a rule, new grain conductor tubes are necessary.

Nearly 3,000 of these new attachments were distributed in the spring of 1935, and met with such universal satisfaction in the hands of users that the same machine, with hardly any changes, will be marketed in future years. Fig. 2 gives a very good idea of how the Universal attachment fits to the ordinary high-wheel grain drill.

The attachment is merely hooked on to the front or rear of the grain box by suitable hooks provided for wood or steel boxes.

The picture shows the attachment mounted behind the grain box on a drill having a steel grain box. The gears and sprockets on the end of the attachment are those used for driving the fertilizer feed shaft and can be changed to give various application rates of feeding. Variations in rate of feed are secured by change of speed from an opening of constant size rather than the method of opening or closing a slot.

With the addition of the spare sprocket and gear shown on top of the fertilizer box, 36 changes in application rates can be obtained, varying between 12 and 120 pounds per acre. The drive for the attachment, when mounted on all types of drills using the fluted-roll grain feed, is taken from the drill grain shaft by mounting thereon a small split chain sprocket. On drills which employ a variable speed grain shaft for changes in rate

Fig. 4—Field in Saskatchewan showing beneficial effects of fertilizers under dry conditions. Note the unfertilized drill row in center.

of sowing, the attachment drive is taken from the main drill axle, so that the fertilizer feeding rate shall remain constant even if changes are made in the grain-seeding rate.

The attachment when fully assembled on the average 20-run drill weighs about 120 pounds and will carry sufficient fertilizer for 3 miles at the usual application rate of 35 pounds per acre. Where greater mileage than this is required between fillings, tip top boxes are supplied which can be quickly attached to the standard fertilizer box, increasing the mileage to five under the same conditions.

Fertilizer boxes are made in 6-inch spacing to suit the majority of high-wheel grain drills, and also in 7-inch, 8-inch, 9-inch, and 10-inch spacing suitable for press drills, tiller combines, and one-way disc seeders.

The Universal fertilizer attachment is an answer to the Canadian prairie needs for utilizing the thousands of grain drills now in use on the prairies. By its use, farmers are realizing higher yields and higher quality cereal crops. More rapid early growth and earlier maturity mean less losses from early fall frosts and rusts. The cereal fertilization becomes an actual reality ranging in costs from 70c to $1.20 per acre. Besides lower unit production costs and higher quality yields, Canadian farmers are realizing that intelligent fertilization, plus good seed and good farming practices, are an insurance with which they are more likely to combat hazards of late spring frosts, soil drifting, weed competition, plant and insect pests, early fall frosts, and adverse harvesting weather. They are realizing that in a cold climate, with short growing seasons, the use of fertilizers many times is the added help to crop growth that turns crops from a partial or complete failure to a profit.

Grass Cheap Dairy Feed

"Pasture grasses furnish the dairyman with the cheapest source of feed," says the Bureau of Dairy Industry, United States Department of Agriculture. Tabulation of costs of growing various crops, gathered from 16 states, showed grasses cost the farmer only 64 cents for each 100 pounds of digestible nutrients, compared to 83 cents for alfalfa, 97 cents for clover hay, and $1.54 for corn silate. Oats are at the other extreme with a cost of $2.02.

The Happy Husker's Holiday

(*From page 5*)

Kernel, kernel, kernel,
 Cob, cob, cob;
From the meadows vernal
 We can feed a mob;
Bang board, bang board,
 Grind it in a mill,
Good for yellow corn pone,
 Good for mush or swill.

It may be said in parenthesis that Silky Krug did not relish this outburst much, as she thought the lines were not complimentary to the testimonials; but she just couldn't have her way in everything.

UPON call of the chairman, the next person to come forward for honors was none other than Professor Teosinte Boone, known in every barnyard for his noble contributions to the science and practice of animal husbandry as a fine art. Leaming handed him a cow-hide brief case and read the following sentiment from the "illuminated corn husk":

From Proverbs, Chapter 27: "Be thou diligent to know the state of thy flocks, and look well to thy herds. For riches are not forever: and doth the crown endure to every generation? The hay appeareth, and the tender grass sheweth itself, and herbs of the mountains are gathered. The lambs are for thy clothing, and the goats are the price of the field. And thou shalt have goat's milk enough for thy food, for the food of thy household, and for the maintenance of thy maidens."

Professor Boone almost shed tears. He vowed that there was no word of which he was cognizant in feeds and feeding or the coefficients of nutrition which could begin to express the fulness of his heart. He offered to give them a lecture then and there on the Germ Plasm Progress in Proven Sire Indices, but Grandpaw Murdock started to snore before the Professor got shifted into third gear of the introduction, and they had to start the harmonica band to wake him up.

Having passed this danger spot, they quickly went on to the next tribute, which was one accorded to B. B. (Bloody Butcher) Mosby, the talented and energetic cooperative organizer, exhorter and leader. To him Leaming extended these phrases:

From Psalms: "Thou calledst me in time of trouble and I delivered thee. Oh, that my people had hearkened unto me and walked in my ways. I should have subdued their enemies and turned my hand against their adversaries."

The harmonica band and the Huskers' yell had to begin mighty quick on signal this time, or else the rest of the evening would have been sadly bereft of good will for the absent middlemen and commission merchants, toward whom on such mellow occasions all resentful bitterness should be forgotten. So the committee wrung B. B.'s freckled hand and led him to a reserved seat, where he sat rather uneasily the rest of the night.

"OUR next tribute goes, as it should, to the presiding genius of this class room, the votaress who guides the destinies of our young and tender shoots," announced Leaming, as he called for Miss Dentura Wimple, and picked out the proper scroll to hand her. Quite according to the ancient British custom, Corn Corners youngsters shouted, "'Ear, 'ear, 'ear!" as she received the prize.

Chapter 9 of Proverbs: "Wisdom has builded her house. . . . Whoso is simple, let him turn in hither: as for him that wanteth understanding, she saith unto him, come, eat of the bread and drink of the wine which I have mingled. Forsake the foolish, and live; and go in the way of understanding."

So overcome was the maiden teacher that she went to her desk, unlocked the secret drawer and removed a huge quarter-sawed oak ruler. She carried the ruler to the redhot stove, into which she threw it with a flourish. Dusting off her mits, she said:

"This is what is known as a symbolic gesture in return for your generosity, and in due appreciation of the season. However, be it known by these presents, that I have made *no* binding New Year resolutions *not* to maintain decorum within these walls as per usual custom. It's up to you, boys!"

AFTER a brief pause to let this sink into the skulls of the grade members, Early Leaming called for Aleurone Rustler, the energetic and ambitious young college graduate nurse and home specialist, now serving the county as demonstration agent. He handed her a husk on which were these sentences:

From Ezekiel, Chapter 4: "Take thou also unto thee wheat, and barley, and beans, and lentils, and millet, and fitches, and put them in one vessel, and make thee bread thereof. . . . And thy meat which thou shalt eat shall be by weight, 20 shekels a day: from time to time shalt thou eat it. Thou shalt drink also water by measure, the sixth part of an hin. . . . And they shall eat bread by weight, and with care; and they shall drink water by measure, and with astonishment."

"Many thanks indeed," replied the buxom young demonstrator. "All this is splendid stuff, and I can subscribe to that last part here where it says 'they shall drink water with astonishment,' because from some of the carryin's on in this section, water would be a rare thirst quencher. But what I wish to say is this: that there is one person on my rounds who deserves more of a tribute than any coming my way, and I have asked her to be here—only she can't, being laid up in the hospital."

A CHORUS of approval from the audience induced the lady to continue.

"Knowing how hard and faithfully this poor soul has struggled during a year of drought and difficulty, and how she kept off the relief rolls by taking in a passel of uppity summer boarders, I could hardly accept this honor tonight without sharing honors with her. This is because she is so typical of all the better women folks in this community, who would do the same thing if they were up against it like she was. Her husband got gored by a bull last winter and she was left with ten children, from six months old to sixteen years. So she's worn out and had to go to the hospital, and you needn't ask if it's the eleventh one either, 'cause it isn't—not yet. But I'm not so sure who'll pay the bill for this rest cure she's taking. As for me, I'm willing to toss in \$5 of my salary, and forget those gloves and ribbons I wanted. Anyhow, here's the scroll we have for her, and Silky helped me prepare it on a silk sampler. There's a lot more to the verses, but these are enough to suit the occasion. Listen:

PROVERBS, Chapter 31: "Who can find a virtuous woman? For her price is far above rubies. The heart of her husband doth safely trust in her, so that he shall have no need of spoil. She will do him good and not evil all the days of her life. . . . She riseth also while it is yet night, and giveth meat to her household, and a portion to her maidens. . . . She layeth her hands to the spindle, and her hands hold the distaff.

"She openeth her mouth with wisdom; and in her tongue is the law of kindness. She looketh well to the ways of her household, and eateth not the bread of idleness.

"Many daughters have done virtuously, but thou excellest them all. . . . Give her the fruit of her hands; and let her own works praise her in the gates."

HARDLY had she ceased speaking than Kernel Krug arose and came forward with a bushel basket. Facing the Happy Huskers he declared, with a wide wave of emphasis:

"My idea is, folks, that all the gifts we have given out tonight, except those to the little nubbins, should be collected in one parcel and be sent over to the hospital. This good woman can call in her numerous brood of children and let them divide the spoils." He put the question after a first and second was heard, and it carried, echoed with a Happy Husker yell.

Then the unusual happened. No other than Neal Paymaster himself, dour Scot though he is, capped the climax of wonders by asking if the society might not like to vote 50 cents for a bunch of flowers or a Christmas wreath to decorate the parcel. Indeed, Neal went even further than that. He dug up a quarter and started to pass the hat—using Leaming's cap to save wear and tear on his own. Miss Wimple grabbed a sheet of foolscap and began the rounds collecting signatures of well-wishing to send along with the donation. Zea Mays and Silky Krug packed up a box of candy and nicknacks and tucked it into the basket along with the gifts. Everybody was running in circles, coins were jingling and faces were radiant. Even Grandpaw Murdock got real excited when they hollered into his ear and told him what the fracas was about.

You might say it was almost unanimous, this spirit of good fellowship in doing the right thing at the right time. So typical is it of Corn Corners and the Happy Huskers, that I would leave them here without further ado, but they say bright things stand out best by way of contrasts, so let's finish it that way.

Just as the basket was filled and about to be tied up and as Neal Paymaster had collected the last farthing from the club, one mealy-mouthed member, called "Blacky Musk," a little withered and wizened specimen, cordially disliked by all and sundry, interposed as follows:

"I'm one of the oldest and steadiest members of this yere outfit," he shouted. "I've paid dues and attended reg'lar, and never had no fuss made over me. I'm old and alone and ought to git a gift. At least I should a had a sentiment writ out fer me. What say? Some of these yere smart-alecs from fresh-water colleges might hand me a husk with some verses on it—seein' they are passin' 'em around so free like."

WITHOUT disturbing the gladsome ending of the program by further argument with Black Musk, the Board of Directors consulted a minute with Grandpaw Murdock, a perfect wizard on Bible lore. Hastily scribbling on a piece of husk, they handed the querulous critic a rather cryptic sentence and gently pushed him rearward. On the husk was written: "Such folks as you should take your answer from Chapter 15 of the book of Job, verse 2." As nobody stopped to find out what this sentiment is, and as nobody cares now except you and me and Bluck Musk, perhaps you will take time out to reach for the Good Book and see for yourself.

And along with the custom and the pleasure of the times, let me keep ardent step with the Happy Huskers in wishing *you* and *you* and *all* of you a very merry and heart-warming holiday.

Youth — I've never seen such dreamy eyes!

Sweet Young Thing—You've never stayed quite so late before.

WHO ENRICHES THE SOIL ENRICHES LIFE

COTTON is truly "all things to all men." To these pleasure-seeking sailors it is a harness for the wind, to industry it is raw material with countless uses, to the Southern farmer it is cash income and to the fertilizer man it is a market of vital importance.

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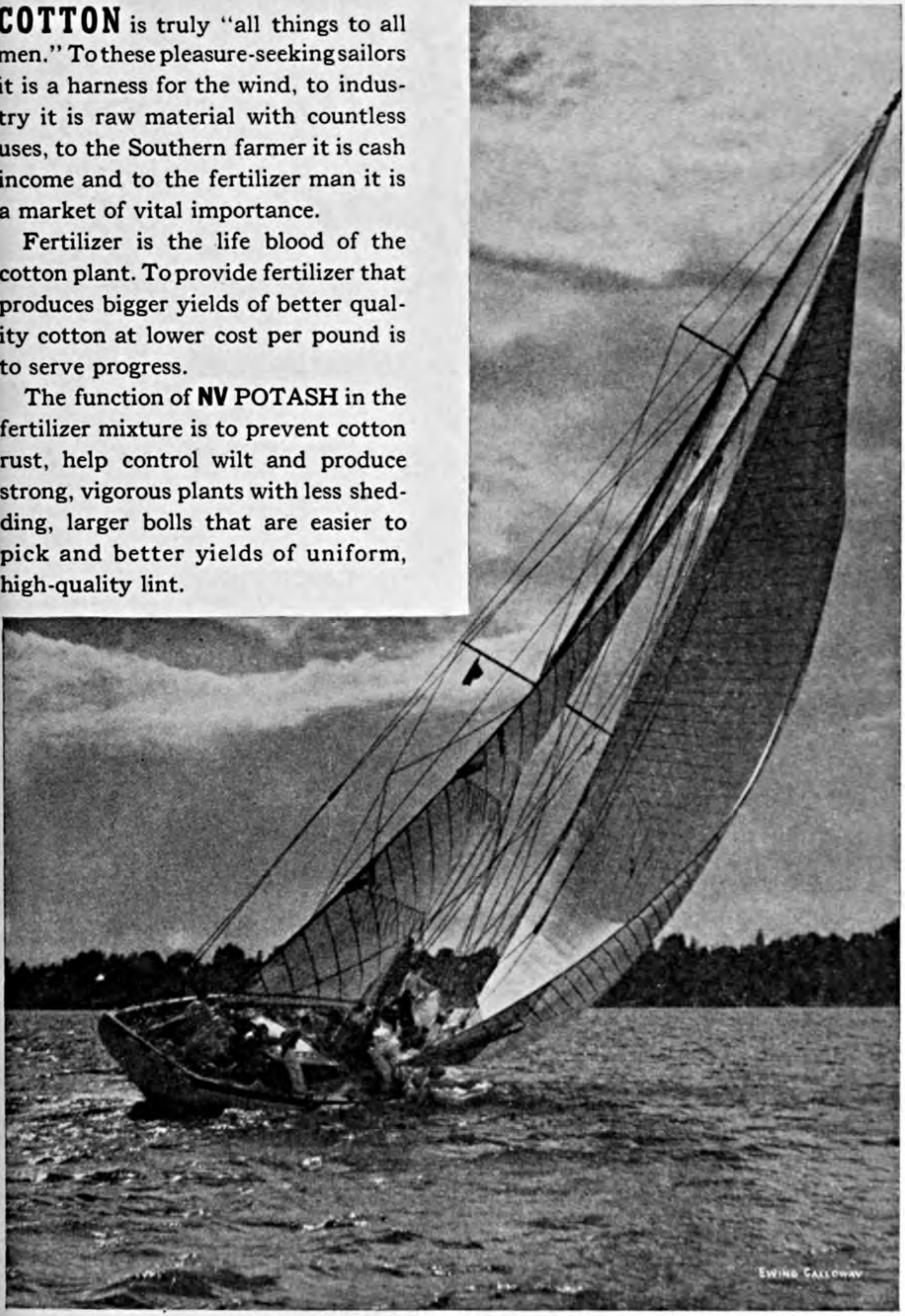

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A-25

O JOY!

A colored woman demanded a refund on a pair of hose recently purchased. The floorwalker asked:

"Madam, did they not come up to your expectations?"

"Lordy, no," she answered. "Dey hardly come up to my knees."

She: "Every time I come to California I have to discard my heavy undies. You know, I'm from Saskatchewan."

He: "Is that so? I'm from Missouri."

NO VALUE

A farmer who was always complaining about everything, was showing the result of fine growing weather and superior skill in cultivating, when his visitor said to him: "Well, you ought to be satisfied with such crops as these. There is certainly nothing lacking. You have nothing to kick about this year."

The old farmer stood in a meditative mood for a minute, then replied: "Well, you know, son, such crops as these are pesky hard on the soil."

A young lady and her aunt returning home from work on pay day, were relieved of their money by a stick-up man. The young lady, rushing over to a policeman, exclaimed "Ive been robbed of my pay and my aunt's pay."

"What do you mean by 'antspa'?" said the copper. "Cut out the hog Latin and tell me what happened."

French Maid (screaming in the night): "Help, help, Madame, help!"

Madame (awakening): "Be brave, Mimi, I'll call my husband and send him there."

Maid: "But, Madame, that's just it."

CHRISTMAS CHEER

Mrs. Jones: "Look, dear, how picturesque; the Browns are bringing in a Yule log."

Mr. Jones: "Yule log, my eye; that's Brown."

"I suppose you carry a memento of some sort in that locket of yours?"

"Yes, it's a lock of my husband's hair."

"But your husband is still alive."

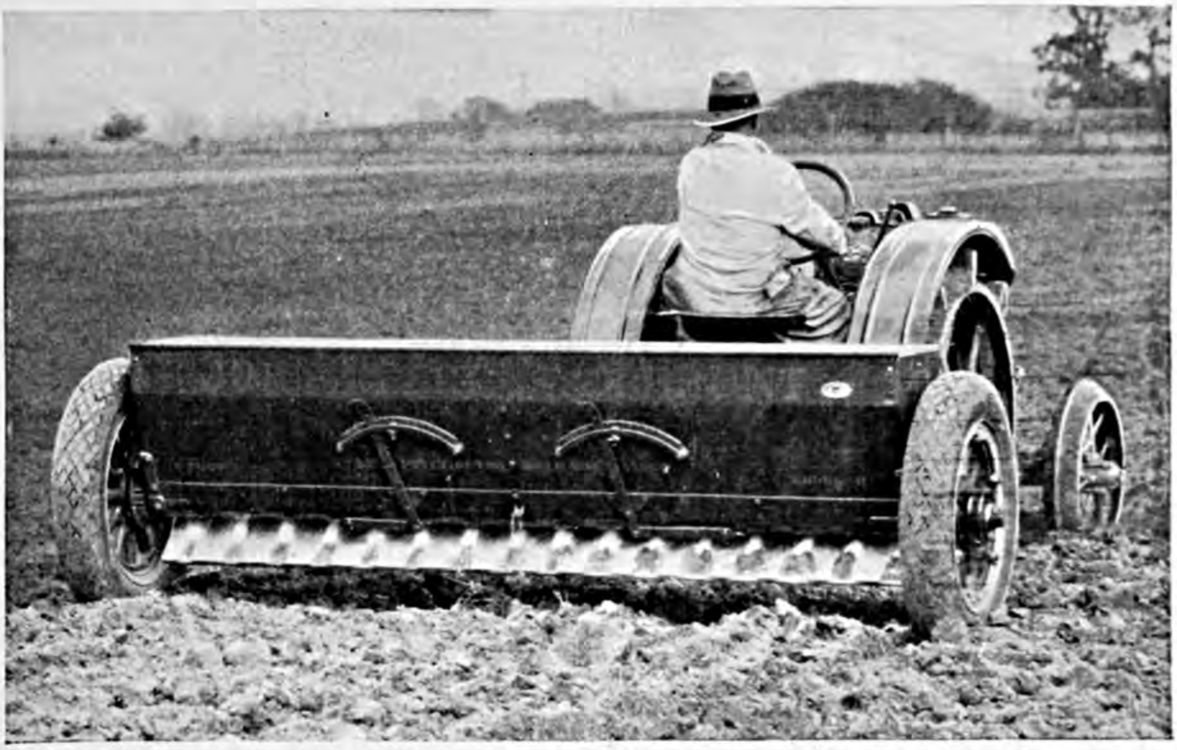
"Yes, but his hair is gone."

CHIVALROUS

Jimmy, age nine, was escorting his younger sister, Ruth, to school. Now, although Ruth was more than a year younger than Jimmy, she was much better read.

On the way Ruth slipped and tore her new frock. "Jimmy," she said, "if you want to show people your chivalry, you will give me that pin in your trousers."

Jimmy, blushing furiously, retorted: "If you think I'm gonna show my—my chivalry just so you won't have to show your petticoat, you're off your block. Go on home and get yourself a pin."



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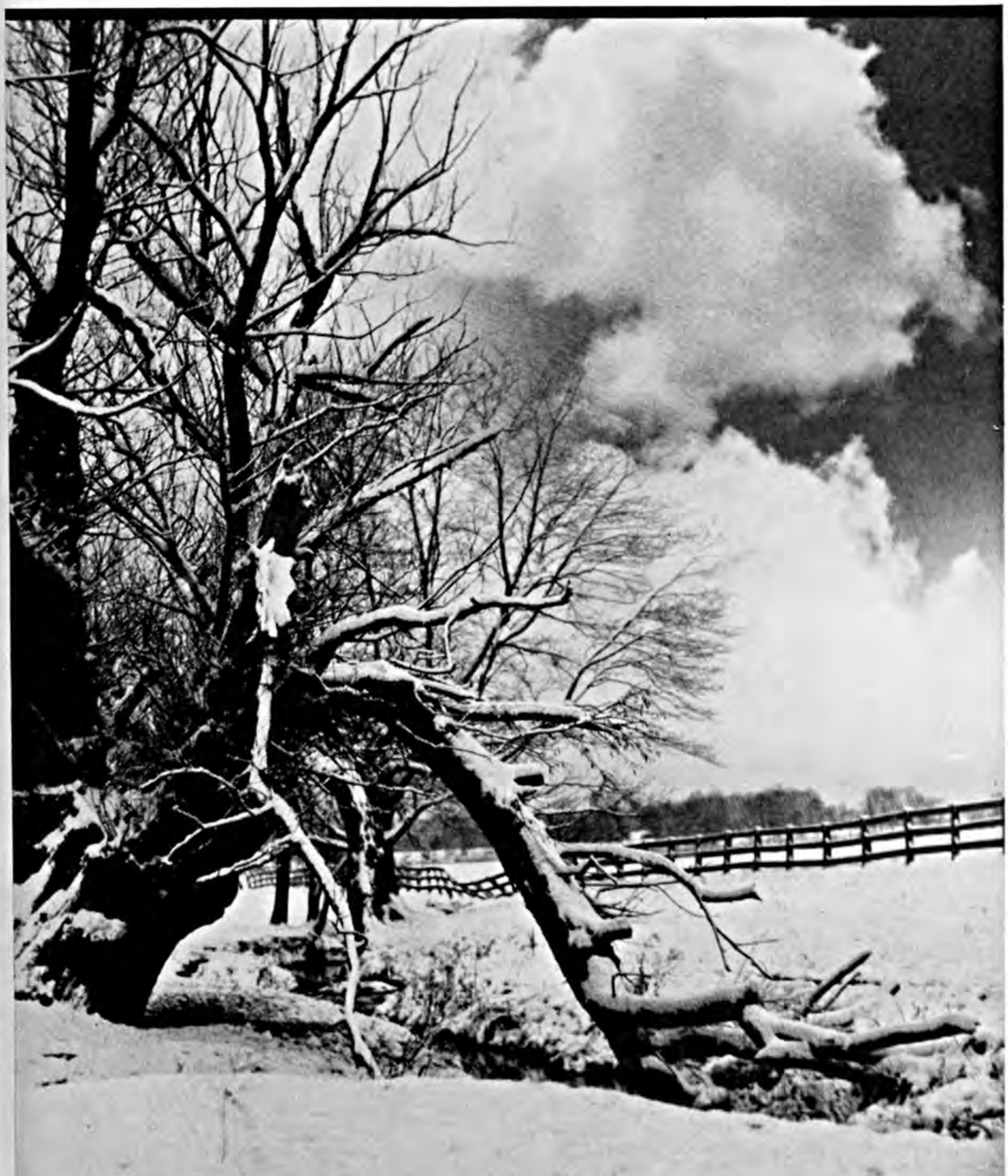

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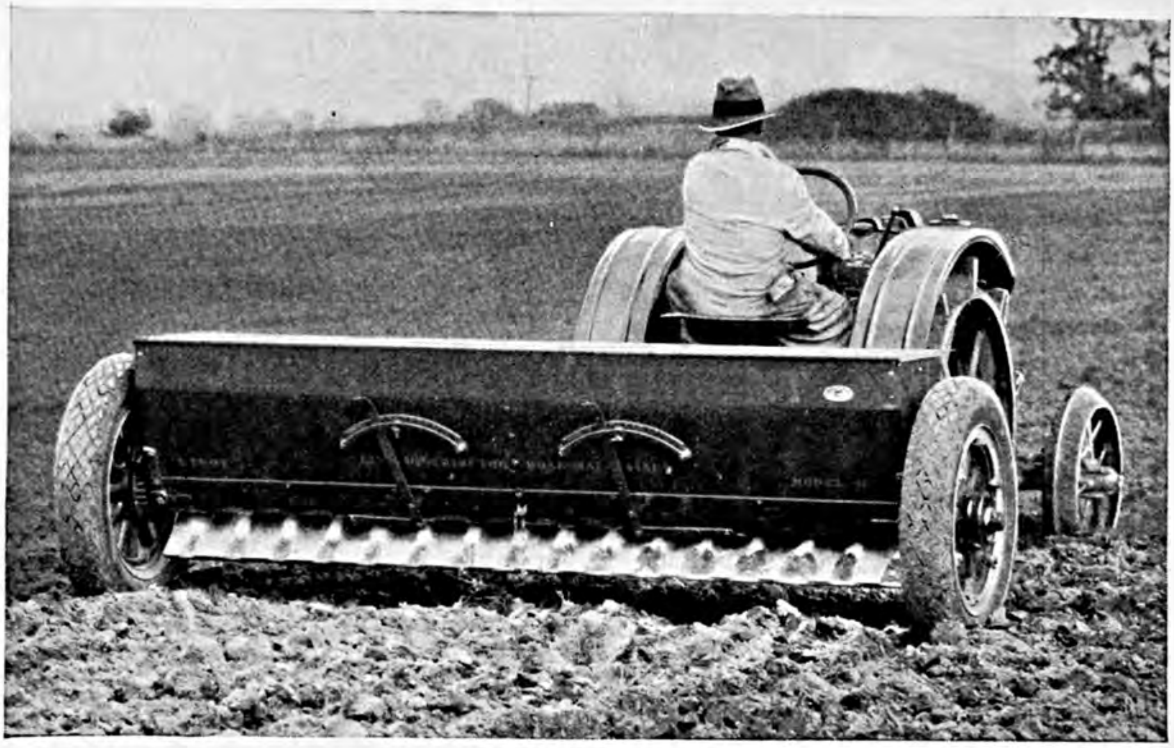

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*
Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XXI NUMBER THREE

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Investment Building, Washington, D. C.

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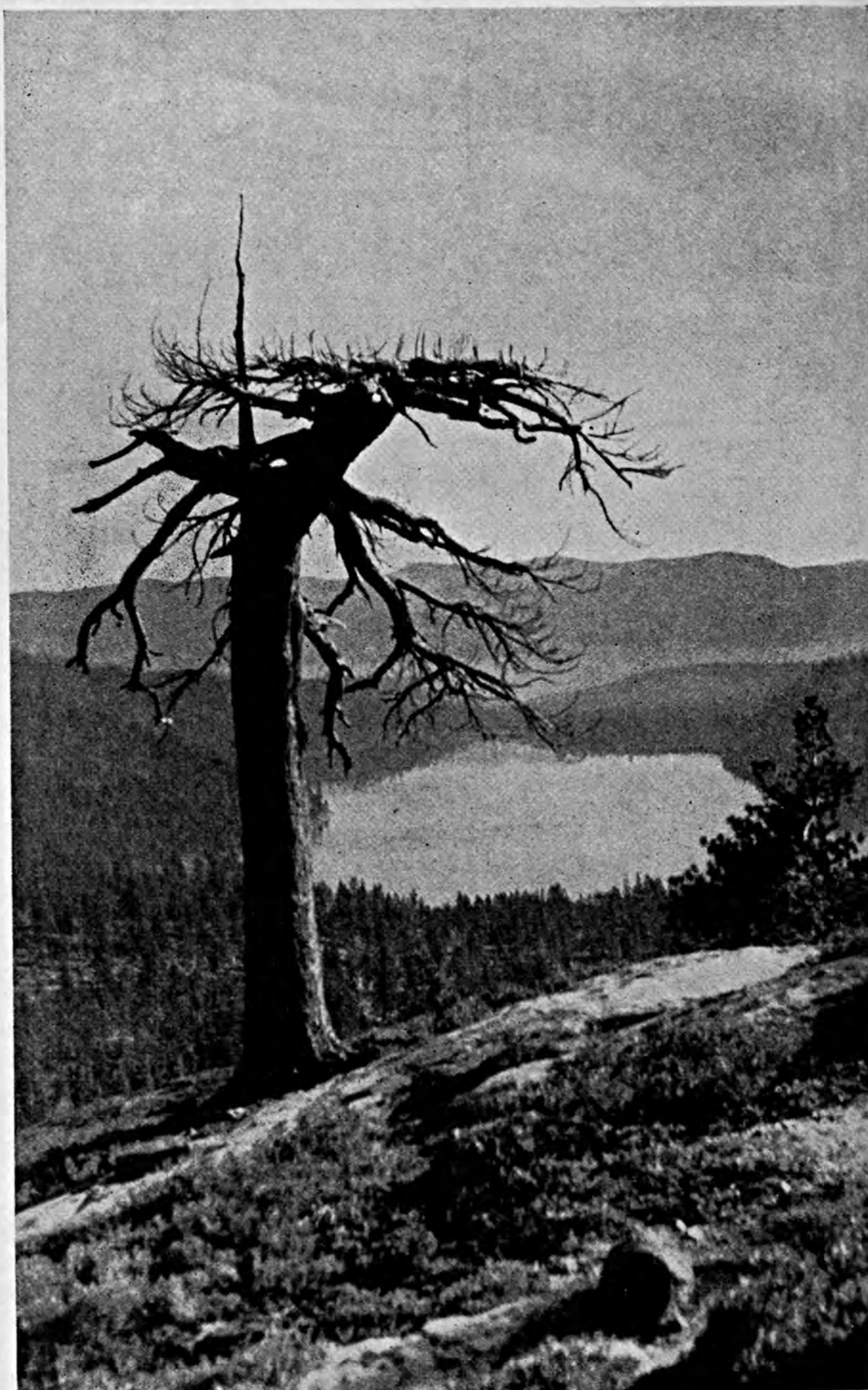

ALOOF AND ALONE, AN AGED SENTINEL STILL KEEPS WATCH.

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., JANUARY 1937 No. 3

Jeff changes liabilities into assets. . .

Inventory

Jeff McDermid

IS IT not time for American agriculture to take a shelf-to-shelf inventory of its rich possessions, like the shrewd country tradesman? After that, is it not appropriate for farmers to do a little constructive advertising of the best occupational assets they discover? Would that help to overcome some of the adverse ideas which the other three-fourths of America entertain about our maligned and misjudged rural minority?

If not, do we go on record in 1937 as inclined to discourage all attempts to make country living attractive or to point out its frequent compensations against a life in town—on the grounds that there are too many ill-fitted folks a-farming today, and that our rural security depends on a diminished movement countryward and a gradual reduction of the food surplus? Frankly, I am sometimes unable to tell to which policy organized agriculture and its spokesmen are directed.

Of course, it seems to me that it is the saner plan to defend and to extol the solid virtues and homely comforts of agriculture as a profession, rather than to join in a chorus which sings lamentations and doxologies. In this course I would reject the untrue and overly sentimental, because facts and proof are sufficient without them.

Further, it seems to me a far better plan to help build up a more durable and attractive industrial plant in America, with its members in a greater degree of social and economic peace and security. This at least is somewhat like helping a neighbor build a better house so that the taxes and interest you pay on yours may be less burdensome in true relation to future community values. We must remember that the heaviest threat to an overdone farm profession is a sinking and a wavering industrial situation. For that combines not only to build up fierce and lamentable agrarian competition, but it cuts the ground under the steady consumption of food at remunerative prices to farmers.

Misconceptions about farming largely arise from hearsay, political distortion, or from the tales of the pioneers. That is, the old independence and bravery of tradition attributed to the pioneers in art, song, literature, and history has all been tangled up in modern minds with messy discomforts like poor roads, bad schools, makeshift living, pancakes at every meal, and the outdoor toilet in zero weather. In spite of the auto era of wide travel, much of this misunderstanding is rampant on the boulevards, and why not? Just test it yourself in regard to your metropolitan impressions.

WHEN we farmers go to the big city, do we not judge hastily by exceptions or extremes? We ride the elevated train to the Chicago stock show on the same day that the elite of the gold coast occupy the boxes for the horse show. We return home with the conviction that cities consist entirely of dreary slums and ash heaps on the rim of a realm of wasteful luxury and prodigality. It's the big middle average that we miss.

Popular notions need overhauling in respect to the better type of country dwellers. It is as though one came to a big red barn, the kind which often has the whisky or tobacco signs on it, and we read the following painted announcement:

"Why Respect Agriculture? It is (1) lonely and secluded; (2) uncultured and narrow; (3) hazardous and uncomfortable; and (4) querulous and dissatisfied."

THAT kind of philosophy has been emblazoned abroad on many a platform by alleged farm supporters for three decades or more. It is no wonder then that many folks prefer to utilize the twilight period as the "cocktail hour" in some gaudy club instead of the "milking hour" on the farm. It explains why the majority choose the alarm clock in the flat to the rooster in the sticks. But worse than any of these, it is the kind of mental poison which breeds maudlin sympathy or amused contempt—either of which are not sought by upstanding farmers. To counteract this we require an aroused army of de-bunkers. And some of the first de-bunking must be performed on their leaders, sad to relate. All we can do is to start the crusade and let the fellows with local details add the finishing touches everywhere. So, taking the above screed apart in due order, let us do some dissecting. Can we scrape some of the red paint off that barn? Give us a lift on the ladder and help us do a clean job without any whitewashing! If whisky and tobacco signs don't belong there, neither does the other one.

First, let's sponge out "lonely and secluded." I do this over the protest of statisticians who bemoan the actual dearth of radio sets in some bucolic realms, and despite the hullabaloo for more and better side roads. For no citizen of our ken is more thoroughly open to constant inspection and uninvited visitation than the average farmer; and his premises are about as secluded as the w. k. road to ruin. There are more busy agents and pompous agencies cluttering up the farm scenery than there are newspaper reporters pestering the Duke of Windsor.

Here comes the census taker who

wants to file with the blessed government all known and imagined data which will help some congressman give his speech a rural flavor. Close on his heels arrives the town assessor, hunting for tangibles to tax. Next friend wife gets a visit from the county nurse to check up on the fresh air intakes for sleeping kiddies, fol-

lowed by the home demonstration agent, who inquires feelingly about the vitamin dietary served to hired men.

Here is the insurance man, ready to write a dual endowment policy for the twins or sign you up for silo coverage. If he already has your premises insured, he insists on peering around from cellar to attic, pointing out hazards and making mother angry because the beds are not made. Not to be outdone on vital statistics, the banker who holds the mortgage swerves into the yard and wants to take an inventory of the exact status of his collateral; and he also desires to see evidence of your systematic accounting methods.

The rural school supervisor drops in for a meal and a lengthy dissertation on the duties of parents and electors. Presently the gate clicks and the sterling remedy and liniment gentleman bursts in to find out if your stock of "heave halt" and "bunion buster" is low, or if mother's vanilla extract needs replenishing. Not far behind him we see the dusty brush man and sudsy soap agent running a marathon to catch the housewife unprepared.

The R. F. D. inspector stops long enough to point out that you need a new steel mail box big enough to hold all those confounded catalogs. The college sends the weed inspector to shame you for leaving so much potential misery along the roadside. In a different mood, the county agent appears at the head of a caravan of farmers from the next county to show them your alfalfa. Suddenly from nowhere the county soil conservation gang climb over the fence with measuring wheels and scrolls of foolscap, anxious to get all the final proof to finish Docket No. A-1, Series 65. That takes two days more. When they depart another fellow comes to make a soil map and bores you almost as much as he does the soil.

AND from here we could run on and on, although time is too precious to delay further, even if we miss the vet who punches holes in good hides for the area test, the gent who collects wild flower specimens for the museum, the geologist hunting minerals, the subscription solicitor with the horse blanket premiums, and the expert who thinks he can cull hens. And so as evening settles down, the family retires without tuning in the amplifier, having had plenty of enough for one day. Who said "pity the pioneers"?

Second, we smear out the words "uncultured and narrow." There are still some folks who regard the countryman and his relatives as uncouth bumpkins in the aggregate, although they do sometimes admit that a flicker of genius often glows from the squash centers and accidentally yields a Grant Wood or a Hamlin Garland.

If they took a regular assay, however, of these fruitful and famous stars of art and literature and then weighed the "pay dirt" in proportion to the population strata from which it

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Permanent Grassland Has Cash Value

By J. W. White

Pennsylvania Agricultural Experiment Station, State College, Pennsylvania

THE author and several of his associates recently made an inspection of the various methods proposed in Pennsylvania for the control of soil erosion. It is not the purpose of this article to discuss the merits of the various systems introduced, for most of you are familiar with such projects in our eastern states. The phase of the control measure which immediately attracted my attention was the paramount role to be played by grass sod, including both temporary grass strips and permanent grassland to be established on the steep hillsides.

In the long-established agricultural sections, such as southeastern Pennsylvania, where a more or less definite field rotation system has been handed down from father to son, the new order of things may seem at first a radical and unnecessary interference with a long-established farming system. In the more prosperous farming area of Lancaster County, permanent pastures play a minor part, for grazing is confined largely to the fields from which clover is harvested in the early summer. Here dry-lot feeding also has long been established. These farmers believe that their fertile fields bring more profitable returns in a short rotation, and that the tillable land is too valuable for permanent pasture. Little do they realize that, like a thief in the night, sheet erosion is gradually, perhaps, but surely skimming the cream from the surface of their now fertile fields.

It seems apropos then to point out

Daisies do sometimes tell! A poor, sour, abandoned field on Dekalb soil glorified by Mother Nature in her successful attempt to hide the neglect of her tenant.

From white daisies to red clover. A new up-to-date tenant moved on this farm, and he cared naught for "Saying It with Flowers." So he plowed down the daisies, harrowed the land, applied lime and PK fertilizers, and seeded the field to clover. The change in the landscape pleased him and all who passed along his way, and following the clover came fields of ripened grain.

at this time the value of permanent grassland aside from the standpoint of erosion control. Such information of a definite nature will place into the hands of those confronted with these problems specific arguments that may aid them in establishing the several schemes of soil conservation involving the use of grass.

No farmer need be sold the idea that soil organic matter is the key to the fertility of his fields. He knows that his soil, dark brown in color, is more friable and mellow and requires less labor to prepare than that field, perhaps on the hillside, where soil is yellow and clods remain behind in the wake of the harrow. He may know why this field is inferior, but does he know how to restore it? Applications of barnyard manure, growing of green manure in the nature of cover crops and catch crops, plowed under say, for corn, will help, but even these measures are not enough. Green manures and barnyard manure may aid in the maintenance of soil organic matter, but so long as cultural practices of plowing, harrowing, and cultivation are followed, the level of organic matter will not be permanently raised.

There is only one economical way of actually building up soil organic matter and that is by means of permanent sod in the nature of a well-fertilized meadow or pasture. On fields already fertile, keep them so by the systematic use of green manure crops and animal manure. To build up the organic matter and restore the life of that worn-out, run-down field, the farmer must resort to more heroic measures.

In 1916, the writer began a series of experiments on Dekalb soil, on exceedingly poor, run-down, mountain land. On one field a 4-year grain rotation was established, and on an adjoining area a Kentucky bluegrass

	Ky. Bluegrass Pasture Fertilizer Treatment				Rotation Fertilizer Treatment			
	Check	P	PK	PKN	Check	P	PK	PKN
Organic Matter	11.9	21.5	48.5	28.1	12.0	16.2	17.1	21.8
Nitrogen	10.5	17.1	50.5	32.3	15.4	18.6	21.3	17.1

Better for the cow than the plow. The program of soil conservation in relation to soil erosion control emphasizes the importance of permanent grassland for hillsides as a substitute for crops in a rotation system. On cultivated hillsides sheet erosion like a thief in the night, skims the very cream from the surface soil. "Save the surface and you save it all."

pasture was started. Each field contained 10 plots, and the two experiments were fertilized and limed in like manner. At the end of 8 years each plot of the two systems was sampled and the soils analyzed for organic matter and total nitrogen. The following summary shows the gain in organic matter and nitrogen during the 8-year period expressed in percentage of increase over the original soils.

With the exception of the untreated (check) plot the soils under permanent grass showed a greater gain in relation to each treatment. It is of interest to note the influence of potash in bringing about the increased accumulation of nitrogen and organic matter especially in the bluegrass pasture.

Further evidence of the soil-building value of grassland is furnished by the Jordan Soil Fertility Plots. The division strips which separate these old plots have been in permanent sod since 1867. In 1922 the writer made a study of the organic matter and nitrogen content of the grass division strips and also the plot soils. From 1868 to 1880, inclusive, the plots were used as miscellaneous experiments. Since that time a definite field plot experiment has been in progress. It became possible, therefore, to determine the effects of a permanent grass sod and a rotation system in the maintenance of soil organic matter and nitrogen for a period of 55 years (1867-1922). The following table shows the results secured in relation to various plot treatments compared to the unfertilized grass strips.

These data present conclusive evi-

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POUNDS PER ACRE OF SOIL ORGANIC MATTER AND NITROGEN FOUND AT THE END OF 55 YEARS IN THE SOILS OF THE TWO SYSTEMS OF SOIL MANAGEMENT.

	Untreated Grass Strips		Plots in Rotation	
Biennial Plot Treatment	Organic Matter	Total Nitrogen	Organic Matter	Total Nitrogen
P (plot 3)	65,791	3,054	49,982	2,284
PK (plot 15)	78,515	3,740	61,971	2,964
NPK (plot 27)	79,390	3,830	59,630	2,880
6 tons manure (plot 16)	85,872	3,980	72,629	3.330
6 tons manure + L (plot 22)	90,745	4,290	78,480	3,690
Check (plot 14)	75,646	3,630	55,478	2,470
Average	79,327	3,754	63,028	2,936
Increase over plot soils	16,299	818		

P = 48 lbs. P_2O_5; K = 100 lbs. K_2O; N = 48 lbs. N. as nitrate of soda.

Excess Soluble Salts In Greenhouse Soils

By C. T. Gregory

Purdue University Agricultural Extension Department, Lafayette, Indiana

ABOUT 10 years ago greenhouse gardeners began experiencing a puzzling trouble in their lettuce. The plants simply would not grow in some spots in the greenhouses. Sometimes these areas were near the walks, sometimes in the back of the beds near the outside wall, or they might be located in the middle of the beds. In one house these areas would be small and in another house rather large. But, they were always quite irregular in size and shape.

The plants in these spots were always stunted, but not always to the same degree. Some plants never seemed to increase in size after they were transplanted into the beds. Such plants were dark green in color, and the leaves were thick and tough. In practically every case the plants did not die. To make this situation more confusing there would be plants in such spots that were apparently quite normal in size and color, growing 7 or 8 inches from the little dwarfed runts.

These small stunted plants were studied carefully in an attempt to determine the nature of the disease causing this trouble. The roots and underground stems were brown or had a superficial olive brown color. But no fungus or bacteria could be associated with the trouble, and nematodes were not present. This led us to the conclusion that it must be some unbalanced condition in the soil.

Soil Symptoms

The late Professor S. D. Connor suggested that it might be due to high concentrations of soluble salts. He made water extracts of soil samples taken from good areas and poor areas and determined the percentage of soluble salts in each case. Immediately the nature of the problem revealed itself. In every case the soil samples taken beneath the poor, stunted lettuce contained from two to seven times as much soluble salts as the soil

Inspecting stunted lettuce which resulted from excess soluble salts.

taken beneath good plants. It was interesting to find that the soil taken beneath a poor plant compared with soil taken beneath a good plant, not over 8 inches away, would show the same differences in the soluble salt content. This was the beginning of the study of excess soluble salts in greenhouse soil. Since that time we have found several different plant symptoms of this condition in vegetables and flowers.

Professor Connor's studies have led us to believe that a rich garden or greenhouse soil will contain about .15 per cent to .20 per cent of soluble salts. When the soluble salt content mounts to .25 per cent, some manifestation of trouble may be expected. Above this point we find greater and greater exaggerations of the slow growth and generally stunted condition of the plants associated with soluble salts.

Another symptom of this trouble in the soil is the appearance of a white crust, as the surface soil dries out. On soils where injury is occurring to the plants, this crust will usually be rather thick and may spread completely over the surface. A few such white areas may appear on soils where the soluble salts condition has not yet reached injurious proportions. Such a white crust should be looked upon as a signal of danger creeping up in the soil.

Vegetable Symptoms

I have already mentioned the stunting of lettuce plants as one symptom of the trouble. In practically every case we may say that soluble salt has not caused death. The plants simply refuse to grow, or, as the gardeners say, they seem to get smaller all the time. However, this does not mean that the concentration of the salts cannot become great enough to actually cause death. We had one case from a greenhouse in Illinois where the grower complained that nothing would live in the soil. The soluble salt content in this case was considerably more than 1.0 per cent.

Ordinarily tomatoes and cucumbers will grow normally in soils where lettuce is stunted, but I have found cases where both of these crops were stunted by soluble salts. Radishes also seem to be more tolerant than lettuce.

Flower Symptoms

Among flowers we find symptoms of injury not usually found in vegetables. Chrysanthemums may be seriously stunted, with their leaves exhibiting chlorosis. Sometimes this chlorosis is general, and at other times it is interveinal in the center of the leaf. The flowers produced will be just about normal in color but will be smaller in size and on shorter stems than the normal flowers of the same variety. Some may say that this could be a manifestation of phosphate deficiency, but heavy watering will correct such trouble if used early in the life of the plant.

Primroses have shown all the symptoms of dwarfed leaves with all the chlorotic conditions from complete bleaching to a distinct interveinal chlorosis. These plants sometimes have almost normally developed lower leaves, with a rosetting and yellowing of the center leaves. Sometimes poor, depauperated flower clusters were formed, but ordinarily no flowers were developed. Plant-tissue tests made by the Thornton method revealed excessively high amounts of nitrate, phosphate, and potash. In one case where a grower had 400 primroses in this condition, he was told to water heavily and frequently and to set the pots up so as to insure thorough drainage. He did this, and 300 of the plants recovered, made a good growth, and were sold at Christmas. The remaining 100 recovered later, and in the spring were making a normal

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Better Sweet Potatoes For South Carolina

By E. H. Rawl

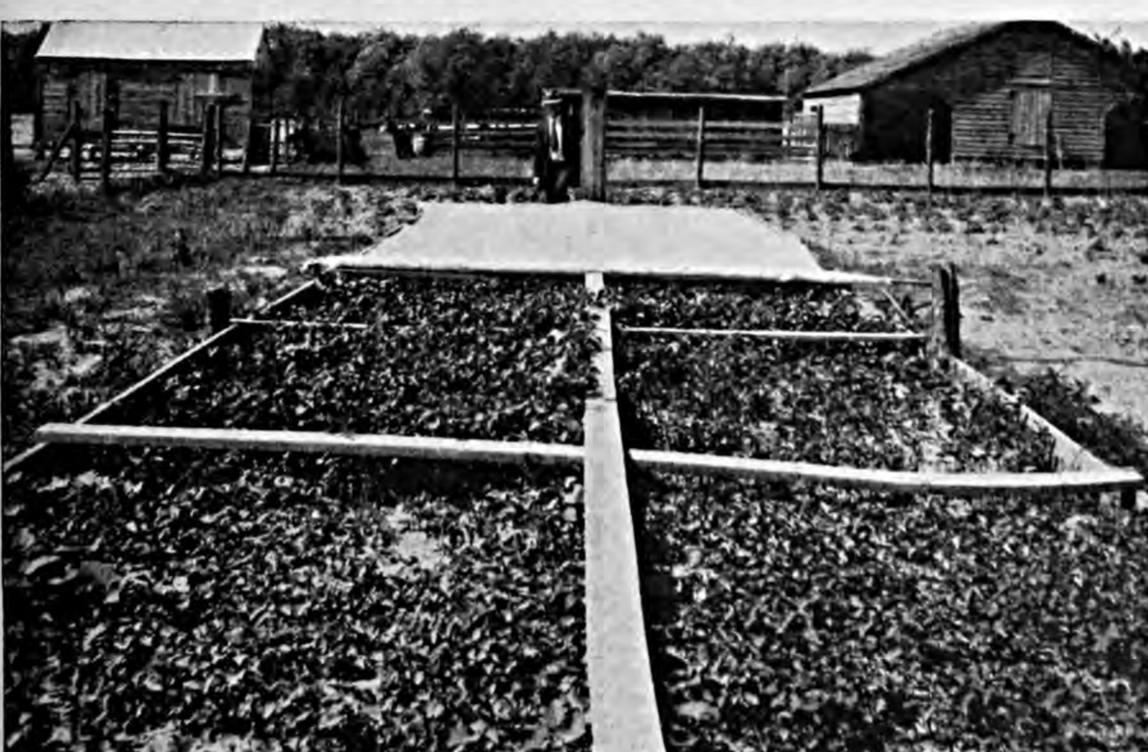
Extension Horticulturist, Clemson College, South Carolina

EXPERIMENTAL work and repeated demonstrations in South Carolina have clearly shown that fertilizers carrying a high percentage of potash are essential in producing a high and profitable yield of U. S. No. 1 sweet potatoes.

The sweet potato is important in South Carolina, rating fifth among crops in the Palmetto state. From 1926 to 1935 inclusive, an average of 51,600 acres was devoted to sweet spuds. From a commercial standpoint, the sweet potato in South Carolina has not been developed to its fullest extent, although growers each year are becoming more cognizant of its value as a money crop. However, as a local market crop, it has been and still is of much importance, and as a food and feed crop for the farms, it occupies a prominent position.

At present about 300 carloads are the maximum annual shipment to northern markets, and in recent years the out-of-state movement has been much lighter. From the long-time viewpoint there seems to be a place for a great development of this industry.

Stimulated by the sweet potato contests some years ago, considerable interest was manifested in the development of this crop commercially. At



A section of fire-heated hotbed showing an abundance of early plants.

the present time renewed interest is being shown. For instance, a carload of copper-colored Porto Rican strain, which was developed by the Louisiana Experiment Station, was placed by the Clemson College Extension Service and the South Carolina Sweet Potato Association in the spring of 1936 among 287 growers in 19 counties. From this foundation stock an ample supply of seed stock will be produced for further distribution. From reports already received, the yields from the Louisiana strain of Porto Rican Potato have proven far superior to any previously produced in South Carolina.

Sweet potatoes when handled properly will have to be considered as one of the most highly specialized truck crops. In the past they have been regarded as a crop which could be grown without a great deal of effort. But, as a result of this attitude, the quality offered generally has not been sufficiently high to establish a reputation. With the renewed interest, considerable attention is being given by the State Extension Service in aiding growers to establish the crop as a profitable enterprise.

A great deal of the specific information being used in South Carolina is based not only on experimental work but on the results of sweet potato contests. Data from the contests show that the majority of the growers in the high yield group followed the recommendations as to close spacing, early planting, and the use of 800 to 1,000 pounds of fertilizer per acre carrying 8 to 10 per cent potash, 8 per cent phosphoric acid, and 3 per cent ammonia. The contests further showed that the low yield group failed to abide by these recommendations.

In Bulletin 66, published by the Virginia Truck Experiment Station, further information on proper fertilization of sweet potatoes is found. In this publication, written by H. H. Zimmerley, it is stated that experiments on sweet potato fertilizers, using the big-stemmed Jersey variety, show that over a period of years the percentage of prime sweets was greatest on the plots fertilized with 3-3-15 (NPK) mixture, and the lowest on the area fertilized with a 3-15-3 (NPK) mixture. These investigations indicate that a good sweet potato fertilizer mixture should furnish approximately 30 pounds of ammonia, 30 pounds of phosphoric acid, and 150 pounds of potash per acre.

Experimental work on the fertilization of this crop at the Maryland and New Jersey Agricultural Experimental Stations furnished information similar to that reported by Zimmerly, to wit, the importance of a relatively high potash content in the fertilizer.

Successful South Carolina growers have found that the mixture below makes an excellent sweet potato

Pounds of material	Pounds of plant food and analysis of mixture		
	Phosphoric acid	Ammonia	Potash
944 Lbs. Acid phosphate (16%)	151.0	0.0	0.0
300 Lbs. Cottonseed meal (3-7-2%'s)	9.0	21.0	6.0
100 Lbs. Sulphate ammonia (25%)	0.0	25.0	0.0
72 Lbs. Nitrate of soda (19.45%)	0.0	14.0	0.0
200 Lbs. Sulphate of potash (50%)	0.0	0.0	100.0
188 Lbs. Muriate of potash (50%)	0.0	0.0	94.0
196 Lbs. Dolomitic limestone	0.0	0.0	0.0
2000 Lbs.	20(160.0	60.0	200.0
	8	3	10

* For all practical purposes, even weights of fertilizer materials have proven satisfactory.

fertilizer when applied at the rate of 800 to 1,000 pounds per acre.

The 200 pounds of dolomitic limestone in the above mixture were shown to be very desirable for counteracting the acidity of the fertilizer and supplying some magnesium which is needed for many of the soils of the state on which the crop is grown. Heavy applications of limestone which would aid the scurf disease were discouraged.

Sweet potato growers were advised that in applying this fertilizer in the amounts suggested per acre, considerable injury to the stand would result during dry weather unless the fertilizer was applied deeply and well in advance of transplanting and was thoroughly mixed with the soil before the ridges or beds were thrown up. A safe procedure was to apply about one-half the fertilizer before planting, thoroughly mixing with the soil, and use the remainder as a side application very soon after transplanting. In making the side application the rows were barred off to get the fertilizer fairly deep into the soil on both sides of the row. After the fertilizer was applied, it was covered by throwing two furrows of soil over it.

View of a typical "mother patch" showing excellent vine growth.

With experiments in Virginia on placement of fertilizer, it has been shown that wide bands of it on each side of the row, after the plants were set, is a superior method in obtaining good stands and satisfactory yields. Research work in North Carolina and Virginia has shown that fertilization in the row at the time of planting or even shortly before planting may be injurious if the roots come in contact with the fertilizer or if the fertilizer salts move upward to the root zone during drought before the plants are well established.

South Carolina growers are being advised to give special care to attaining and improving the quality of seed stock. The fields in which seed stock is produced should be free of sweet potato diseases, some of which live in the soil for 3, 4, or 5 years. Therefore, special precautions are being

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Rhododendron and azaleas used as a shrub border to a lawn.

Good Shrubs Result From Good Treatment

By T. D. Gray

Landscape Architect, Agricultural Extension Service, Morgantown, West Virginia

MY EVERGREENS turn brown during hot weather, my goldenbell fails to bloom, my weigela kills to the ground each winter, are the wails which come from home owners far and wide. These favorites that seem to do so well elsewhere, that give some houses such a trim effect, are unsuccessful with those who write.

No panacea may be offered for all, however, if a careful check is made one will doubtless find lack of plant hardiness, bud hardiness, improper soil conditions, lack of water, fertilization, insects, or disease at the base of a vast majority of the trouble.

Naturally the question arises, what would you plant? In selecting material for plantings, it is necessary to consider first, hardiness of material. The best guide is the plants which grow naturally in the vicinity. If rhododendron, mountain laurel, azalea, andromeda, dogwood, redbud, spicewood, haw, or viburnum, snowberry, and coralberry grow wild, here is a nucleus to select from and add to. Secondly, comes the preference of individual owners. Some may prefer evergreens and some deciduous material. The pocketbook is a vital factor, for many cannot afford expensive materials, such as the evergreens and rarer types of materials. The effect which is wanted and the need for which the shrub is planted determine largely the selection. Freedom from disease and insect pests and adaptability to soil conditions will be the final factors.

One feels that those are a lot of hurdles to jump. This may be true; however, one vigorous, healthy shrub is much to be preferred to a dozen sickly, drooping ones. Go to the nearest reliable nursery and see what shrubs are doing well. Study them, and question the nurseryman about his practices in handling them. More will be learned here in a day than elsewhere in a month.

It is not so much a question of what shrubs are used in planting as it is the way in which they are used. The entire effect may be obtained through the use of a few evergreens, the tall chamaecyparis and arbor vitae for accent at corners and on either side of the entrance, supplemented with Pfitzer's junipers. A different effect may be obtained, but just as satisfactory, by using black-haw and mock-orange (*Philadelphus virginalis*) in place of the tall evergreens and supplementing with flame azaleas. Some would much prefer the latter.

There is too general a tendency to smother the foundations of buildings with excessive plantings. Like a wreath they drape the building. This may have been excused when high foundations of cement block and tile prevailed. Today, architects bring the house material to the soil line, making the house more attractive, and there is little excuse for blotting it out with shrubs.

Wood hardiness is true of many shrubs which are not bud hardy. This is particularly true in many instances with early flowering shrubs, such as spirea Thunbergi, spirea Vanhouttei, forsythias, flowering quince (*Cydonia japonica*), weigela, and magnolia. Warm days in January or February will start their buds swelling, and a succeeding cold snap often kills the entire crop. It has been found at Morgantown, W. Va., that we may expect good bloom from the above shrubs about once in four years. The same shrubs at Amherst, Mass., where the buds remain dormant throughout the winter, make a gorgeous spring display. Buddleia, abelia grandiflora, and some of the weigelas are not wood hardy and kill to the ground or may be entirely killed during the winter months. Why worry with those plants which are not hardy? Scratch them off the list and add those which are.

A Good Start

More failures can be traced to lack of good soil preparation than any other one cause. When cellars are dug, the soil is often used to fill in around the foundation. It's an easy place for the contractor to dispose of broken brick, cement block, and other waste material in construction. This is not good material in which to plant, and the filled soil should be removed to a depth of 18 inches and good garden soil added. Use plenty of well-rotted manure. If this cannot be obtained, use sheep manure, which may be bought commercially from any dealer in farm

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Wild crabapple, fragrant, flesh pink, is found throughout West Virginia.

Successful Strawberry Practices in the South

By L. A. Niven
Memphis, Tennessee

THE five-year average acreage in the United States devoted to the commercial production of strawberries is 180,360. Of this acreage 96,470 or 53.5 per cent is located in the 13 Southern states, thus showing that the South is the most important section of the United States as far as the commercial production of strawberries is concerned.

While the yield in the South, as elsewhere, varies from year to year, the average is right around 1,500 quarts per acre, or approximately 145,000,000 quarts—more than a quart for each man, woman, and child in the United States. If we assume the price average to be 10 cents per quart, which isn't far out of line over a period of time, we see this crop represents $14,500,000 annually to Southern growers. This certainly puts it in the "important" class as a Southern money crop.

The fact that it goes to market quite early in the spring, a time when the main Southern money crops have mostly been sold, makes it all the more important as a source of cash income at this time of year.

While this crop is grown over a rather wide range of territory, the heaviest producing sections are found in Florida, Louisiana, Alabama, Arkansas, Tennessee, North Carolina, Kentucky, and Virginia. Beginning in mid-winter in Florida, the season gradually pushes North, the shipping being largely completed in the upper South during May.

Select markets require careful grading before shipment.

When it's strawberry picking time down South.

The strawberry may be set any month during the year, but the best time is in fall, winter, or early spring. In the middle and upper South most of them are usually set between October and early April. Fall setting enables the plants to become established, for the root system to start growth, thus putting the plants in a more vigorous condition when the real growing season is at hand. Then too, when set in fall they will bear a small crop the following spring, whereas those set in late winter or early spring will not bear until a year after being set.

Soil Preparation

The strawberry will grow well on almost any type of soil, provided it is well drained and fertile. However, it is highly desirable that they follow a cleanly cultivated crop, such as cotton, corn, tobacco, soybeans, etc. In preparation for setting the plants the ground should be broken deep and thoroughly pulverized by harrowing. When the ground is thoroughly prepared, lay off the rows three and a half to four feet wide with a rather deep furrow or trench. Put in the bottom of this furrow a good commercial fertilizer, such as a 6-8-6 or 6-8-8, at the rate of 500 to 1,000 pounds per acre, or two to four pounds for each 100 feet of row space. Then throw the dirt back on it with two furrows so as to form a slight bed, and the plants are ready to be set. Be sure to get the fertilizer deep enough in the ground so that when the strawberry plants are set the roots will be at least an inch or two above the fertilizer, because allowing the roots to come in contact with the fertilizer will result in injury to the plants. At least 6 per cent of potash is needed in any strawberry fertilizer used, in order to produce properly colored and firm berries.

The plants should be set from 24 to 30 inches apart in the row. In the home garden set 18 to 24 inches apart. Plants set during late winter or early spring will, if allowed to do so, produce a few berries that season, but in order to get the best and most vigorous plants for producing a heavy crop the following season, it is advisable to pinch off the few blooms that appear the first season. If allowed to produce berries the first season these late set plants are weakened somewhat and are not in a position to produce a maximum crop the following year.

Cultivate often enough throughout spring, summer, and into the fall to keep them free of all weeds and grass. Do not disturb the runners as they develop. Allow them to run over the

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California Prunes Respond to Potash

By B. E. Maynard

San Jose, California

IN CALIFORNIA where dry summers prevail, the question sometimes arises, Is it possible to obtain results from the use of fertilizers in unirrigated orchards? In fact, many fruit growers in unirrigated districts have refrained from the use of fertilizers, due to the belief that it is useless to apply them where winter rainfall alone had to be depended upon. That such reasoning is without any foundation in actual practice has been definitely proved in a number of instances in the past.

Weathered Hot Spells

Two illustrations given herewith, taken from results recently obtained in tests carried out by individual growers under unirrigated conditions, conclusively indicate that fertilizers can be profitably used where moderate winter rainfall is the only source of water obtainable. These two tests, as well as others that are made, further indicate that potash, when abundantly provided, is a very important factor in enabling the trees to resist drought and withstand injury from excessive heat. During a hot spell that occurred, just before the prune crop began to ripen, the trees and fruit in plots where potash had been used showed but little injury, whereas trees and fruit in adjoining plots where no potash had been applied suffered greatly.

To determine the effect of nitrogen and potash on his unirrigated prune orchard near Morgan Hill, California, Carl Schrader for the past 3 years has had a series of plots. One plot received nitrogen and potash, a second plot was given nitrogen only, while a third plot, of an equal number of trees, received no fertilizer and was used as a check. The trees selected for this demonstration were of the same age and were very uniform in general condition and size. However, all of the trees when this demonstration was inaugurated showed marked evidence of potash hunger, as is the case in other orchards in this vicinity, even where irrigation is practiced. Soil tests also show that these soils are very low in available potash, there being a strong correlation between these soil tests and the condition of the trees.

Improved Production

In the tests carried out by Mr. Schrader there has been a steady and marked improvement in the condition and productivity of the trees where potash has been applied, as compared with those in adjoining plots where it was omitted. Although nitrogen undoubtedly is needed on this place, where it was used alone the trees showed little benefit, due to lack of potash. In fact, evidences of potash hunger were more marked in trees receiving nitrogen only than in the rest of the orchard where no fertilizer had been applied. In the plot where potash was applied, the trees have improved greatly, and indications of potash hunger have practically disappeared. These trees also came through an exceptionally hot spell shortly before harvesting time in 1935 with minimum injury to either leaves or fruit, whereas the trees in plots and the rest of the orchard receiving no potash suffered greatly from twig dieback and leaf scorch. Injury to fruit also caused a serious loss of crop.

Mr. Schrader's figures giving the 1934-1935 returns from this test are as follows:

In Plot 1 (NK) each tree for the past 3 years has received annually 2½ pounds of sulphate of ammonia and 1½ pounds of actual potash (K_2O).

In Plot 2 (N) each tree has received annually 2½ pounds of sulphate of ammonia but with the potash omitted.

In Plot 3 (Check) no fertilizer was applied.

In the above only the second and third pickings are taken into consideration, as no record was kept of the first and fourth.

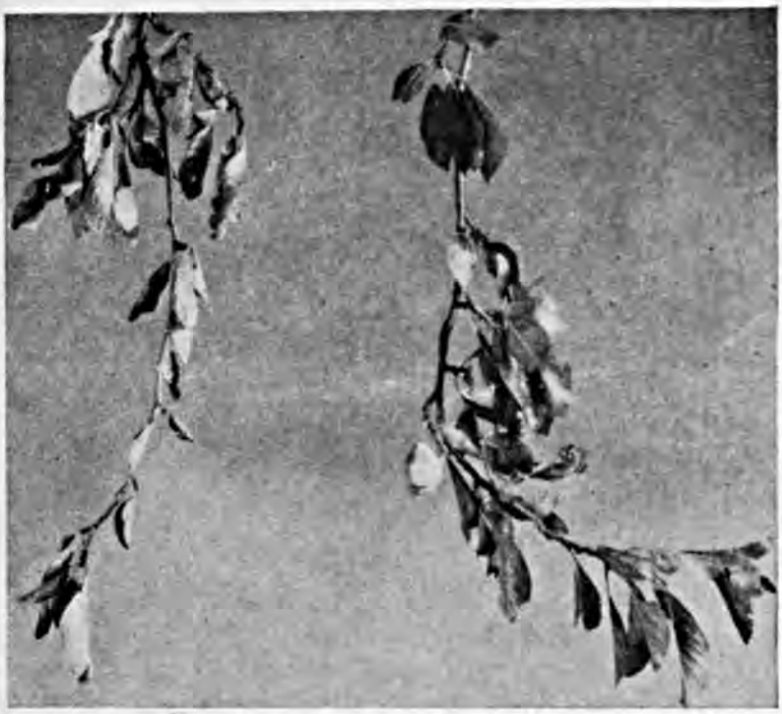
In comparing the returns from Plot 1 with Plot 2 it will be seen that the value of the crop was reduced $77.33 per acre in 1935 and $43.34 in 1934 by omitting potash in Plot 2.

Plot No.	1934 Yields and Values per Acre (base price 4c per lb.)		1935 Yields and Values per Acre (base price 2¼c per lb.)	
1 (NK)	2,030 (pounds dry)	$95.43	3,564 (pounds dry)	$122.96
2 (N)	1,144 " "	$52.09	1,440 " "	$ 45.63
3 (Check)	1,220 " "	$53.70	1,026 " "	$ 33.34

By omitting both nitrogen and potash, as shown by the return from the check plot compared with Plot 1, the value of the crop was reduced $89.62 per acre in 1935 and $41.73 in 1934.

A demonstration similar to the one carried out by Mr. Schrader is being conducted by F. F. McQuilkin of Gilroy, California. In this case the soil is a deep adobe which readily slacks on exposure to the air, forming a desirable summer mulch. This orchard also is unirrigated. The condition of the trees on this place indicates a serious potash deficiency, and the soil tests bear this out.

The prune crop for 1935 in this orchard was light, but the effect of



Potash deficiency symptoms showing on the Schrader prune trees.

potash was very marked in the improved condition of the trees, as well as in increased production and sizes of the fruit. Mr. McQuilkin's report on the 1935 and 1936 returns is based on 75 trees per acre and values in accordance with sizes at a market basis price of 2¼c per pound in 1935 and 3½c in 1936.

In Plot 1 (N) each tree received

2½ pounds of sulphate of ammonia but no potash.

In Plot 2 (NK) each tree received 2½ pounds of sulphate of ammonia and 1½ pounds of actual potash (K_2O).

In Plot 3 (Check) the trees received no fertilizer.

Plot No.	1935 Yields and Values per Acre (base price 2¼c per lb.)				1936 Yields and Values per Acre (base price 3½c per lb.)			
1 (N)	720	(pounds dry)		$25.20	3,232	(pounds dry)		$144.16
2 (NK)	1,837	"	"	$68.91	3,967	"	"	$188.85
3 (Check)	420	"	"	$14.70	1,342	"	"	$ 53.70

By comparing the returns from Plot 1 in Mr. McQuilkin's orchard with Plot 2, it will be noted that omitting the potash in Plot 1 resulted in a loss of $43.71 per acre in 1935 and $44.69 in 1936. In comparing Plot 2 with Plot 3, the check plot, we find that omitting both nitrogen and potash in the check plot resulted in a loss of $54.21 per acre in 1935 and $135.15 in 1936.

The trees in Plot 2 (NK), the only ones that received potash, withstood drought and an excessively hot spell preceding harvesting far better than any of the others. The foliage throughout the season maintained a rich, healthy, green color, and evidences of potash hunger have practically disappeared from this plot.

In Plot 1 the trees receiving nitrogen only showed considerable response, indicating the need of nitrogen in this orchard too, but indications of a potash deficiency are still very evident. On the check plot where no nitrogen or potash was applied, the crop was practically a failure, and the trees suffered greatly during the hot spell, showing much leaf scorch, mottling of the foliage, and twig dieback. Several of the trees looked as if they were about ready to die.

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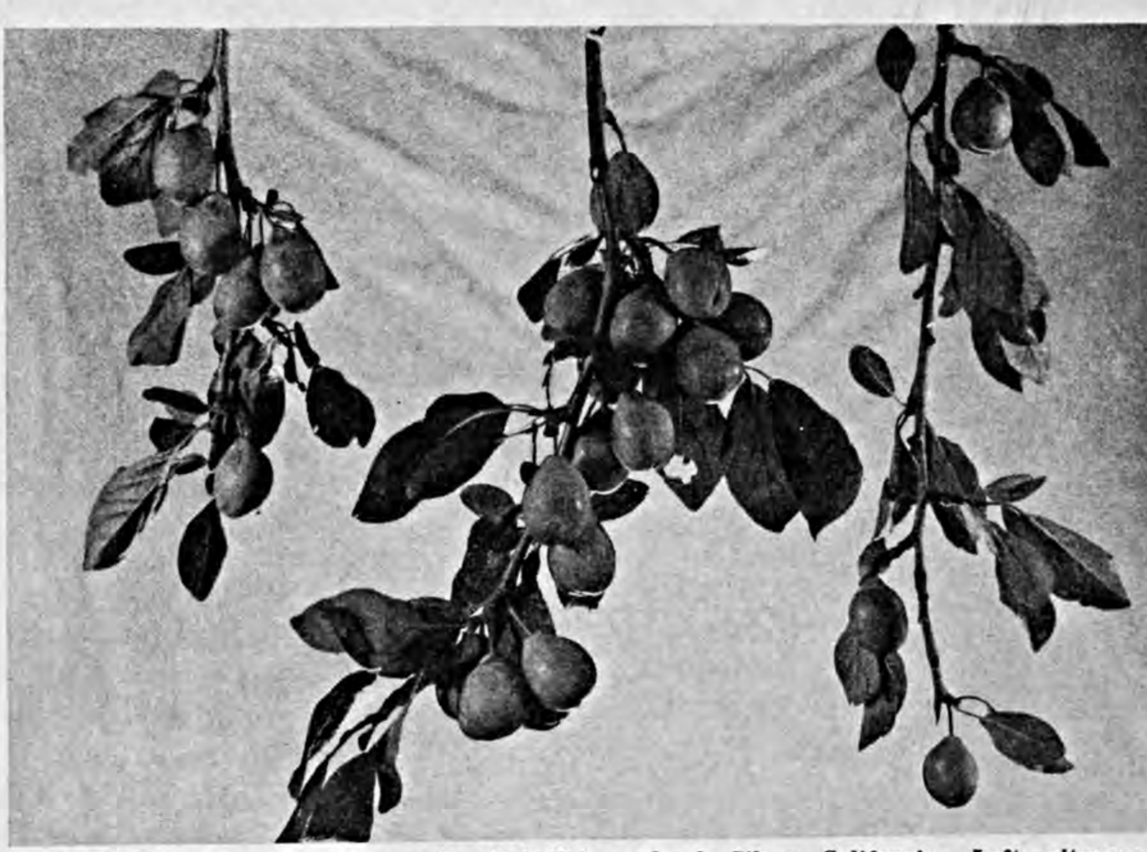

Typical twigs from test plots on the McQuilkin orchard, Gilroy, California. Left—nitrogen treatment, center—nitrogen-potash treatment, right—check plot (untreated).

Good Reasons For
Fertilizing Corn

By Arthur O. Braeger
Wisconsin College of Agriculture, Madison, Wisconsin

WHILE growing corn with fertilizers is not an entirely new style in farming, it continues to be a profitable investment. Since the time when the American Indian first began this program by placing a fish in the corn hill, to present day practices of fertilizing, the returns in corn production have increased with the betterment of fertilizing practices.

Farmers state that maturity has been advanced from a week to 10 days; yields have increased from 5 to 15 bushels per acre. Fertilizers get the crop ahead of the weeds, so that the corn can be cultivated earlier and more effectively, and it has been found that they improve the quality and increase the feeding value of the corn crops, according to C. J. Chapman, of the soils department, University of Wisconsin.

Chapman gives five reasons for fertilizing the corn crop: (1) To start the crop off quickly; (2) to get it ahead of the weeds; (3) to advance maturity; (4) to improve feeding quality and feeding values; (5) to increase yields. For these reasons, Wisconsin farmers have found commercial fertilizers to be a valuable supplement to stable manure.

In order to get a clear picture of corn fertilization, the plant-food needs of the plant must be considered. A 75-bushel crop of corn plus fodder requires about 125 pounds of nitrogen. Corn is a rather heavy feeder on potash, a 75-bushel crop requiring about 93 pounds. The phosphorus requirement of a 75-bushel crop of corn including fodder amounts to about 56 pounds of phosphoric acid per acre.

Ten tons of manure contain about 100 pounds of nitrogen, but only a part of this 100 pounds contained in the manure is available, Chapman points out. Clover sod furnishes some nitrogen, and furthermore, sod land usually works up loose and friable. It is filled with decaying roots, and not only does this organic matter or humus act as a sponge to conserve moisture, but it is valuable from the standpoint of preventing erosion.

Heavy Potash Feeder

As has been stated before, corn is a rather heavy feeder on potash. Chapman says that while 10 tons of manure does supply about 100 pounds of potash, only a portion is available, and it is found that during the early stages of growth a small amount of potash contained in a commercial fertilizer applied near the hill is helpful. Of course, the need for potash in a fertilizer for corn is greater where no manure is applied. But under any conditions, it is possible to supply only a small fraction of the total potash requirement of the corn crop by the hill-drop method.

A lack of phosphorus results in soft, immature corn. It is known that manure can supply but very little phosphorus, and for that reason many of our soils are lacking in this element, due to continuous cropping of land

and the loss of phosphorus through the sale of farm products. This is the reason why commercial fertilizers for corn are high in this plant food.

Hill Fertilization

In Wisconsin the practice of hill dropping a small shot of fertilizer with an attachment on the corn planter has done much to improve the quality, increase the yield, and advance the maturity of our corn crop. In regard to broadcast applications, Chapman believes that there may be some instances where this is advisable, but in general he recommends that the broadcast treatment be made to the grain and hay crops. The fertilizer should be applied at the time of seeding and worked into the soil. There is always some residual benefit from phosphate applied at the time of seeding, which is available to the corn crop 2 years later, but even here the use of a small application of fertilizer in the hill of corn is advisable.

The side-dressing attachment for the sulky cultivator is not advisable for the application of fertilizers to corn unless the fertilizer is applied within a few days after planting. If farmers wait until the corn is large enough to cultivate the first time, they will have passed up their greatest opportunity for helping this crop in the early stages. Where farmers blind cultivate their corn immediately following planting, the use of the attachment on the sulky cultivator may be an effective way of applying fertilizer.

Chapman gives the following recommendations for the fertilization of corn:

"On the loose, friable, prairie soils as a supplement to stable manure, we usually recommend the straight 20 per cent or 40 per cent superphosphates—from 90 to 100 pounds per acre where drilled. When the more concentrated 45 per cent is used, it should be applied at rates of from 75 to 125 pounds to the acre and all drilled.

"On the heavier soils, silt loams, clays, particularly the lighter colored silt and clays where the corn usually starts rather slow, I would advise the use of a fertilizer carrying some nitrogen and potash as well as phosphoric acid. Such mixtures as the 3-16-4, 2-12-6, 4-24-12, or a 4-16-4 are being used with excellent results. I should prefer the 3-18-9 or 4-24-12. These fertilizers should be applied in amounts from 60 to 100 pounds per acre where checked or from 100 to 175 pounds per acre where drilled, depending on the concentration of mixture used."

Broadcast Method

On sandy soils, Chapman is not so enthusiastic over hill fertilization of corn. On such soils, he advises that most of the fertilizer be applied broadcast for grain at the time of seeding to clover or alfalfa. He has observed, however, good results on such soils from fertilizers applied with an attachment on the corn planter. He feels that it is usually advisable to drill the fertilizer rather than check it by reason of the danger of injury to germination on these lighter soils. Such mixtures as the 3-12-12, 0-14-14, or 0-20-20 have been used with excellent results on the lighter soils.

For peat or muck soils, Chapman advises that such mixtures as the 0-8-24, 0-9-27, 3-9-18, or 2-8-16 mixtures are being used with excellent results. Up to 300 pounds per acre can be applied with an attachment on the corn planter. On the mucks or peats, the fertilizers should be drilled continuously rather than checked. Cross cultivation, of course, will result in some distribution of the fertilizer.

Some farmers have reported to Chapman that they have experienced disastrous results where fertilizers have been applied improperly. "For better results," Chapman says, "the fertilizer where applied with an attachment should be delivered in a band about

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PICTORIAL

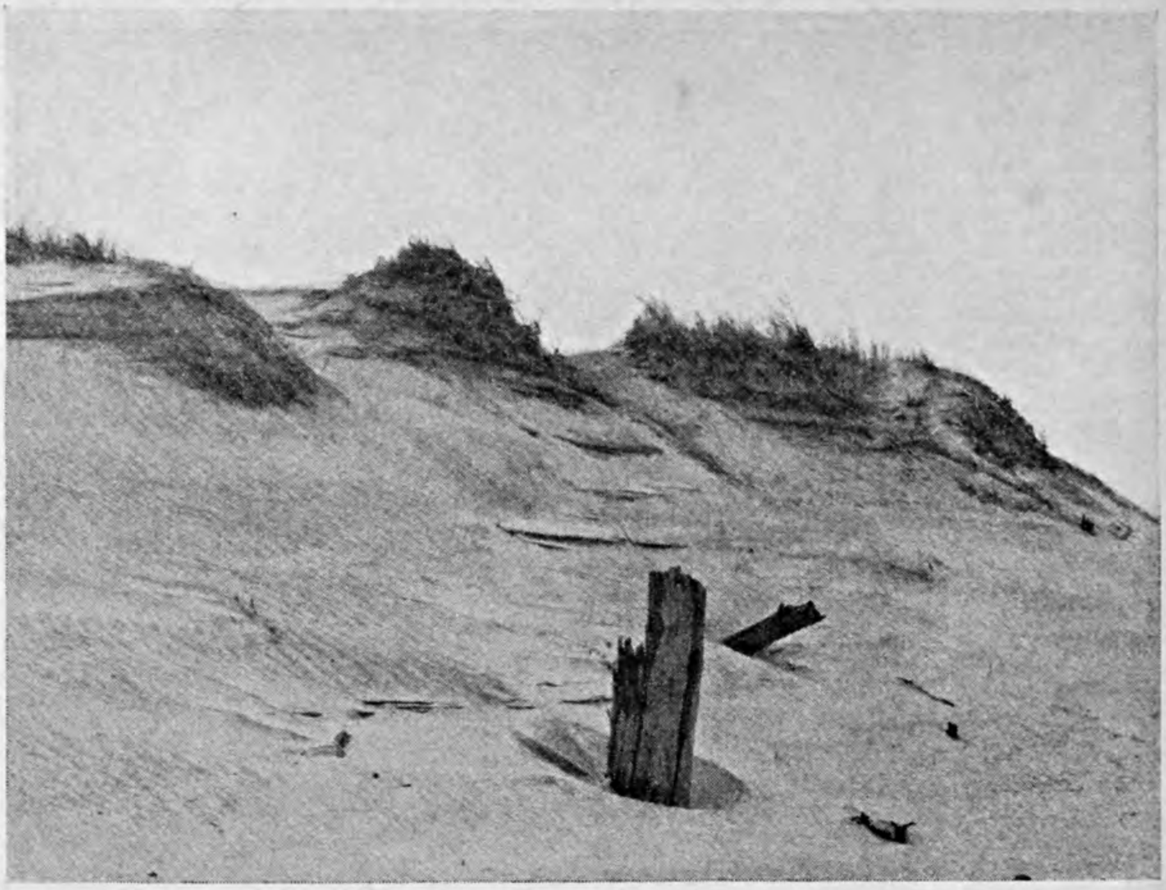
All's well while posing for the camera, but wait till the trotting begins!

The smile of a winner — William Curry, new World's Corn King, and his Queen. Mrs. Curry, who won the grand Sweepstakes award at the International Hay and Grain Show, Chicago, with his entry of Curry's Yellow Dent corn. He used an 0-14-6 fertilizer.

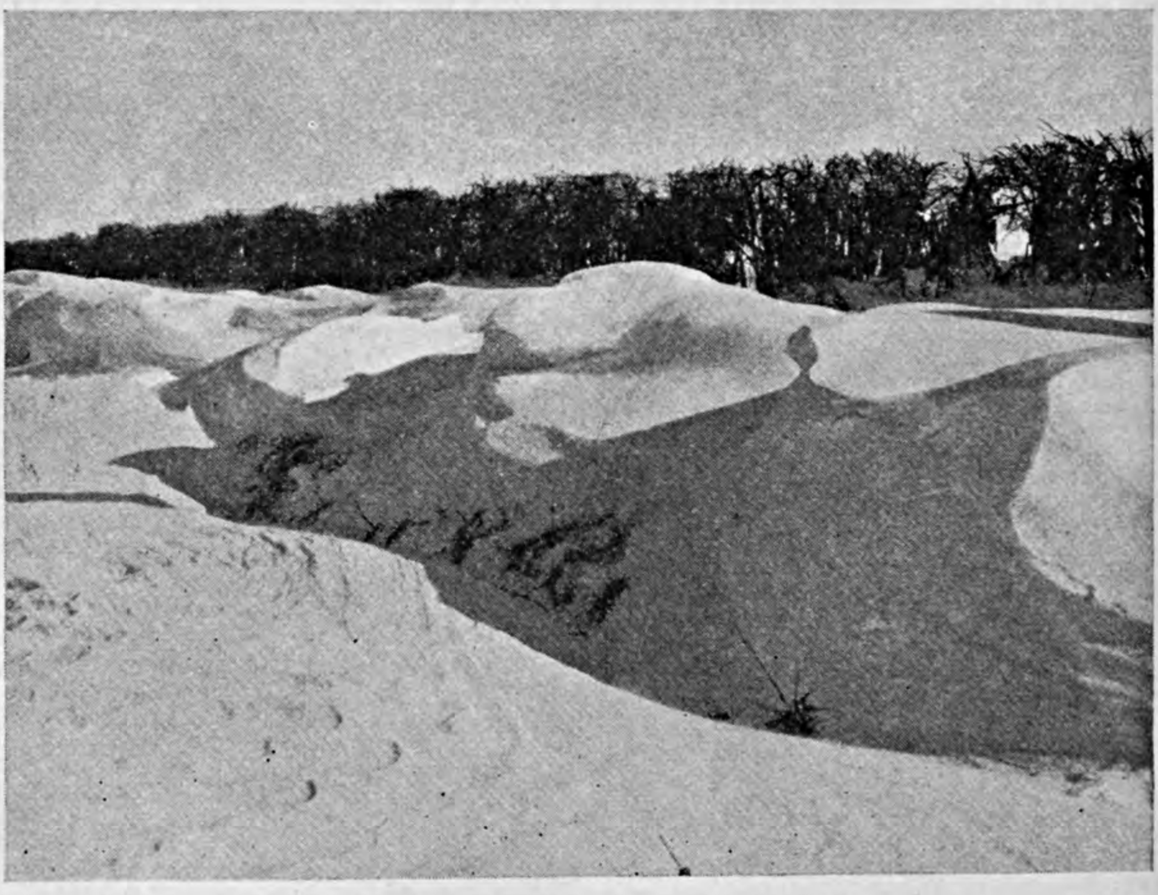
"Most Distinguished Muck Crops Farmer in Indiana for 1936," is the title awarded John Kiesling of Logansport. Mr. Kiesling farms in Fulton County, and his entries at the State Muck Crops Show, Akron, Indiana, won many first prizes.

Indiana's Queens of the Muck Crops, Miss Evelyn Edwards (left), of Knox and Miss Marcille Fleck (right) of Disko, who were chosen the most beautiful girls at the State Muck Crops Show held at Akron.

E. R. Troyer of LaOtto, the 400-bushel Potato Club Champion shown with Roscoe Fraser (right) of the Purdue Extension Department. Mr. Troyer produced 493 bushels of U. S. No. 1 potatoes per acre in his field of 13 acres. He fertilized the potatoes with 500 pounds of 0-8-24 per acre.



Sand drifts—snow drifts. Nature's restless mood described in new contours.



The Editors Talk

More Money For Research

The launching of the first million-dollar block of what is to develop as a five-million-a-year research program under the Bankhead-Jones Act was the principal new development in the work of the Office of Experiment Stations, U. S. Department of Agriculture, James T. Jardine said in his annual report made public recently. The Bankhead-Jones Act was approved June 29, 1935. It appropriated $1,000,000 for research in the fiscal year ending June 30, 1936, and provides for an annual increase of $1,000,000 each year until the annual appropriation is $5,000,000. The act permits the expansion of agricultural research, both state and federal. The intent of the act is also to favor even closer coordination of research between states and between states and federal agencies.

Three regional research laboratories are already under way. One of these is the laboratory for research in vegetable breeding near Charleston, S. C.; a second is the soybean research laboratory at the University of Illinois; the third is the joint study of grass breeding and pasture improvement for the Northeast at Pennsylvania State College. In addition, 32 other special research projects deal with fundamental problems of agriculture in its broadest aspects.

These additional funds will make available opportunities for research which is essential as a foundation to an efficient agriculture.

Well-Balanced Fertilizers

For a fertilizer to be well-balanced, it must contain the right amounts of the plant foods needed to supplement the available nutrients in the soil in order to fully meet the requirements of the crop. A complete fertilizer containing nitrogen, phosphate, and potash is not necessarily always a well-balanced fertilizer. It may contain too little or too much of any one of these elements. Different crops use more of one plant food than others, and soils vary greatly in their ability to supply this plant food. Only a knowledge of the available plant-food nutrients of particular soils and of the requirements of the crop permits the grower to properly balance his fertilizer.

In recent years rapid chemical and biological methods of testing soils for available plant foods have been developed. Associated with the use of rapid methods is the better knowledge of what crops remove from soils and symptoms of specific plant-food deficiencies. Growers should not think of fertilizers in terms of the analysis alone, but also in terms of the number of actual pounds of each nutrient a certain analysis will supply per acre in the amounts of the fertilizer they are using, and to think of this number of pounds in relation to the requirements of their crops and soil supply.

The use of fertilizers in terms of so many pounds of each nutrient per acre is growing. Many farmers are already doing this. However, when a grower realizes he needs more of any certain element, the question arises: Should he continue using an increased number of pounds of the same analysis? It may be that he is then applying more of one plant food in the analysis than is required. It is often better to change the analysis to a different ratio. Such a practice is more economical and results in a much better nutritional balance, higher yields, and better crop quality.

The range of fertilizer analyses now on the market makes it possible for growers to obtain suitable combinations of the essential plant nutrients for the majority of soil and crop needs. The urgent need is to impress upon farmers the importance of using their fertilizers in terms of pounds of each of the essential plant foods in accordance with their soil and crop needs. Then is the fertilizer well-balanced.

Reclaiming the Zuider Zee

Information on recent progress in reclaiming the Zuider Zee for agricultural purposes has just been published by N. V. Handelsdrukkerij Holdert & Company, Amsterdam, Holland. The report is divided into two chief sections. The first, of a more technical character, reports work on the enclosing dam, the maintenance of weirs and locks, and the continuation of reclamation operations. The second section, of more interest to agriculturists, discusses the cultivation of the Wieringermeer.

As in all projects involving methods of freeing the soil from salt, progress in this phase of the work is of primary importance in replying to the question of whether or not the soil is suitable for cultivation. These methods are referred to as "freshening" the soil and require continual care. In the larger part of the reclaimed area the presence of salt does not now injure the development of crops, although salt concentrations are still found. The movement of salt in these areas occasionally presents an uncertain factor, especially in dry periods.

Experience gained from experimental plots in maintaining soil tilth and fertility has saved much disappointment. Phosphoric acid was found to be necessary on the lighter soils. On sand-grassland a need for potash shortly after cultivation was started was found to be necessary. Several questions in relation to the efficient use of fertilizers still have to be worked out.

The report also contains vital data on population and the general management of the new polders. The people of the Netherlands are to be congratulated on the excellent progress that is being made in reclaiming land from the Zuider Zee, not only for agriculture, but for placing and developing in social security and happiness, whole new populations.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

Many important suggestions regarding the fertilizers suitable for field crops in Louisiana are contained in Ext. Cir. 167 of the Louisiana Agricultural Extension Service entitled, "Fertilizers for Field Crops in Louisiana," by W. G. Taggart, M. B. Sturgis, H. C. Lovett, and R. A. Wasson. The authors point out that a large number of planters have become more accustomed to consider the application of fertilizer in terms of pounds of plant food per acre rather than so many pounds of a certain fertilizer analysis. This highly commendable practice is more likely to result in adequate and efficient fertilization than applying simply so many pounds of an analysis per acre, frequently without very much attention to the needs of the soil or crop.

Fertilizers for cotton on Coastal Plain soils having permeable, well-drained sub-soil would be expected to give satisfactory results from applications of 400 to 600 pounds of 6-8-4 or 4-8-4 per acre. The 4-8-6 or 6-10-7 analyses would be better adapted on the more sandy type and on soils where cotton is known to be susceptible to rust. Analyses such as 4-12-4, 4-8-4, and 6-10-7 are most applicable for Coastal Plain soils which have plastic, or poorly permeable subsoils.

An application of from 400 to 600 pounds of 6-8-4, 4-8-4, and 4-12-4 should prove satisfactory for cotton on the flatwoods and Coastal Prairie soils. The Mississippi Bluff and Prairie Soils are very responsive to fertilization. Recommendations for these soils include 6-8-4, 4-8-6, and 6-10-7 ratios at the rate of 600 pounds per acre. The fertile first bottom soils of the Red and Mississippi Rivers where good farming practices have been followed give favorable responses to nitrogen fertilizers. Under many conditions the use of 300 pounds of a 12-8-0 per acre should prove profitable on the more sandy series.

An application of 200 pounds of 4-8-4 per acre for corn is advised when the soil is low in phosphorus and potassium. Side-dressing with 100 pounds of a quick-soluble nitrogen fertilizer applied when the corn is knee high is also recommended by the authors. On more fertile soils nitrogen alone is recommended. Stubble cane is commonly fertilized with about 200 pounds of 15 to 20 per cent nitrogen fertilizer, or 300 pounds of 12-8-0. Applications of 300 pounds of 8-8-4 or 8-8-8 per acre to rice at planting time could be expected to give significant increases in yield.

The circular states that very good results have been obtained from the use of 200-300 pounds per acre of 3-12-6 on mixed pasture. In addition, 0-15-6 and 4-10-7 are recommended on Coastal Plain soils. On green pastures, 4-10-7 is considered a well adapted analysis.

Included in this interesting publication is a map which gives the locations of the various important soil groups in Louisiana. This permits a more accurate estimation of the fertilizer needs of an area or location.

"The Value of Lime in a Two-year Rotation on Sand Mountain," Agr. Exp. Sta., Auburn, Ala., Cir. 75, Oct. 1936, M. J. Funchess.

"Fertilizer Recommendations for Field Crops," Agr. Ext. Serv., Little Rock, Ark., Cir. 214, Rev. June 1936, Martin Nelson and D. J. Burleson.

"Fertilizers for Irish Potatoes, Sweet Potatoes, Tomatoes, Muskmelons, and Watermelons," Agr. Exp. Sta., Fayetteville, Ark., Bul. 333, June 1936, J. R. Cooper and V. M. Watts.

"A Study in Soil Nitrogen," Agr. Exp. Sta., Amherst, Mass., Bul. 333, July 1936, F. W. Morse.

Soils

According to H. H. Bennett, in Miscellaneous Publication No. 253, U. S. D. A. entitled, "Conservation Farming practices and Flood Control," the role of farmers in the prevention and control of flood waters cannot be minimized. By slowing down the run-off of rain water in order to curb erosion, the farmer simultaneously reduces the volume and velocity of water which might otherwise contribute to floods. At the same time, the soil which is held on the land by erosion control methods is kept out of the streams where it would reduce the water-carrying capacity of the channels and fill up costly reservoirs. "Floods are simply raindrops infinitely multiplied and concentrated quickly in a single channel."

The publication outlines some of the most effective methods of decreasing run-off and erosion by means of vegetation and mechanical control. Definite progress in the prevention and control of floods can be expected if farmers will adopt contour strip-cropping, terracing, crop rotations, contour tillage, check dams and grassed waterways, and other inexpensive soil and water conservation practices, the author declares. The majority of farmers have viewed the whole difficult problem of flood control as strictly an engineering problem involving the construction of down-stream levees, dams, revetments, and spillways. Enormous quantities of rain water that should have been stored in soils for crop use during dry seasons have flowed away as so much waste. By proper use of his land the farmer contributes substantially to the desired end of not only conserving soil water but controlling run-off and the surge of flood waters as well. This fact is substantiated by data obtained from the erosion experiment stations of the Soil Conservation Service throughout the country.

The author emphasizes that, "Except the oceans there is no reservoir for water so vast and effective as the soil. It is this great reservoir that the farmer can utilize in his contribution to flood control."

"Use of Water by Washington Navel Oranges and Marsh Grapefruit Trees in Salt River Valley, Arizona," Agr. Exp. Sta., Tucson, Ariz., Bul. 153, Aug. 15, 1936, Karl Harris, A. F. Kinnison, and D. W. Albert.

"Field Characteristics and Partial Chemical Analyses of the Humus Layer of Longleaf Pine Forest Soils," Agr. Exp. Sta., Gainesville, Fla., Bul. 302, Sept., 1936, Frank Heyward and R. M. Barnette.

"If Your Land is Acid," Circular, Agr. Ext. Serv., Urbana, Ill., H. M. Mumford, Director.

"Soil Survey of Iowa, Monroe County," Agr. Exp. Sta., Ames, Iowa, Soil Survey Report 76, Sept. 1936, P. E. Orrben, H. R. Meldrum, and A. J. Engleborn.

"A Land Use and Soil Management Program for Tennessee," Agr. Ext. Serv., Knoxville, Tenn., Pub. 197, Nov. 1936, H. E. Hendricks.

"Soil Survey of Randolph County, West Virginia," U. S. D. A., Washington, D. C., Series 1931, B. H. Williams and H. M. Fridley.

Crops

A recent publication of particular value to farmers, county agents, and other groups interested in agricultural advancement is Arkansas Extension Circular No. 380 entitled, "4-H Club Manual in Growing Early Irish Potatoes," by Claude Woolsey. An important consideration for the profitable production of high acre yields of good quality potatoes is the selection of suitable soils, preferably gravelly or sandy loam types that are well drained and provided with an ample supply of plant food. It is suggested that stiff clay soils and sandy soils be avoided. The use of cover crops to supply humus and organic matter is stressed. A good practice is to plow under a crop of soybeans, vetch, or cowpeas previous to planting. The land should be well prepared and worked down to a fine crumbled condition.

The publication details good practices more in line with conditions to be found in this state. However, it emphasizes fundamental points, including the use of proper fertilizers, selection of varieties, seed stock, amount and size of seed, cultivation, diseases and insects, sprays, and selecting and exhibiting potatoes. Such manuals for 4-H Club use should aid greatly in furthering the efficiency of this great agricultural youth movement which has become such an important part of our agricultural industry.

"4-H Club Manual in Cotton Production," Agr. Ext. Serv., Little Rock, Ark., Cir. 160, Rev. June 1936, D. J. Burleson.

"Lespedeza," Agr. Ext. Serv., Little Rock, Ark., Cir. 185, Rev. June 1936, Martin Nelson.

"Establishing the Peach Orchard," Agr. Ext. Serv., Little Rock, Ark., Cir. 191, Rev. June 1936, Claude Woolsey.

"Early Tomato Production in Arkansas," Agr. Ext. Serv., Little Rock, Ark., Cir. 223, Rev. June 1936, Claude Woolsey.

"Production and Harvesting of Watermelons in Arkansas," Agr. Ext. Serv., Little Rock, Ark., Cir. 225, Rev. June 1936, Claude Woolsey.

"Permanent Pastures," Agr. Ext. Serv., Little Rock, Ark., Cir. 334, Rev. June 1936, Martin Nelson.

"Shrubs, Their Propagation and Management," Agr. Ext. Serv., Little Rock, Ark., Cir. 345, Rev. June 1936, Claude Woolsey.

"4-H Club Manual in Sweet Potato Production, Handling, and Marketing," Agr. Ext. Serv., Little Rock, Ark., Cir. 381, June 1936, Claude Woolsey and J. H. Heckman.

"Soybean Varieties for Hay, Seed, and Oil Production," Agr. Exp. Sta., Fayetteville, Ark., Bul. 334, June 1936, C. K. McClelland.

"Study of Relation of Growth to Nutrition of the Rice Plant." Agr. Exp. Sta., Fayetteville, Ark., Bul. 335, June 1936, L. C. Kapp.

"Forty-ninth Annual Report of the Director of the Colorado Experiment Station," Colo. Exp. Sta., Fort Collins, Colo., E. P. Sandsten, Director.

"Barley Production in Colorado 1928-1935," Colo. Exp. Sta., Fort Collins, Colo. Bul. 431, Aug. 1936, D. W. Robertson, Dwight Koonce, J. J. Curtis, and J. F. Brandon.

"Further Studies on Vitamins in Alfalfa Hay," Colo. Exp. Sta., Fort Collins, Colo., Tech. Bul. 18, Sept. 1936, C. E. Vail, J. W. Tobiska, and Earl Douglass.

"Forty-eighth Annual Report, Georgia Experiment Station," Agr. Exp. Sta., Experiment, Ga., H. P. Stuckey, Director.

"Rates of Seeding Small Grains and Winter Legumes for Hay," Ga. Exp. Sta., Experiment, Ga., Bul. 194, July 1936, R. P. Bledsoe and S. J. Hadden.

"Commercial Mushroom Production," Agr. Exp. Sta., East Lansing, Mich., Cir. Bul. 158, Nov. 1936, C. H. Mahoney, E. A. Bessey, and E. I. McDaniel.

"The Value of Winter Green Manure Crops," Agr. Exp. Sta., New Brunswick, N. J., Bul. 609, Sept. 1936, Howard B. Sprague.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXI, No. 183, Nov.-Dec. 1936.

"Corn Production," Agr. Ext. Serv., Clemson, S. C., Cir. 89, Rev. June 1936, R. W. Hamilton and B. E. G. Pritchard

"Extension Work in South Carolina 1935," Agr. Ext. Serv., Clemson, S. C., D. W. Watkins, Director.

"Farm Gardens," Agr. Ext. Serv., Knoxville, Tenn., Pub. 145, Rev. Jan. 1936, W. C. Pelton.

"Raspberries, Blackberries, Dewberries in the Farm Garden," Agr. Ext. Serv., Knoxville, Tenn., Pub. 191, Jan. 1936, W. E. Pelton.

"Planning and Care of the Farm Garden," Agr. Ext. Serv., Knoxville, Tenn., Pub. 192, Apr. 1936, N. D. Peacock and A. B. Strand.

"Better Home Grounds. Growing and Transplanting Trees and Shrubs," Agr. Ext. Serv., Knoxville, Tenn., Pub. 196, Nov. 1936, W. C. Pelton.

"Important Steps in Growing Sudan Grass," Agr. Ext. Serv., College Station, Texas, L-9, Jan. 1936, E. A. Miller.

"Important Steps in Growing Peanuts," Agr.

Ext. Serv., College Station, Texas, L-11, Jan. 1936, E. A. Miller.

"Important Steps in Growing Soy Beans," Agr. Ext. Serv., College Station, Texas, L-12, 1936, E. A. Miller.

"Important Steps in Growing Cowpeas," Agr. Ext. Serv., College Station, Texas, L-13, 1936, E. A. Miller.

"Forty-eighth Annual Report, 1935," Agr. Exp. Sta., College Station, Texas, A. B. Conner, Director.

"Publications with Author Index, Classified by Series from 1890 to June 30, 1936," Agr. Exp. Sta., Logan, Utah. Misc. Pub. 15, June 1936, Blanche C. Pittman.

"Agricultural Seed," Agr. Exp. Sta., Burlington, Vt., Bul. 410, Oct. 1936, Anna S. Lutman.

"Korean Lespedeza and Lespedeza Sericea Hays for Producing Milk," Agr. Exp. Sta., Blacksburg, Va., Bul. 305, Sept. 1936, C. W. Holdaway, W. B. Ellett, J. F. Eheart, and A. D. Pratt.

"Group Discussion and County Agricultural Program Planning," Agr. Ext. Serv., Blacksburg, Va., 1936, B. L. Hummel.

"Department of Agriculture-Immigration," Richmond, Va., Bul. 343, Nov. 1936, and Bul. 344, Dec. 1936.

"Succulent Feed Crops. Cost of Producing in Northern Wisconsin," Agr. Exp. Sta., Madison, Wis., Bul. 436, July 1936, E. J. Delwiche.

"What is Hybrid Corn?" Agr. Ext. Serv., Madison, Wis., Cir. 282, Sept. 1936, A. H. Wright, N. P. Neal, and E. J. Delwiche

"Index Bulletin H, Sept. 1936," Agr. Exp. Sta., Laramie, Wyo., Margaret Lamb.

"Report of the Secretary of Agriculture for 1936," U. S. D. A., Washington, D. C.

"Planning the 1937 Farm Program," U. S. D. A., Washington, D. C., G-60, Sept. 25, 1936.

"Blue Grama Grass for Erosion Control and Range Reseeding in the Great Plains and a Method of Obtaining Seed in Large Lots," U. S. D. A., Washington, D. C., Cir. 402, July 1936, Jess L. Fults.

"Identification, History, and Distribution of Common Sorghum Varieties," U. S. D. A., Washington, D. C. Tech. Bul. 506, July 1936, H. N. Vinall, J. C. Stephens, and J. H. Martin.

Economics

Much interesting information is presented in Extension Circular No. 351, "Types of Farming in Arkansas," which was prepared by the Research and Extension Staff of the College of Agriculture of the University of Arkansas.

Types of farming are defined according to the enterprise or combination of enterprises used on individual farms. Natural conditions and economic forces which cause different enterprises to be selected in different areas largely account for the types of farms. Where the natural and economic conditions are favorable, production costs are low, and vice versa. Thus, farming types are grouped according to what experience has taught farmers of a given locality to be the most advantageous combination of enterprises. For example, cotton farms are located in the lowlands and on the better uplands throughout the state, with the exception of the rougher land and the cooler altitudes. Rice farms are found in level areas having a particular type of soil and subsoil and available water for irrigation. Fruits or vegetables are grown in localities favorable to growth and market outlets. Livestock is raised on the rougher land type where pasture grasses thrive. Mixed farming is carried on where some of the conditions favor one enterprise and other conditions favor another enterprise.

The productivity of soil in Arkansas varies widely from one area to another. A suggested classification on the basis of average yield is as follows: Non-agricultural, unproductive, low, moderate, good, high, very high, and exceptionally high productivity. The first two groups should not be devoted to agriculture or cultivated crops. In some instances, hay or other low-cost crops might be grown to an advantage. The other groups differ only in the degree of yield. However, the soils of moderate and good productivity must be managed better if present yields are to be maintained. It is possible that farmers can secure yields above the average for the soil type on which they are located, provided good management practices are followed, such as the use of crop-rotation, legumes, and cover crops. It is also possible to increase the yield by the proper use of fertilizer. However, due to the great variation of the natural productivity of Arkansas soils no set formula or rate of application can be given for general use.

"Fertilizer and Fertilizer Material," Dept. of Agr. and Ind., Montgomery, Ala., Dept. Bul. 32, Fiscal Yr. 1935-36, R. J. Goode, Commissioner.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., No. 18, Nov. 1936.

"Commercial Fertilizers," Agr. Exp. Sta., Lafayette, Ind., Cir. 222, June 1936, H. R. Kraybill, O. W. Ford, O. S. Roberts, L. E. Horat, M. H. Thornton, S. M. Cobee, and J. W. Jackman.

"The Kansas Agricultural Outlook for 1936-37," Agr. Ext. Serv., Manhattan, Kans., Cir. 126, Aug. 1936, H. Umberger, Director.

"Inspection of Commercial Fertilizers," Agr. Exp. Sta., Amherst, Mass., Control Series, Bul. 84, Oct. 1936, H. D. Haskins.

"The Cranberry Industry in Massachusetts," Agr. Exp. Sta., Amherst, Mass., Bul. 332, June 1936, C. D. Stevens, H. J. Franklin, C. I. Gunness, and V. C. Peterson.

"Farm Economics," Cornell Univ., Col. of Agr., Ithaca, N. Y., No. 97, Nov. 1936.

"Analyses of Commercial Fertilizers for Fall Season 1935. I. Mixed Fertilizers. II. Fertilizer Materials," State Dept. of Agr., Raleigh, N. C., Mar. 1936, Wm. A. Graham, Commissioner.

"Inventory of Land Use in Tennessee," Agr. Exp. Sta., Knoxville, Tenn., Report No. 5, Feb. 1936, Charles E. Allred, Samuel W. Atkins, Walter P. Cotton, and John E. Mason.

"Regional Grouping of Crop Production in Tennessee," Agr. Exp. Sta., Knoxville, Tenn., Report No. 12, May 1, 1936, Charles E. Allred, William E. Hendrix, and Benj. H. Luebke.

"Commercial Fertilizers in 1935-36," Agr. Exp. Sta., College Station, Texas, Bul. 529, Sept. 1936, G. S. Fraps, S. E. Asbury, and T. L. Ogier.

"United States Standards for Potatoes," U. S. D. A., Washington, D. C., S. R. A.-B. A. E. 151, Sept. 1936.

"Regulations for Warehousemen Storing Tobacco," U. S. D. A., Washington, D. C., Serv. and Reg. Announcements No. 129 Rev., 1936.

"Regulations of the Secretary of Agriculture under the United States Cotton Standards Act," U. S. D. A., Washington, D. C., Serv. and Reg. Announcements No. 153, Aug. 1936.

Canadian Flax

OTTAWA, Canada.—Two types of flax are produced in Canada. One type is cultivated for the production of fiber as used in the manufacture of linen; the other is grown for the production of flaxseed from which linseed oil is extracted. The flax plant is the source of both these types which are cultivated according to whether the seed or the fiber is the principal product desired. Fiber flax has longer straw and fewer branches and is more suited to moist climates. It is grown chiefly in Ontario and Quebec. The seed flax type has shorter straw, branches freely, and is more suited to a moderately dry, sunny climate. Taking Canada as a whole, from 90 to 97 per cent of the flax produced is grown for seed production and is localized mainly in the central part of Saskatchewan, although flax is grown successfully over a wide area.

An excellent quality of flaxseed for all purposes is grown in the Dominion, the principal consumer being the linseed oil manufacturer who produces two commercial flaxseed products, linseed oil and linseed meal. At present eight mills in Canada use flax.

There is a growing demand for fiber flax from the women's farm circles in the Province of Quebec, which make homespun linens that find a ready sale with tourists.

Winter Cover Crops More Than Rugs For the Soil

FARMERS cooperating with the Soil Conservation Service seeded more acres to cover crops this fall than ever before.

Cover crops, say agronomists of the Service, are more than rugs for rain-worn soils. Wherever cover crops can be seeded on clean, cultivate land, they reduce run-off and check soil erosion. But cover crops do even more—they tend to increase the yields of regular farm crops. Agronomists in the Bureau of Plant Industry found that winter cover crops, such as field peas, vetch, crimson clover, and rye, planted on cotton land, increased cotton yields about one-third and corn yields about three-fourths.

Credit this to cover crops also: They help to keep soluble nitrogen and other plant food in the soil from leaching out and going to waste. They also protect new terraces and terrace outlet channels during the fall and winter when the soil between terraces ordinarily would be bare.

In addition to supplying fall, winter, and early spring pasture, cover crops plowed under add humus to the soil, increasing its fertility and capacity to hold moisture.

Cotton growers usually turn under the cover crops about three weeks before planting, while corn growers ordinarily turn them under about two weeks before seeding.

Excess Soluble Salts in Greenhouse Soils

(*From page* 10)

growth. This was a case where soluble salts developed in pots.

On raised benches or ground beds such flowers as snapdragon, calendula, stock, carnation, and sweet pea may show the unmistakable signs of soluble salts. The growth will be uneven. There will be areas where the growth of the plants is stunted and poor, and in the midst of such areas may be one or more plants that are apparently quite normal. The flowers on these stunted plants are always fewer in number and often smaller in size. One of the reasons for the beneficial effects of hot water treatment on sweet pea soil may be the removal of excess salts by the hot water.

One of the reasons for the injurious effects of steam disinfection of the soil is the accumulation of soluble salts. It is quite possible that the injurious dissolved salts may be present immediately after the treatment. It is equally possible that the steam may have scattered the soluble salts to such an extent that they will not be injurious immediately, but the salts will accumulate in the surface soil later.

According to Professor Connor, the injurious soluble salts are largely nitrates, sulfates, and chlorides. It may be that other acid radicles may act in the same way, but these are the particular forms that Professor Connor found most commonly in his determinations of soluble salts.

The control of this injurious condition in soils is easily accomplished. The salts must be leached from the soil by heavy watering. Six, eight, or even twelve inches of water per square foot of soil will be needed to do this work efficiently. Naturally concomitant with this leaching is good drainage. If this heavy application of water cannot drain readily through the soil, or if a sufficient amount is not applied to actually pass through the soil, the treatment will not be effective. These excess salts must be actually carried away into the porous subsoil or out into drain tile.

Odd as it may seem, one of the greatest difficulties in controlling this trouble is to impress on the grower just what is meant by heavy watering. Many of them feel that when they have applied water so that it stands on the surface in puddles, that should be sufficient. In many cases it is necessary to urge them to apply what seems to them to be a very heavy watering and then to go back and repeat the application. Ordinarily it is necessary to repeat such applications twice a week, and sometimes this is done every day for a week.

Excess soluble salts are far more common in greenhouses than growers have suspected. Symptoms may be mistaken for deficient nitrates, potash deficiency, and iron deficiency. The Thornton plant-tissue test can be used as the first test for this trouble. Plants so affected will ordinarily be filled with nitrates, phosphates, and potash — but particularly nitrates. When plants have the appearance of needing plant foods and yet show an abundance in the tissues, the presence of soluble salts should be suspected.

Successful Strawberry Practices

(*From page* 17)

row and take root wherever they will, thus forming new plants to produce a heavy crop next season. Of course, where one has set plants very close together and has only a small piece of ground, these runners may be set off, leaving only the parent plant and a few plants close around it to produce berries, but this method is not generally practiced except in Florida and in the small home garden where space is quite limited.

Mulching with pine straw, wheat straw, or other similar material is practiced by nearly all good growers. It is usually applied in January or early February, and at the rate of a ton or more per acre. This is done to hold the berries up off the ground and prevent them from being ruined by grit.

In late August or early September give an application of commercial fertilizer. The same 6-8-6 or 6-8-8 recommended for use before setting is a good one for this purpose. If it is not easy to secure, a 4-8-6 will serve the purpose reasonably well. Scatter it broadcast on top of the plants, covering the whole row and middle with it, and follow immediately with a broom or brush, sweeping the fertilizer off the leaves of the plants so as to get it down on the ground and prevent burning of the leaves. Apply when leaves are dry. Use 500 to 1,000 pounds per acre, or two to four pounds for each 100 feet of row space. Give another application of the same kind and amount of fertilizer in the same way in late fall, say during November or December, because it is during this time of year that the buds are forming which will produce berries the following season.

In the past the most largely planted variety in this section has been the Klondyke. This is largely because it is a berry that is quite firm and ships well. It is not, however, the best variety as far as quality is concerned and is being replaced by the Blakemore and Aroma. Other good varieties are the Premier, Missionary, New Southland, Dorset, Fairfax, Progressive Everbearing, and Gandy.

As soon as the crop of berries is off, work out the old plants and grow new ones for the coming crop. This method of course, does not apply to the Gulf Coast section where new plants are usually set each year. There are two common methods of doing this, the most common of which is to bar off on both sides of the row, leaving a strip about a foot wide. Then with another turning plow furrow cut off about half of this strip, which turns under the old mother plants, and moves the top of the new row over a few inches from where it was before.

In this turn plow furrow put 500 to 1,000 pounds 6-8-6 or 4-8-6 or 6-8-8 fertilizer. Then run a drag harrow straight across the rows several times to kill grass. This covers the fertilizer and finishes destroying the plowed up plants. This leaves a strip of plants three to six inches wide, and the field looks as if it has been wrecked, but it hasn't. If the plants left are not as vigorous looking as they should be give a top-dressing of 100 to 150 pounds nitrate of soda at this time. Put it right on top of the plants when they are dry. From now on cultivate just as the first year the plants were set, as you are actually growing new plants just as when first started.

The other method of growing a new crop of plants is very similar to the one just outlined. It consists of first running a bull tongue furrow right on top of the row and under old plants, rooting them out. Then run a turning plow furrow 4 to 6 inches to one side of the row, forming a balk. From this time on work as by the other method.

It is usually not desirable to grow new plants from the old ones more than two years, and many good growers say not more than one.

Good Shrubs Result From Good Treatment

(From page 15)

or garden supplies. A few extra dollars spent now will save trouble later.

When plantings arrive from the nursery they should be opened and the plants set in water overnight, if planting is done next day. If they are to be held for any length of time, heel in by digging a trench, placing the plants in it, and covering with dirt. When planting, remove only as many plants as you can plant in a short time. Cut off all broken roots with a sharp knife or shears. Wrap the plants in wet burlap while planting. Set the plant in the prepared position (never set closer than 20 inches of the foundation) spreading out the roots, then fill in with good top soil until the hole is half full. Tamp well with the feet and continue to add dirt and tamp until the hole is nearly full. Water copiously and when water has soaked in, fill in the remainder with loose dirt. Tamping and watering, if properly done, will remove any air pockets which would otherwise permit the soil to dry out.

Plants which are moved without "ball and burlap" should have a third to a half of the top wood removed. Cut out all weak stems and prune back the stronger ones. This will help balance the top system and the root system—the latter having been heavily pruned in digging. Plants which are moved with "ball and burlap" do not require such heavy pruning. Even here it is wise to remove any weak stems. The evergreens which are moved this way may have the branches sheared back. Never remove the terminal bud or central leader in spruces and firs, since it disfigures the plant.

Too often, shrubs are forgotten after they are planted and, like "Topsy," just left to grow. It is a marvel that so many survive. Shrubs need cultivation and fertilization after

White fringe, Chionanthus Virginica, grown as a specimen. The flowers are white and make their appearance before the leaves.

planting, just as much as cabbages and tomatoes.

Deciduous shrub beds should be cultivated the first three years, and mulching with leaves and manure will suffice after that. Never cultivate the azalea, rhododendron, mountain laurel, and andromeda, for their roots are close to the surface. Mulch with well-rotted sawdust, acid peat moss, or oak leaves instead. The fine leaved evergreens, such as the junipers, may be cultivated the same as deciduous material.

A Balanced Diet

Plants, like animals, require a proper diet for healthy, normal growth. Like animals, they respond to the proper diet with vigorous, upright stems, leaves of healthy green, and an abundance of flowers. Lack of it results in few flowers, weak stems, and yellow drooping leaves like a dog with the mange. The plant takes its food from the soil and air, and animals exist by feeding upon plants or other animals. Nitrogen, phosphoric acid, and potash are the three elements most needed in a plant's diet, and when combined in a fertilizer, the same is spoken of as a complete fertilizer.

Unfortunately, experimental work with ornamentals has not been conducted on a scale comparable to that with farm crops. That fertilization is necessary is borne out by everyday observation and whatever experimental work that has been done. Experiments by tree experts at Stamford, Conn., and other places show very definite results from the use of complete fertilizers or those containing nitrogen, phosphoric acid, and potash. Nitrogen, as might be expected, is the chief limiting factor. A 6-8-4 fertilizer for trees has been recommended in some instances. This mixture, applied at the rate of a half pound to three pounds per shrub, depending upon the size, will be satisfactory for a majority of shrubs. Where manure is used to mulch the shrubs, nitrogen should be eliminated.

A very good demonstration with trees may be seen on the street in front of my home. They are all American elms of uniform size, planted the same day eight years ago, by the same man. Those which have been fertilized regularly, usually with a 4-12-4 fertilizer, are twice as large today as those which have not been fertilized.

The New Jersey Experiment Station has found that complete fertilizers are beneficial to rhododendron and other ericaceous plants. However, nitrogen in the mixture must be in the form of ammonia and not free nitrate. In other words, nitrate of soda was not beneficial, but tankage and dried blood gave definite results.

Watch your shrubs and if they are not making an annual growth of 6 to 10 inches, plus a good normal green color in the leaves, something is wrong, and proper fertilization may be your answer. Of course, you will not expect your Old English box to make such a growth, however, it should have a glossy green color.

Controlling Growth

Shrubs should be pruned to remove weak and diseased stems, to remove old wood and force out new growth which bears flowers, and, in the case of hedges, to keep them within bounds. This is very distinct from training, such as topiary or espalier work. Shrubs which need continuous pruning to keep them within bounds should be removed and replaced with those which do not grow so large.

Flowers are borne either on annual wood or wood of the previous year. Abelia grandiflora and P. G. hydrangea are good examples of the first, and azaleas, goldenbells, and most of the spireas, of the second. Heavy winter pruning is all right with those shrubs which bloom on annual wood. Those which bloom on the previous season's growth should be pruned immediately after blooming.

Insects and diseases may cause havoc with shrubs. Healthy shrubs, however, which have been properly planted, fertilized, pruned, and kept in a vigorous condition, are much less apt to suffer injury than those left to grow like "Topsy." San Jose scale, oyster shell scale, bag worms, aphids, caterpillars, and countless others you will have to watch for and control. Your State Agricultural Experiment Station is your surest source of information.

Despite all the trials and tribulations one may have with his shrubs, there is a real joy and pleasure in growing them. Those flame azaleas nurtured for years and now grown to full stature make a gorgeous annual flower show, and so do the rhododendrons, dogwoods, or whatever your personal preference. They compensate for all the trouble and labor expended in growing them.

Good Reasons For Fertilizing Corn

(*From page* 22)

2 inches wide and sprinkled over an area about 6 inches long above the seed, or better, to the sides of the seed. Where the fertilizer is delivered in a small bunch right over the seed, there is apt to be injury to the seed. The germination of the corn is easily affected by too high a concentration of fertilizers."

Most of the corn planter attachments can be adjusted in such a manner that this danger is greatly lessened. Even the oldest types of attachment can be modified to eliminate the danger. A small piece of tin or leather can be wired to the delivery spout of the fertilizer attachment, delivering the fertilizer a little further back to delay the dropping of the fertilizer until some soil has covered the seed.

Chapman points out that there may be danger of the corn burning or firing in dry summers when heavy applications are made. Especially is this true on the sandier soils. On heavier soils, the muck and peat soils, there is less danger of burning from heavier applications during the summer period.

Chapman's experience with fertilizers for corn has shown that year in and year out they have proved themselves a profitable investment.

California Prunes Respond to Potash

(*From page* 20)

To determine the value of both nitrogen and potash in his Burbank sugar-prune orchard, Roy Hatch of Morgan Hill, California, is carrying out a 3-plot test:

Plot 1 (NK) for the past 3 years the annual application has been 2½ pounds of sulphate of ammonia and 1½ pounds of actual potash (K_2O). Plot 2 (N) received 2½ pounds of sulphate of ammonia, but no potash.

Plot 3 (Check) receiving no fertilizer.

The soil on which this test is being conducted is a deep gravelly loam and, from the chemical analysis made, showed a much larger amount of apparently available potash than the two orchards previously mentioned. To prove to his satisfaction that more potash could not be used to advantage, Mr. Hatch decided to carry out the demonstration described.

In 1934 the prunes from Plot 1 (NK) showed improvement in sizes and a slight gain in production over Plot 2 (N), which gain in actual figures amounted to about $16.00 per acre. Nitrogen alone as used in Plot 2 made a very good showing over the check plot, where no fertilizer was used, the gain amounting to about $69.00 per acre. In 1935 the general improvement in production and appearance of his trees from the use of both nitrogen and potash was very apparent, compared with those in the check plot, but since some question

Plot No.	1935 Yields and Values per Acre (base price 2¼c per lb.)		1936 Yields and Values per Acre (base price 3½c per lb.)	
1 (NK)	4,761 (pounds dry)	$233.00	4,986 (pounds dry)	$310.92
2 (N)	3,330 " "	$162.81	3,951 " "	$243.82
3 (Check)			3,213 " "	$196.92

A Santa Clara Valley prune orchard in which potash has been an important part of the fertilizer program.

arose as to the correctness of the returns from the check plot it was decided to omit them in making the 1935 calculations. The only comparisons given are between the returns from Plot 1 receiving both nitrogen and potash and Plot 2 in which nitrogen was the only fertilizer ingredient applied. In 1936 further improvement was apparent, and complete records were kept.

All figures given are based on 90 trees per acre, and values according to sizes which are figured on a market basis price of 2¼c per pound in 1935 and 3½c per pound in 1936.

Mr. Hatch in commenting on the results obtained in this test stated that one need in his sugar-prune orchard was to overcome its tendency to light production. From these tests he seems to have proven that applications of both nitrogen and potash are very important factors in overcoming this trouble. Chemical tests indicate that there is enough available phosphoric acid in this soil to meet present requirements, but within the next few years the higher level of production will necessitate a consideration of the use of phosphates as well.

Permanent Grassland Has Cash Value

(*From page* 8)

dence of the superiority of permanent grassland over a cultivated system in the building up and maintenance of soil organic matter and nitrogen. Even though the grass strips have not been fertilized, the accumulation of organic matter and nitrogen is much greater than even the plot soils which, between 1881 and 1922, have received a total of 123 tons of farm manure in addition to the roots and stubble from the crops of corn, oats, wheat, and hay.

Grass has an additional value in the production of feed units as compared to crops in a grain rotation. The following summary shows the feed units (total digestible nutrients and digestible crude protein) supplied by a 4-year grain rotation and a Kentucky bluegrass pasture. The following results are based on the average of three soils in which the pasture and rotation plots received the same fertilizer treatment.

The above data show that the feeding value of a Kentucky bluegrass pasture exceeds that of a grain rotation. The economic value of the various manurial treatments emphasizes the importance of liberal fertilization.

In 1928, the Pennsylvania Agri-

AVERAGE ANNUAL PRODUCTION OF FEED UNITS (COMPUTED DIGESTIBLE NUTRIENTS) IN EXCESS OF THE UNFERTILIZED PLOT SOILS—POUNDS PER ACRE.

Biennial Plot Treatment	Ky. Bluegrass Pasture Air Dry Matter	Digestible Crude Protein	Total Digestible Nutrients	*Grain Rotation Air Dry Matter	Digestible Crude Protein	Total Digestible Nutrients
P	1,916	232	1,097	1,564	83	1,013
PK	2,491	310	1,419	2,285	121	1,456
NPK	3,443	436	1,944	2,524	124	1,596
P + 6 tons manure	3,133	398	1,779	2,534	130	1,747
Average	2,746	344	1,560	2,227	115	1,453

P = 64 lbs. P_2O_5; K = 50 lbs. K_2O; N = 48 lbs. N as nitrate of soda.

* Including all products of a grain rotation of corn, oats, wheat, and mixed hay.

cultural Experiment Station in cooperation with the U. S. Department of Agriculture, began an extensive pasture experiment on Dekalb soil at Kylertown in 1928. In addition to 24 two-acre grazing plots, there are included several hundred small plots devoted to a detailed fertilizer study. The plan of the experiment includes also 2 fenced-off acres (quadrates) within each 2-acre grazing plot. One-half of each small plot is cut twice during the growing season (designated as hay and aftermath), and the other half is cut at frequent intervals (designated as clippings). The following data show the effect of the two systems of management.

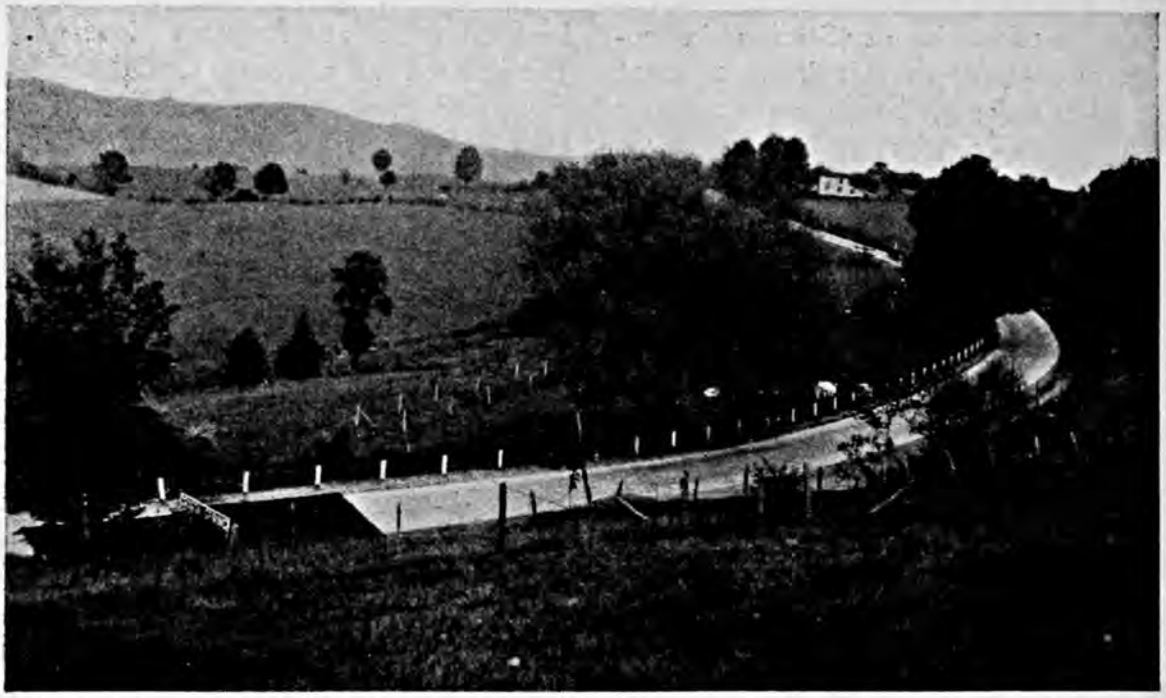
These data show conclusively that frequent cutting (imitation of close grazing) produces less total dry matter but greatly increases the yields of digestible protein and ash content of the grass. The P, K, and N treatments have a very significant value in the increased production of dry matter and the nutritive value of pasture grasses.

Pastural contentment at 9.30 a. m. A well-fertilized pasture approaches very close to the ultimate—"to eat the cake and still have it." Not only does such a pasture produce digestible protein far in excess of an equal area in a grain rotation, but at the same time represents the only economical means of building up and maintaining a high organic matter and nitrogen content of the soil.

Chemical Composition and Feeding Value of Mixed Grasses as Influenced by Frequent Clippings.

	Meadow (2 cuttings) *Fertilizer treatment				Pasture (frequent clipping) *Fertilizer treatment			
	L	L+P	L+PK	L+PKN	L	L+P	L+PK	L+PKN
P_2O_5 (per cent)	0.634	0.694	0.476	0.403	0.561	0.702	0.685	0.626
CaO " "	1.17	0.881	1.05	0.662	1.02	1.23	1.10	0.746
Fat " "	2.39	2.20	2.55	2.47	2.80	2.73	2.76	2.87
Ash " "	5.85	6.30	6.23	5.36	7.43	7.65	7.61	7.13
Feeding value, pounds per acre:								
Digestible protein	66.5	120.2	136.0	198.1	101.5	168.3	185.5	290.1
Digestible nutrients	754	1,146	1,240	2,405	710	1,066	1,222	1,897
Total dry matter	1,290	1,961	2,124	4,131	987	1,490	1,706	2,640

* L = Limestone; P = 64 lbs. P_2O_5; K = 50 lbs. K_2O; N = 48 lbs. N, applied in the early spring and 24 lbs. applied in late summer as sulfate of ammonia. P and K applied biennially. (Bulletin 323, Pennsylvania State College.)



Permanent grassland in Bradford County, Pennsylvania. Soil erosion is at a minimum in this natural grass county, where the dairy industry is highly developed. The following values were obtained there for mineral fertilizers on a Kentucky bluegrass pasture: average annual yields per acre, air-dry bluegrass. P = 1,831; PK = 2,672; and NPK = 4,120 lbs.

Farmers interested in milk or beef production who may object to changes in their present cropping system, as suggested by the New Soil Conservation Program, should be mindful of the following significant fact concerning the value of pasture. To produce a 4-year rotation yielding 61 bushels of corn, 3,166 pounds of stover, 33.3 bushels of oats, 28.3 bushels of wheat, and 3,200 pounds of hay on 4 acres, requires 226 hours of man labor and horse labor at a cost of *$59.61.

On the basis of the above figures, the labor cost necessary to produce 1 ton of digestible crude protein in a grain rotation would be $178.22 as compared to approximately $2.82 from a well-fertilized pasture.

These data dealing with the soil-building properties of grassland and the economic production of feed should convince the most skeptical farmer that changes in his present cropping system, involving seeding-down cultivated fields to permanent grass, is economically sound.

Better Sweet Potatoes For South Carolina

(*From page* 13)

taken to see that seed stock is planted on soil where the crop has not been grown, or where the manure of livestock which have been fed vines or culled potatoes has not been applied for at least 3 years. It is recommended that whenever possible soil that has never been planted to sweet potatoes should be used for growing the seed stock. Successful South Carolina growers this year inspected their seed stock plants during the growing season for diseased hills. Every diseased hill, as well as at least one hill to each side of the diseased hill, was dug and removed from the

* Summary of cost production records in Lancaster Co., Pa., 1921, by E. L. Moffitt and H. S. Sloat, Pa. Extension Service.

field. This largely eliminated stem-end rot or wilt.

Emphasis was placed by the Extension Service upon the production of the market or commercial crop from vine cuttings. Sweet potatoes may be produced either from cuttings or from plants. Vine cuttings are strongly recommended as a precaution against disease. In Louisiana the crop was formerly grown from plants with unsatisfactory results, but now the commercial crop from that state, which is of excellent quality, is produced entirely from vine cuttings.

Suitable Hotbeds

We have found that there are two suitable types of hotbeds, fire-heated beds and manure-heated beds. The value of the fire-heated beds has been thoroughly demonstrated throughout the state during the past 4 years. Early in 1932 the Extension Service drew up and distributed plans for these beds and conducted that year 32 plant-growing demonstrations in the different sections of the state. In these beds 666 bushels of seed stock were bedded and 1,455,900 plants were produced, or an average of 2,186 plants per bushel of seed stock bedded.

These early plants resulting from the hotbeds are set out into a small patch commonly referred to as "the mother patch." This planting produces a supply of vines sufficiently early for transplanting to the commercial field, which enables the growers to produce satisfactory yields. When hotbeds are not used, it is often impossible to get the desired quantity of vines early enough to mature a good crop before frost. With the long growing season that prevails in South Carolina, growers are enabled to employ the method previously mentioned.

More modern methods of harvesting, grading, and packing are now being used by commercial growers in South Carolina. It is still a common sight to see the crop being plowed out of the ground by farm hands, with the pickers following the plows and carelessly throwing the potatoes into piles. Then, after they are dug, one sees them haphazardly tossed into wagons, hauled to storage houses or banks, and thrown into bins. This practice always has and always will result in bruising practically 100 per cent of the potatoes.

Often the harvesting is not done until frost has killed the vines and many potatoes have been injured by the cold. Such handling explains why such tremendous losses result from rotting in storage.

The careful grower who is commercializing his product is most careful in harvesting. The plow or middle-buster is run to avoid cutting the potatoes. Pickers with cotton gloves carefully lay the tubers on the side of the furrow to permit some

An excellent example of the difference between proper and improper handling of sweet potatoes. (Left) Prime. (Right) Ungraded, badly bruised, and rots developing as a result.

drying. Following this operation, the No. 1's are very carefully laid in containers to avoid bruising. These containers are not packed but are barely filled and then hauled to the storage house.

The right temperature in curing is a vital factor in this sweet potato business, and the South Carolina growers who are producing commercially are not neglecting any of the details involved in the curing process and proper storage.

Successful growers are regarding their Porto Ricans before making shipments; in fact the best growers, not satisfied with the U. S. No. 1 potatoes, are actually grading for what might be called prime or the size most highly in demand by merchants and housewives. Formerly bushel tubs were used as containers, but now the bushel crate is being adopted by some growers. Incidentally, the same type of crate is the container used in Louisiana.

In regrading, each potato is carefully handled by graders who wear gloves. The surplus soil is brushed off them and only a clean, uniform-sized, and attractive product is packed.

Inventory

(From page 5)

emerged, I do not doubt that the percentage of thinkers and producers of culture hailing from the hay belt would outnumber those from congested areas.

THE sources of culture and new vistas were at one time the chief possession of centers of wealth and population. In this list belong the churches, the clubs, the schools, the libraries, and galleries of art. Whether these were utilized more successfully by those nearest to their portals remains an open question. The answer might best be obtained by a thorough Who's Who of the asylums, prisons, and houses of correction, to determine their occupants' youthful evironment.

We are painfully aware of the imposing grandeur and stained-glass-rosewood attractiveness of the urban altars of soulful inspiration, in bitter contrast to the salvation spots where we were "fetched up." I recall how one of our circle of provincial ministers freely acknowledged that his only object in preaching was a miserable "five hundred a year" and cordwood. It is no pleasure to remember some of the Ichabod Crane types of teachers we suffered under.

We all share memories of the kind of chromo masterpieces that hung on the kitchen walls of yesterday—mostly the art selections of Panrope's hardware emporium in the form of dingy calendars. We also recollect the subscription book of travel craze which went side by side with the men who peddled those globes of wax flowers and the atrocious crayon enlargements from the family album. The demand for these grotesques may not be good proof of rural taste, but just remember they all originated in the cities!

He who thinks these absurd things in any great measure dominate and govern the rural culture of today is probably one who gets his own pet amusement from the comic strips and burlesque comedians. They're about the only places where out-moded and outlandish rubes and customs are on display these days.

We have about as many rural culture clubs as we have townships in some agricultural states. These groups include homespun heroines who gain solace from the suds in afternoon tea fights, minus the cigarettes. The latter is the main difference between them and their city cousins, for otherwise the jargon of everything "arty" from old masters to surrealism and other do-dad cults sounds much the same. If they fail to swallow it all, what's wrong? One does not step into a scented bath to obtain a drink! So maybe the veneer over their refreshed country skins of thought is just as thick as that secured under the spell of some long-haired celebrity in the snob zone.

Of far more purpose in the farming regions are the community clubs which devote constant study on vital matters of progress and citizenship, and where debate and discussion are encouraged. You will hear as lively repartee in those conclaves as you might in the average city ward.

And then, if it's style and dressmaking you demand as the real index of culture, just attend one of the regular junior achievement days or national club congress pageants. All that I might attempt to say on this score had best be very short, to match my knowledge of wardrobe design, but it's certainly the antithesis of drab and dowdy! And if it's music you want, wake up and hear the bands play at rural high school competitions.

MEASURING country culture by current urban standards is not and never will be the right way for us to get an estimate of the nobler aspirations of the farmer.

This closes the question on any comparative basis, yet it offers new incentives for a richer era of cultural attainment than rural America has yet known. We are already feeling its first effect in nearly all branches of the fine arts; and my hunch is that when agriculture is able to retain its best minds instead of donating them to the cities, our soils will germinate art as well as artichokes and poems as well as potatoes.

Third, let's consider altering "hazardous and uncomfortable." The key to this lies in what do you mean by hazardous? Is it hazardous of yield, income, or environment? We omit the tons of supporting data familiar to most of us and dispose of it thus: Hazardous of yield sectionally and locally? Yes. Hazardous of yield in relation to population requirements? No. Hazardous in returns? Yes, but no worse than for the city worker and with more privileges and benefits than he enjoys. Hazardous in occupational risks or social conditions? Just accept one quote from a recent report by a sociologist after paying a visit to a huge rubber factory. Compare it with the worst country slum you ever saw.

BY Ruth McKenney—"During the third hour you tramp through the pit where tires are cured in huge molds by steam and boiling water. The hot rubber smell is overpowering, the jets of steam hiss and billow out in clouds, and it is damp, sticky, and hot even in December. It is so hot in summer that even the foremen faint. The roar and noise is tremendous, clanking machines and shrieking steam valves. The men wear old pants cut off at the knees, tennis shoes, ragged shirts with no sleeves, open down the front. There is plenty of muscle and speed needed in the pit. The men move in quick, furious motions; they run, not walk at their work. The unhappy man who carries no union card and wears no colored button over his visor leads a life of long misery. His wife is shunned by the neighbors, the children are bullied by the neighbor boys. He himself walks home from the factory full of apprehensions and carefully avoids dark corners and casual saloon conversation. He may expect to have sore feet or broken toes, for the union men who work next to him can be very careless indeed, and although they apologize when the foreman comes around, they keep right on stamping on his feet or to be more exact, jumping on his feet, with all the energy of a 180-pound rubber worker in A No. 1 condition. There are no neutrals, as non-combatants are scorned on both sides."

As for creature comforts and conveniences, their possession in the open country could be improved in scope considerably, but our progress in this direction in 10 years has been so marvelous that little criticism need be leveled on the whole. More leisure and better communication are the sources from which come the social, recreational, and aesthetic activities which are the heritage of rural life, but which were so largely lost during the pioneer epoch in America.

Finally, wipe out "querulous and dissatisfied." All there is to this charge is a little funny psychology which artful politicians have magnified. Ever since the settlement of the west, the farmer as a class has been slow to brag, and he has been always braced for a shock. Dealing with the vagaries and harshness of nature, he learned the uncertainty of human expectations. Instead of bowing and yielding, he has dodged. He has never been any too eager to make forecasts. His conservatism has often been regarded as stubbornness. His caution has branded him as a chronic opposer. His prudence has been labeled pessimism. And in the name of all these suppositions and traits, the political machine has used the farmer for its own spoils system, and thereby given him a black eye in the sight of others.

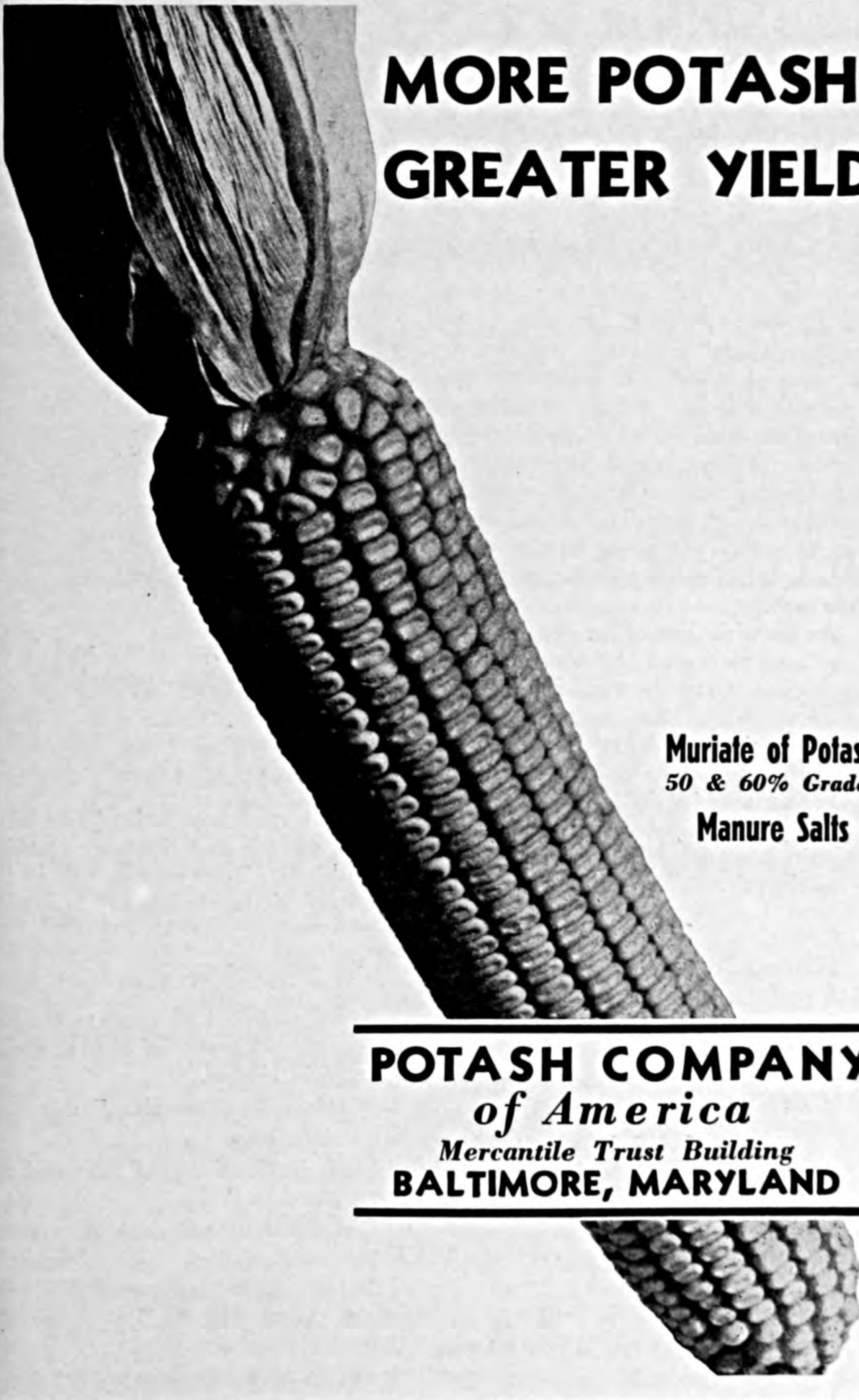
On the contrary, if there are any more patient and long-suffering folk than those who reside in the country and who have raised many generations of good citizens with very few privileges to command, bring them right out and show them off! Instead of being accused of chronic dissatisfaction, the criticism might well be directed at those who so long permitted folks of their own craft to tolerate unfair handicaps without squawking about it.

We do not need to lecture the average farmer on sentiment for his calling. Many of them are too sentimental as it is on some points—often too sentimental for their own welfare. The real task is to get that same feeling he possesses out in the open where other classes can understand its meaning. So far it has been submerged and distorted by concave or convex mirrors, and the clear reflection has seldom come to the surface.

If every farm community could take its grand inventory in terms of achievement, culture, and content, and hand it on to the township and the county groups, and they in turn might assemble such hopeful things in state archives, would we find a better way to educate the public as to the real farm situation?

Of late farmers have been called greedy and class conscious, and others have said they were mere tools for schemers. The drouth has rubbed old sores and exposed inherent weakness in our tenant and credit systems. We know many grubbers call themselves farmers when they are far from it. The national program itself is not definitely directed toward any fixed goal. We are all groping still.

That is why it is a mighty good time to get our house in order. It is a proper time to acquaint America with its patriotic and purposeful farming class, and likewise a fine period to let farmers get some first-hand facts on the urban toilers. We stand in more need of a little national cement than we do hell raising and dynamite.



TOO BAD

An habitual celebrant crept stealthily into his house one night, but, despite his caution, fell and broke the empty flask he was carrying in his hip pocket. He was sufficiently lucid to realize that first aid should be applied to the cuts which resulted, and accordingly backed up to a mirror and applied a generous dressing of adhesive tape.

As his wife showed no signs of having been awakened, he was no little astonished when she roused him next morning with, "So you came home drunk again last night!"

"Why, my dear, what in the world gave you that idea?"

"If you were sober, will you please explain how the adhesive tape got all over the mirror?"

Salesman, to new car prospect: "Do you prefer a coupe or a sedan?"

Prospect: "I really can't say just now."

Salesman: "I understand. I'm married myself."

WELL, WELL

"Was he shocked over the death of his mother-in-law?"

"Yes, he was electrocuted."

"Faith, Mrs. Casey, you're a woman of wide perception."

"Sure 'tis me own figure and I'll not have ye makin' remarks."

"May I take you home? I like to take experienced girls home."

"But I'm not experienced."

"No, and you're not home yet, either."

First pickaninny: "Gimme some 'lasses."

Second pick: "Don't say 'lasses, say molasses."

First: "How kin I say mo' 'lasses when I ain't had no 'lasses yit?"

HOW NICE

From a church bulletin: "The ladies of the church have cast off clothing of all kinds. They may be seen in the basement of the church any afternoon this week."

A priest offered 25 cents to the boy who could tell him who was the greatest man in history.

"Christopher Columbus," answered the Italian boy.

"George Washington," answered the American lad.

"St. Patrick," shouted the Jewish boy.

"The quarter is yours," said the priest, "but why did you say St. Patrick?"

"Right down in my heart I knew it was Moses," said the Jewish boy, "but business is business."

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Better Crops WITH PLANT FOOD

February 1937 10 Cents

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R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XXI NUMBER FOUR

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American Potash Institute, Inc.

Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*

G. J. CALLISTER, *Vice-President and Secretary*

" 'TIS WINTER NOW—BUT SPRING WILL BLOSSOM SOON."

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., FEBRUARY 1937 No. 4

Land Grant Landmarks

Jeff McDermid

SPEAKING of "better crops," the bumper yield per acre and per dollar of original investment in the whole history of American agriculture was harvested from an area of 6,300,000 acres of government land deeded by Abe Lincoln to the "non-collegiate common people" in July 1862. In spite of much sowing of tares by numerous enemies at dark and otherwise, that seed planted seventy-five years ago next summer has taken the record for purity and high germination test.

You have guessed it! I am reveling in another anniversary! What I lack in fundamental knowledge of the subject I hope to overcome and offset by a high degree of enthusiasm.

While 1862 was also significant for a document issued to free the slaves, Lincoln did not realize that the real emancipation proclamation was the one Congress presented to him, called the Morrill Act. His own battle for an education might have told him that, but the thundering guns of Antietam Creek were not conducive to academic reflections.

All victories for agriculture have been preceded by vetoes. Lincoln's predecessor, James Buchanan of Pennsylvania, had vetoed the land grant bill because there was no precedent for it, and it would cost the government $5,000,000 a year in "reckless extravagance."

Yet anyone comparing finances and

land area in relation to government intervention in farming would smile at Buchanan's fears of extravagance, and chuckle at the 6,000,000 acres as well. Any good corn-belt county absorbed more government funds than this in 1934-35, and five times the old land grant area was involved in crop-withdrawal contracts.

That the land grant act survived for two years after passage indicates to me that there must have been fewer job-seeking attorneys hovering on the fringes of Congress than there are today. That is, it is quite evident that there is just as much justification for putting agricultural training by federal support on the skids as there was in 1935 for thumbing down the project to adjust production through federal action. Of course, the real answer is that few persons of that day, with special privilege to protect, worried over the rapidity with which pioneer colleges could put new ideas in rural craniums. And it *did* take quite a long while at that!

THE germs of agricultural education and the chromosomes therein engendered were begotten amid tallow candles, quill pens, powdered wigs, flowered waistcoats, horn books and almanacs, oxen and flails, churchwarden pipes, tom and jerry, egg-nog, hard cider, and soft soap!

There was considerable gain in impetus from 1840 to 1850, in the era of private schools and public scandal, New England rum and protective tariffs, the cotton gin and the mint julep, compromise and conspiracy. It reached the climax in the two decades from 1850 to 1870 to the music of "Dixie" and "Hail Columbia," and persisted along with reconstruction, civil service reform, the trans-Atlantic cable, the transcontinental railway, redskin wars, and the supposed conquest of the Great American Desert. It grew apace in the epoch of the hickory shirt and the hoop skirt, the fading of the bustle and the bison, and the heyday of parlor organs, plug hats, carriage horses, and the Republican Party!

I PROPOSE to devote the space assigned to me in this number purely to high lights of progress toward the land-grant goal of 1862, with trimmings, and reserve the next issue to the foreground which offers as many vexing questions as the background.

It will do some good to the thinking elements of our land-grant staff to remind them that education is not worth a plugged nickel until such time as the people are ready for it. Our worthy dons of the colleges are often impatient at the sluggishness of enthusiasm amid the populace, for new libraries and laboratories. They forget that informal, spontaneous, independent agencies came before the formal systems of education, and that slow-growing trees usually have tougher fiber and deeper roots than seasonal saplings. Grabbing for miles instead of being tickled with inches is a too common fault of many a land-grant deacon. Looking at a few notches cut along the backward trail by timber cruisers in the woods of ignorance may send us back to classroom and farm better satisfied with conditions as they are on post-depression appropriations.

It may also remind us enthusiasts that the old-timers spent small sums and made great progress on them, while our ever-present liability is that we may show relatively less progress but leave plenty of debt behind for the youngsters to settle. If we don't approach history in a humble state of mind we are untrue to the spirit of land grant learning.

During the early part of the century in which the land grant colleges were founded, there were more big hearts and huge hands than stupendous heads. Every-day folks needed courage, hope, and muscle, and they regarded the gentle art of absorbing culture from "dead lingoes" as a graft for preachers, lawyers, and doctors.

Trail makers who left the east coast for the wilderness left ministers,

attorneys, and physicians behind them; and when their later settlements afforded a place for "luxury," they took the professions into their hamlets and usually measured the weight of law, morals, and healing by the amount of mystery which sonorous Latin and Greek phrases suggested, or the slumber they produced to ease the weary frame.

TRADITIONAL and classical education held sway for half a century after the Revolution. Grubbers and wanderers had little desire for it, but they paid well for its inception to others, in one way or another, just the same. The light of knowledge shone for the church and the courtroom, never for the forge and the farm. Esthetic doctrines paved the way for life in the next world, but left the living man to guess and grope.

Education in those times was for the soul and the body, seldom for the land, because when land wore out more could be had simply by moving like the aborigines to fresher stamping grounds. Only when avenues of escape are cut off do folks learn to make the best of what they have, or perish.

BUT educated minds breed more education. Such persons are uneasy until others know as much as they do, or maybe a trifle more. This remarkable generosity is the real secret of the growth of land-grant colleges. Peering back into colonial and early republic days, we find that industrial and agricultural education sprang from educated landed squires and country gentlemen, or lawyers, ministers, and editors. They could not sit and wait for the legislature or the A. F. B. F. to endorse some ambitious scheme. Instead they kept pounding away in their several corners on some flowery text like this: "Arrest not then by your apathy the progress of agriculture. Its improvement is the amelioration of the lot of thousands yet unborn." Yet their ideas were regarded by ordinary mine-run farmers as they look upon golf today—an imported pastime for harmless idlers.

Initiative, growth, equality of opportunity, and helpfulness are what Americans demand of educational institutions.

All of these are manifest in the work of those early original exemplars of practical training and research. Nowdays we turn a cold shoulder to rugged independence or profess to, but this attribute of the founders can never be excelled by the pressure groups we now so widely encourage.

In hustling around for themselves and others seeking a new deal in farm-

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Mineral Fertilizers for Pasture Improvement

By Howard B. Sprague
New Jersey Agricultural Experiment Station, New Brunswick, New Jersey

THERE has been a notable change during the last 10 years in the attitude of agricultural leaders and farmers toward pastures. Largely neglected or ignored in 1926, permanent grazing lands are now generally recognized as the greatest agricultural resource of the northeastern quarter of the United States. Numerous experiments conducted in various sections to determine suitable methods of soil treatment and grazing management are beginning to show concrete returns on farms in the form of lower milk costs and reduced feed costs for beef cattle and other livestock.

In spite of long neglect, with proper soil treatment there are great opportunities for remarkable returns from pastures. An illustration of this type of response is found in New Jersey experiments conducted on Chester gravelly loam, an upland soil derived from gneiss rock. The average yields of clippings taken at 2-week intervals on these pastures during the grazing season for a 3-year period (1929-31) following a single treatment, were as follows:

An application of 1,000 pounds of an 0-10-0 fertilizer and 1½ tons of limestone produced sod mostly grass.

Treatment	Acre Yields of Dried Clippings 1929-31	Per Cent Relative Yields of Clippings	Per Cent Clover in Vegetation
None	2,120 Lbs.	100.0	3
Lime alone	2,338 Lbs.	110.3	7
Lime and superphosphate	3,167 Lbs.	149.4	19
Lime, superphosphate, and potash	3,803 Lbs.	179.4	31

In these tests the rates of application were 1/3 ton of hydrated lime, 600 pounds of superphosphate, and 100 pounds of muriate of potash applied in the early spring of 1929. Using prices as of March 1936, the cost of these materials was $9.37 in contrast to the value of the extra feed produced by the complete treatment for the 3-year period, which would total $81.90 when purchased as concentrate feeds.

The increase in total yield was only one phase of the improvement produced by mineral fertilizers. Of even greater importance was the beneficial change in the seasonal distribution of growth. The complete mineral fertilizer stimulated growth 2 weeks earlier than on untreated plots, and also continued feed production at a much higher level during the months of July and August when permanent pastures are usually short. The no-treatment plots produced 29 per cent as much feed during the period of feed shortage (July 17-August 28) as in the flush period (May 8-June 19). By a contrast, the mineral treatments averaged 52 per cent as much in the short period as during the flush period. It should be noted that the years covered by these observations were comparatively dry during the 3 summer months.

Mineral treatments also improved the palatability and feeding value of the herbage. On unfertilized areas

Wild white clover predominated in the sod receiving 1,000 pounds of 0-10-10 and 1½ tons of limestone.

the surplus growth not consumed promptly by grazing cows soon became unpalatable and persisted through the summer as clumps of mature plants, avoided by livestock and occupying areas that might have been producing palatable feed. On the other hand, the treated areas were entirely palatable at all seasons, and the excess growth containing large amounts of clover not consumed during the peak period of growth was quite palatable at a later date. On the plots mowed regularly, the protein content of the untreated areas averaged 14 per cent, while the dried herbage on the treated plots increased in protein to 20 per cent.

Following these experiments, a comprehensive system of pasture management was put into effect on this farm for the entire grazing area of 105 acres. The returns in increased feed production have fully equalled the expectations based on these tests. With two additional fields of cultivated land assigned to the production of temporary pastures in July and August, to supplement the permanent grazing lands, this farm is now producing nearly all of the feed required for approximately 70 high-producing milk cows and 75 dry stock and calves for approximately 6 months each year.

Complicating Factors

It is unfortunate in some respects that such simple soil treatments as those outlined above cannot always be relied on to produce equally satisfactory returns. Several factors complicate the situation. On some soils, imperfect drainage, and on others, low water-holding capacity and susceptibility to drought limit the response to mineral fertilizers. In addition, it is frequently found that soils have been too badly depleted by many years of neglect to show such prompt response to mineral treatment. This is illustrated by a permanent pasture on Collington loam, an adequately-drained, coastal plain soil that had received no soil treatment for many years. Applications of lime, phosphate, and potash, alone and in combinations, failed to produce any increases in yield greater than 20 per cent during the following 3-year period.

Time of Application

Since this failure to respond satisfactorily to mineral fertilizers is a condition found on many pastures, it was planned to make a further study of this soil under controlled conditions in the greenhouse. The soil was uniformly screened and placed in pots, and a sod of mixed grass and clover established on the entire series. The fertilizers were then applied as top-dressings to all but one group of pots, to simulate field conditions. The resulting yields of clippings were similar to those obtained in the field. On one series, however, lime was incorporated with the soil at the beginning of the experiment, and minerals were applied as a top-dressing 3 months later. The effect was phenomenal; the yield under this treatment was 210 per cent of the untreated pots, in contrast to 120 per cent for those receiving lime and minerals simultaneously as a top-dressing, and 123 per cent for pots with lime and minerals incorporated with the soil immediately before seeding.

The entire series was allowed to become dormant for a period, to resemble winter field conditions, following which a second season of growth was produced. The yield for the second growth period, in pots where lime had preceded the use of phosphates and potash, was 150 per cent of the untreated pots, in contrast to a yield of 142 per cent for pots which had received simultaneous top-dressings of lime, minerals, and nitrogen. Clover

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Potash for Cotton in The Delta Foothills

By Roy Kuykendall
Delta Experiment Station, Stoneville, Mississippi

THE Delta foothills section of Mississippi includes that strip of land about 10 miles wide and 200 miles long, adjacent to the hills on the east, beginning at the Tennessee line, and extending southward through Tunica, Panola, Quitman, Tallahatchie, Leflore, Carroll, Holmes, Humphreys, Yazoo, Issaquena, and Warren Counties. The eastern portion of this section is the foothills proper. The soils are built chiefly from soil materials from the bordering hill section. They are mostly sandy loams. The west part of this strip of land is located in the Coldwater - Tallahatchie - Yazoo River basin which separates the foothills proper from the delta proper. These soils are made up of varying mixtures of soil material from the Mississippi River drainage basin and deposits from the rivers rising in the adjacent Mississippi hills. They contain less sand than the other group.

Experimental results indicate that for profitable crop yields the soils of the hill section are deficient in all of the major fertilizing elements—nitrogen, phosphorus, and potash—whereas the soils of the delta area proper are deficient only in nitrogen. The soils of the delta foothills region, therefore, may be expected to show a shortage of potash and phosphorus in proportion to the mixture of the deposits from the Mississippi hill streams and those from the Mississippi River.

In this section very little potash has been used in the past, therefore a huge potash deficiency has apparently accumulated throughout the area. This potash deficiency in the

The shaded area represents the Delta foothills section of Mississippi.

foothills area proper is plainly visible when driving down through this area in August and observing thousands of acres of cotton heavily damaged by potash hunger or rust.

potash. The potash not only increased the cotton yields, but caused the bolls to mature better and open more fully, which increased the ease of picking.

The results of these potash tests are

Farmers inspecting potash fertilizer experiments in the Mississippi Delta foothills.

presented in the following table. Nitrogen represents 45 pounds of nitrogen from 219 pounds of ammonium sulphate per acre. Phosphorus represents 45 pounds of phosphorus from 225 pounds of 20 per cent superphosphate per acre. Potash represents 37.5 pounds of potash from 75 pounds of 50 per cent muriate of potash per acre. All fertilizers were applied in the drill in the spring before planting.

To determine the fertilizer needs for these soils more fully, the Delta Experiment Station, Stoneville, Miss., initiated a program of cooperative research with farmers at several different locations in the foothills region. Thus far six experiment fields have been located and work begun with the following planters: W. S. Atkinson, Valley, and Marx Schaeffer, Yazoo City, for the southern area; L. S. Hemphill and Hugh L. Gary, Greenwood, for the south central area; and Tom Ladd, Charleston, and Whitney Smith, Webb, for the north central area. Two fields are to be located in the northern area.

Potash Controls Rust

In these experiment fields, tests are being conducted on cotton, with several sources of commercial nitrogen, winter cover crops, elimination fertilizer tests, variety and new strains comparisons. One of the outstanding things that has been accomplished to date is the control of rust and increased yield of cotton by the use of

The Atkinson, Hemphill, and Ladd fields are located on the very sandy soils in the foothills proper, and the Schaeffer, Smith, and Gary fields are in the Coldwater-Tallahatchie-Yazoo River basin.

In two of the fields, Atkinson and Ladd, in the foothills area, potash increased the yields 447 and 266 pounds of seed cotton per acre, or 38 per cent and 20 per cent respectively, in 1936. The 2-year average increase for potash at the Atkinson field is 356 pounds of seed cotton per acre, or 38 per cent more than nitrogen alone. Valuing seed cotton at 4c per pound,

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The Family Garden Deserves Planning

By W. B. Ward
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A GOOD garden should not only be a means of supplying food for the family as an aid in decreasing the living costs but should supply quality produce for daily use at a minimum expense. The family gardener who desires fresh vegetables and small fruits in season, with a surplus for canning or storing, should plan the garden long before the first planting date arrives. The best farm and home garden records in Indiana come from those gardens which were carefully planned on paper, and a definite plan followed throughout the season.

Intelligent planning is based upon the knowledge of planting dates, the space required for the best development of the plant, and the length of time required from seed or transplanting time until maturity. With this information in mind, the garden may be planted to some crop or other from early spring to approximately 30 days before the expected frost in the fall, as oftentimes succession plantings of the same variety are more successful than the first. Sufficient seed should be ordered early, and only such vegetables planted as the family will eat. It is advisable to keep posted on the better varieties, as seedsmen are continually improving certain strains, and as soon as a better variety is on the market the older one should be discarded.

It has been the custom to garden certain parts of the entire farm, with the small kitchen garden close to the house, and sweet corn, tomatoes, and cabbage in various truck patches scattered to the other three corners. These scattered truck patches were cultivated only when convenient, the rows were spaced far apart in order to permit the use of horse-drawn cultivators, and the vegetables handled like any general farm crop. If some plants were trampled by the horses or plowed out it seemingly made very little difference to some, as they perhaps thought there were a few too many plants anyway.

The present trend is for more compact and well-arranged gardens so they may be easily cultivated with a wheel hoe, dusted or sprayed to control any sudden threats from insects or diseases, and at the same time cared for with the smallest expenditure of time or labor. Perennial vegetables, like asparagus, rhubarb, winter onions, and berries, should be planted along the sides of the garden so as not to interfere with either the plowing or cultivation.

Supply Nutrients

Intensive gardening removes considerable plant foods from the soil. The garden area may be brought back to a high state of fertility by an annual application of manure and commercial fertilizers. Manure may be used at the rate of 20 to 30 loads per acre as an annual application. The manure should also be supplemented with other fertilizer containing phosphoric acid and potash especially, and oftentimes nitrogen is necessary. Perhaps 500 pounds per acre of a complete fertilizer containing from 2 to 4 per cent nitrogen, 10 to 12 per cent phosphoric acid, and 6 to 8 per cent potash would give the best results, although a sack or two of any fertilizer on the farm when applied to the garden would be beneficial. Fertilizer may be applied before plowing and the garden soil plowed from 8 to 10 inches deep. Lime is of particular value in the case of acid or heavy clay soils. A mellow garden soil with plenty of plant food may be gardened for years, and this type of soil is well adapted to wheel-hoe cultivation.

Equipment

The small, well-constructed, and sturdy wheel hoe is finding great favor among the gardeners. Wheel-hoe handles should be long, adjustable to the height of the person using the tool, and have a small wheel and shallow cutting sweeps as standard equipment. The investment in a good wheel hoe is a little more than the cheaper ones, but in the long run the better tool will last from 20 to 30 years or longer, with better service.

Wheel-hoe cultivation permits closer row plantings, and such vegetables as beets, carrots, onions, etc., may be spaced so that once through with the wheel hoe will take out the weeds and leave a good mulch. For other crops that require wider spacing, two and sometimes three times through are necessary. The more vegetables planted to a given area, the less room will be allowed for the weeds to grow, and the ground will be shaded by the foliage of the desired plants. Shading of the ground does not permit excessive evaporation of moisture only but also is an aid in preventing the organic matter from "burning out" from the soil.

Nutrition specialists suggest that each family should have on hand approximately 60 quarts of canned vegetables, or its equivalent, and 49 quarts of fruits for each adult member of the family, this amount of food to be consumed during the off-garden season, a 7 months' period from October to the following May for the north central area. This 7 months' food budget may be supplied from the well-planned garden.

Those families with young and growing children will find that the boy or girl will consume as much fruit and vegetables as an adult and, therefore, should be counted full measure. On this basis, a family of four would require 240 quarts of vegetables and 196 quarts of fruits, or a total of 436 quarts, for the winter, canned, stored, or purchased. The vegetables used are listed in the order taken from the farm and suburban home garden questionnaire, and show that the potato ranks first. Tomatoes, green beans, cabbage, lettuce, corn, peas, onions, carrots, turnips, beets, pars-

Thorough and timely applications of either a spray or dust control the pests. This young gardener is applying dust on the underneath sides of bean leaves to control the Mexican bean beetle.

nips, spinach, sweet potatoes, and salsify follow in order of importance. Lettuce is generally purchased from the store; tomatoes, beans, corn, peas, spinach, and sometimes kraut and beets are canned, while the rest may be successfully stored and used fresh rather than canned. Of the fruit products, grapes and the berries rank first, followed by peaches, pears, plums, and apples. With the exception of apples, practically all of the fruit is canned. The storage budget should also be based upon the per capita consumption, and the following amounts are suggested for storing for each adult:

Potatoes	3½	bu.
Sweet potatoes	¼	"
Carrots	¼	"
Turnips or rutabagas	¼	"
Beets	½	pk.
Onions	½	"
Cabbage	20	lb.
Apples	1	bu.
Popcorn (on cob)	½	"
Nuts (hickory, walnut)	½	"
2 large pumpkin or squash		
Small squash	½	"

Parsnips and salsify may be left in the ground over winter or dug in the late fall and buried.

How much is actually canned and stored by the average family from home-grown produce is shown from 3,672 garden records. The average size of the family is approximately 4 people. This past year each family averaged 95.6 quarts of vegetables and 84.1 quarts of fruit. Two thousand five hundred and one families stored 48,323 bushels of vegetables, and 968 stored 8,589 bushels of apples and pears. Besides the home-grown produce, 1,221 families purchased 71,397 quarts of vegetables, and 2,061 families 142,947 quarts of fruits. Another interesting note came from the questionnaire in that 1,576 families reported canning 75,360 quarts of meats, some reporting that the chicken especially came from the garden.

No garden is complete without a strawberry patch. Four hundred ft. of row produced 450 qts. of berries for "Skippy."

Favorable Returns

Two of the numerous reports received this past season list: (1) 8 in the family, 509 quarts of vegetables and 380 quarts of fruits canned from home-grown produce, 40 bushels of potatoes, 12 pounds of dried corn, and several pumpkin and squash stored for winter use; (2) family of 3, 163 quarts of vegetables, 80 quarts of fruits, 55 bushels of vegetables, 5 bushels of fruit, 30 pumpkin, and 15 large squash stored, and 19 quarts of canned fruit purchased. Forty quarts of meat were also canned. At the bottom of the page this interesting note was added from the No. 2 report: "I had two new daughters-in-law this summer, so I raised enough from our garden so they could can 146 quarts of vegetables and 100 quarts of fruits."

The garden now plays a very important part in the happy family life. Not only are quality products grown and a saving shown on the expense account, but there is also a lot of real enjoyment in knowing that a good job was well done.

Andrew W. Milnar of Kimmel, champion onion grower of Indiana, has just been crowned monarch of the Onion Growers of America at their convention held at Kalamazoo, Mich. He grew 1,471 bushels on 1 acre and fertilized with 500 pounds of 0-20-20 broadcast and 300 pounds 2-8-16 in the row.

Meet Indiana's 1936 Onion King

By Roscoe Fraser

Muck Crop Specialist, Purdue University Agricultural Extension Service, Lafayette, Indiana

"THE value of fertilizer in an onion crop cannot be overestimated," is the advice that Indiana's 4-time Onion King gives to his fellow muck-crop producers, as derived from his experiences in ascending to the high position and later to prevent abdication from the throne.

Production practices employed by Andrew Milnar, better known as Andy, in attaining the honor of having grown championship yields of onions on muck soil for 4 years are unusually interesting. Surely the fact that "he knows his onions" cannot be disputed, and equally as safe should be his advice on the matter of what things or conditions are required not only to produce record yields of onions and other muck crops, but to produce yields as practicably and economically as possible.

And so, it is with the idea that what Andy found to be satisfactory would be equally as valuable to the "average muck-crop farmer" that I am desirous of passing on some of my observations. Before I go into some of the things that our Indiana King did to get such a corner on the state's onion crop, it would be well to give a bit of his background.

Turning back the calendar to the fall months of 1922, when the future course of the nation's agriculture was not absolutely clear in the minds of farmers, we find young Andy a lad, shy of his majority by 4 years. At that age, he became associated with the produce business, joining the firm of Dingfelder and Balish in New York City in the capacity of a stenographer and assistant bookkeeper. When the firm enlarged a few months later, the Indiana Onion King in the making was promoted to the position of bookkeeper and later to office manager. More onion facts were collected while serving in the capacity as an assistant to one of the firm's owners from 1928 to 1930.

Then the great depression began to break out like chicken pox. There followed a series of fast-breaking events that greatly changed the scenery for Andy, giving him the opportunity of his life, though he probably didn't think so at the time. The duty on onions was raised. Foreign business dropped to a point that caused a reorganization in the firm that Andy was with. The company decided to set up subsidiaries in various onion-growing sections of the country. And, the next thing Andy knew, he was on his way to Kimmell, Indiana, in Noble County, to manage one of the farms.

Now, what would a young fellow, who had spent most of his time dealing with onions in the office or on the New York docks, know about producing a successful commercial crop, especially on Indiana's muck land? Here's what Andy has to say about his record since he has had his feet on "the promised land":

"The first year here I spent mostly getting acquainted, since field work was entirely new to me. In 1931, I experimented, using imported seed and plenty of commercial fertilizer, and won the state onion championship for the highest yield on 1 acre, as well as sweepstakes on my sample shown at the Indiana Muck Crops Show that year. We repeated the championship yields during the years of 1932 and 1933."

Set New Record

This year's record was a production of 1,471.98 bushels of U. S. No. 1 onions on 1 acre of well-managed, properly-fertilized, Indiana black muck land. That yield was nearly a couple of hundred bushels above his nearest Indiana competitor in the 1,000-Bushel Onion Club, a Hoosier agricultural extension project, thus winning the "Onion Crown" from eligible Indiana farmers for the fourth time since 1930. This time he established a new high yield for onions. And that is not all, he won the national onion grower championship.

How did Andy grow the enormous onion crop on a single acre? What

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Interested critics of the prize crop, the author, the winner, and county agent M. A. Nye.

The Tung Oil Industry In Mississippi

By Ben Hilbun
Agricultural Experiment Station, State College, Mississippi

THE warm soil of south Mississippi that nourished great forests of long-leaf pine trees, now almost gone, may furnish the state another great industry. Tung trees, brought here as an experiment from ancient China, have buoyed hopes of an industry that some think will rival the lumber industry which, after running its course, left thousands of acres of cut-over lands a burden to those who own them.

Grown wild in the great Yangtse Valley of south central China at least 2,838 years B. C., tung trees have been considered, until recent years, as belonging by natural decree to that country. However, in 1907 a few of these trees were brought to the United States for experimental purposes, with the Chinese, in attempting to protect their ancient monopoly of tung oil, saying the United States could not compete with them because of their labor prices of 10 and 12 cents per day.

Increasing Supply

A few tung trees were planted at the Poplarville, Miss., Branch Experiment Station in 1927, but little or no attention was given them until 1932. Then Dr. J. C. Robert, director, became interested in the plant that bids fair to revolutionize the agricultural industry in the southern part of the state, provided experience does not destroy the faith leaders now have in the possibility of tung oil as a major cash crop for the section.

From the beginning of a few trees planted largely through curiosity in 1927, the plantings in Pearl River County have mounted to 50,000 acres, and an expansion program has been launched to add 50,000 acres by the end of 1937, ten years after the first planting. If given reasonable care, by the fifth year a tung tree orchard should produce 1 ton of nuts per acre. The nuts pan out about 25 per cent oil, which sold this year for an average of 15 cents per pound.

Growing Demand

Using the cotton crop and tung oil acreages in 1935 as a means of emphasizing the potential importance of tung oil as a cash crop, Dr. Robert compares the $115,000 cotton crop with the 30,000 acres of tung trees. At five years old the tung trees should produce a ton of nuts or 500 pounds of oil per acre, which at 10 cents per pound would amount to $1,500,000. "We are not saying," Dr. Robert added, "that these figures will hold true on all plantings, but from every indication it appears that the tung oil industry is either a great mirage or a coming industry for the southern part of Mississippi."

"The United States in 1935," Dr. Robert said, "used 120,000,000 pounds of tung oil, and produced less than one-half of 1 per cent of that amount. Half of this was produced in Pearl River County, showing conclusively that there is a great demand for the product. Present demand, however, is not to be considered the ultimate possibility of the industry, since new uses for tung oil are being discovered, thus adding to the potentialities of this potentially great industry."

Among the 100 or more commercial commodities that contain tung oil are paints, varnishes, lacquers, various water-proof materials, such as oilcloth, umbrellas, linoleum, rubber shoes, brake linings for automobiles and railway equipment, synthetic rubber, and communication equipment. Ashes of tung nuts, from which the oil has been extracted, are used in the manufacture of the so-called India ink. The oil, which dries with a hard finish, is also excellent in protecting objects from weathering processes that normally cause chemical deterioration.

Tung oil has been used in the manufacture of paint for about 50 years. It has been shipped from Japan for about 40 years and for a while was known as Japanese oil. The Japanese obtained it from China and sold it to American consumers under the name which they applied to it.

Perhaps the best known use of tung oil is in the manufacture of spar varnish, which is said to be the only varnish that will not turn white when water is placed in it. This varnish is made of tung oil and resin. South Mississippi, site of the greatest development of tung trees in America, grows both pine trees and tung oil. The two in many instances are growing side by side, bringing together two useful products that were produced on separate continents for many centuries.

New Projects

The largest tung oil project in the world is located near Picayune in Pearl River County. It embraces slightly less than 10,000 acres and is owned by Lamont Rowland, who is utilizing cut-over land in an extensive development. A tung oil mill is being built at Picayune for extracting the oil from the nuts now produced. There is another mill at

Four-year-old tung tree in blossom. Commercial fertilizer was applied at the rate of 4 lbs. per tree.

Unfertilized tung tree the same age and on the same soil as the one below.

Bogalusa, Louisiana, about 20 miles from the experiment station at Poplarville.

Tung trees, according to Dr. Robert, require a heavy rainfall—about 60 inches annually—and do not thrive where the temperature dips lower than 12 degrees. The rainfall and temperature of the lower third of Mississippi compare favorably with that of the tung tree section of China. The soil, he thinks, is excellent, although tung trees, like any other plant, are affected by the amount and kinds of plant food in the soil.

Very little has been done in an experimental way in Mississippi to determine the kind and the amount of plant food that should be added to secure maximum results in both quantity and quality. Dr. Robert adds, however, that "tung trees respond well to fertilizer, when needed, and the specific need for fertilizer would depend on the quality of the soil."

Some experimental data on the effects of commercial fertilizer in varying amounts on tung oil productions have been gathered from tests conducted by the Great Southern Lumber Company of Bogalusa, Louisiana, which has extensive plantings on average cut-over land. Superphosphate (18 per cent) used alone in varying amounts, muriate of potash used similarly, and a complete fertilizer were tested against a check plot of no fertilizer.

Yields on the six plots of 1 acre each were varied, showing a decided leaning to the use of fertilizer in the production of tung oil. The yield on the 1-acre plot that was treated with 100 pounds of 18 per cent superphosphate was 1,327.5 pounds of nuts as compared to 1,405.61 pounds from the acre receiving 200 pounds of the same fertilizer.

An application of 200 pounds of muriate of potash used alone gave a yield of 1,030 pounds of nuts per acre, and a combination of 200 pounds of 18 per cent superphosphate and 100 pounds of muriate of potash boosted the per acre yield to 1,617 pounds of nuts. A complete fertil-

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Tree fertilized with 100 lbs. of muriate of potash and 200 lbs. of superphosphate per acre.

Learn Your Soil's Limiting Factors

By Ford S. Prince
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THOSE of us who secured our college training two or three decades ago will remember the illustration of the barrel with a short stave with the water pouring freely out over this guilty member in a miniature Niagara. Perhaps the short stave was phosphorus, or again it may have been potash or nitrogen. It was probably one of these, but it might even have been organic matter or lime at that time. However, the picture did not portray boron, manganese, magnesium, or some of the other rarer elements as being the short stave causing the lack of water in the upper part of the barrel.

The point is, our thought with respect to fertilizer needs is constantly changing, in that there are being discovered new elements or substances that act as limiting factors, preventing optimum plant growth, often to the point of unprofitable production. Nor is this true only of newly-discovered materials, for it still holds true of the three "essential" elements as it always has.

We might venture to say that the leaching which normally occurs in humid climates is partially responsible for these changing conditions. Cropping, erosion, and any other source of loss of nutrients from the soil are doubtless contributing factors.

Take a specific illustration, such as the New England potato crop. Ten years ago the idea that this plant needed individual nutrients not found in the ordinary fertilizer was unknown. Then came the discovery in Maine that a peculiar chlorosis, typified by a yellowish bronze color of the leaves, could be overcome by spraying the vines with soluble magnesium salts, and a new chapter in Maine potato history was written. Magnesium hunger typified by the chlorosis has now been overcome by putting the magnesium into the fertilizer, and the healthier crops that are produced respond to this treatment by digging out as many as 70 bushels more potatoes per acre, at an increased cost for the magnesium of only a dollar or so per acre. In this instance the inclusion of magnesium changed the yield as much perhaps as increasing

Potatoes grown without potash. Note scant foliage development.

the amount of fertilizer 50 per cent or more.

This is but one of the limiting factors that may affect the New England potato crop. Leaching and cropping which have contrived to deplete the magnesium and calcium have caused a corresponding rise in the acidity of the soil. Land below pH 5.0 is common, and reactions as low as pH 4.0 to 4.5 are not unusual. At these acidity levels clover fails, bacterial activity is probably inhibited, and even the potato crop, one which is not highly sensitive to an acid soil, does not produce optimum crops. Extreme acidity which causes high solubility of iron and aluminum means that phosphorus and potash too are taken out of available form and cannot be secured by the plants. High fixation and low bacterial activity may easily mean a severe reduction in yield. The trouble may be overcome by liming, of course, but too much lime causes scab and farmers are a little chary about applying it.

According to principles laid down at the Maine Experiment Station and announced by Dr. J. A. Chucka, agronomist there, scab can be avoided and lime can be used if applied in small amounts in the potato rotation; not to exceed 1,000 pounds of ground limestone if the soil tests below pH 5.0, and not more than 500 pounds if the soil runs pH 5.0 to 5.3. Furthermore, any lime that is used should be applied after the potatoes are grown and before clover is sown so as to get the maximum benefit from the lime on the clover and to reduce scab-causing tendencies when potatoes are next planted. In New Hampshire lime in the above amounts at a soil reaction of pH 5.3 has not caused scab, but in amounts of 2 and 4 tons scabby potatoes have been produced no matter what the reaction of the soil.

Application of a 5-16-7 fertilizer produced these luxuriant potato vines.

Furnish Organic Matter

The proper use of lime under conditions such as have been described tends to overcome another limiting factor in potato production, and that is the lack of organic matter. Potatoes are not heavy users of plant food derived from this substance, although it is advantageous to supply them with nitrogen from the organic source. It is very advisable to have the soil well supplied with it though, to absorb and furnish moisture and overcome the effects of drought and midsummer heat which often seriously reduce yields. The utilization of a clover sod has given an average yield increase of 50 bushels per acre in our New Hampshire 300-Bushel Potato Club. This quickly-decaying organic residue means more nitrogen for the crop and more moisture during the growth period.

These points have been mentioned with respect to the New England potato crop to indicate that it is not always a lack of the plant-food elements, nitrogen, phosphorus, and potassium, that causes relatively low yield levels, although a grower must know his soils and their needs for these elements. Other factors are

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Present Trends in Fertilizer Usage

By R. E. Stephenson
Oregon State Agricultural College, Corvallis, Oregon

DURING the past 25 years fertilizer consumption in New England, the Middle Atlantic, and Southern States has not increased relatively as much as in other sections of the United States. The Southern States, by far the largest users, have dropped somewhat in total tonnage consumed, perhaps because of a reduced acreage of cultivated land. The midwest has materially increased its consumption, and the Western States now use more than three times the amount used 25 years ago. Fertilizer usage, like civilization, has followed the impelling urge to "go West." Total fertilizer consumption in the West is yet small, however.

Fertility Exhausted

Perhaps the explanation is simple. The soils of the West are relatively young in cultivation. Virgin fertility has carried production to the present time. But conditions are now changing. Recently a farmer of western Oregon stated that land which once produced 90 bushels of oats to the acre now produced about 30. Another stated that he knew a certain ridge country which had produced grain more or less continuously for the past 90 years, and still is producing something but not a very satisfactory yield. Another grain farmer asked what was wrong with his land which used to produce good grain but now produces very good straw which fails to fill. The grain yield is disappointing, perhaps due to exhaustion of available minerals of the soil.

Grain farming exhausts fertility and cannot be continued indefinitely without providing some means for humus renewal and the return of some of the mineral nutrients removed in the grain which is sold off the farm. In a few cases old, exhausted grain farms in western Oregon have been converted to nut orchards with not too much hope for success. Soil that is exhausted for grain is perhaps also too poor to grow trees that will develop into good bearing orchards. Certainly a soil-building program will be needed on such soils if orchards are to prove a success.

Soil depletion has moved westward and has preceded the adoption of good fertilizer practices. Speedy adoption of soil conservation and fertility maintenance practices may arrest the oncoming fertility depletion. Will we of the West stand by and see our great soil resources exhausted, or will we quickly adopt better practices to conserve our greatest natural resource? It is hoped that the latter course may be followed.

The first sign of waning fertility is often the depletion of the virgin humus. Yields drop somewhat in proportion as the active humus is depleted. This condition is associated with increased soil acidity, slow availability of the soil minerals, loss of soil structure, and failure of legumes. More than likely the growing of legumes has long been neglected and that is part of the reason for the bad state of the soil. Too much plowing and too little sod favors erosion, and soon not only the fertility but the soil itself is gone.

Prevention usually is better than cure, and especially so in dealing with soil problems. Soil eroded away never can be recovered. Probably only natural soil generating processes can restore productivity to such areas, and this requires a long time. Meanwhile there is the economic loss from the depleted and eroded areas.

What to Use?

Legumes are unsurpassed for restoring humus and nitrogen to rundown soils. The importance of lime and fertilizers for growing legumes can not be contradicted. On fairly good soils deficient in available phosphorus, stands of alfalfa are sometimes maintained and yields doubled by annual top-dressings with superphosphate. Seriously depleted soils may become noticeably responsive to potash.

In the growth of plants potash concentrates in the forage. Animal manure, crop residues, and root systems make humus and help keep the active potash in circulation. When the humus is depleted by too continuous cultivation to row crops, or by removal of top soil through erosion, there is no means for keeping potash active. Such soils need complete and liberal fertilization to reestablish a plant cover.

The effect of potash and phosphate in bringing clover into grass sods has recently attracted attention. There is some speculation as to the cause. Potash is especially important to the manufacture of carbohydrate by plants. Legumes are perhaps compelled to manufacture more carbohydrate than non-legumes. The microorganisms in the nodules of the legume must have carbohydrate (obtained from the host plant) to furnish energy for the fixation of atmospheric nitrogen. With insufficient carbohydrate the legume organism is unable to function efficiently. Thus potash becomes doubly important in the life processes of legumes.

This explanation of the importance of potash in starting legumes on poor land appears plausible. E. B. Fred of Wisconsin has demonstrated that the increased photosynthetic activity of legumes, brought about by increasing the carbon dioxide available to the leaf system, increases nitrogen fixation. Increased photosynthetic activity through the use of potash should have a similar effect.

The total tonnage of fertilizer consumed in the United States has increased during the past 25 years. The average composition or plant-food content of the fertilizer has also increased nearly 50 per cent. Nitrogen consumption for improving soils depleted of their humus has about doubled.

Maintain Productivity

Increased use of potash is especially noticeable during the period 1919 to 1929. In that period the use of muriate of potash increased sevenfold, while the use of manure salts with 20 to 30 per cent potash increased 22 times. Consumption of other forms of potash changed much less.

These changes in favor of higher grade materials and more liberal fertilization are the result of greater appreciation of the importance of commercial fertilizers in maintaining productive soils. Fertilizers are indirectly a help in erosion control. Fertilized pastures in Ohio had only one-eighth as much water run-off and a minute fraction of the erosion of unfertilized pasture. With crops grown in rotation at Missouri, the use of fertilizer

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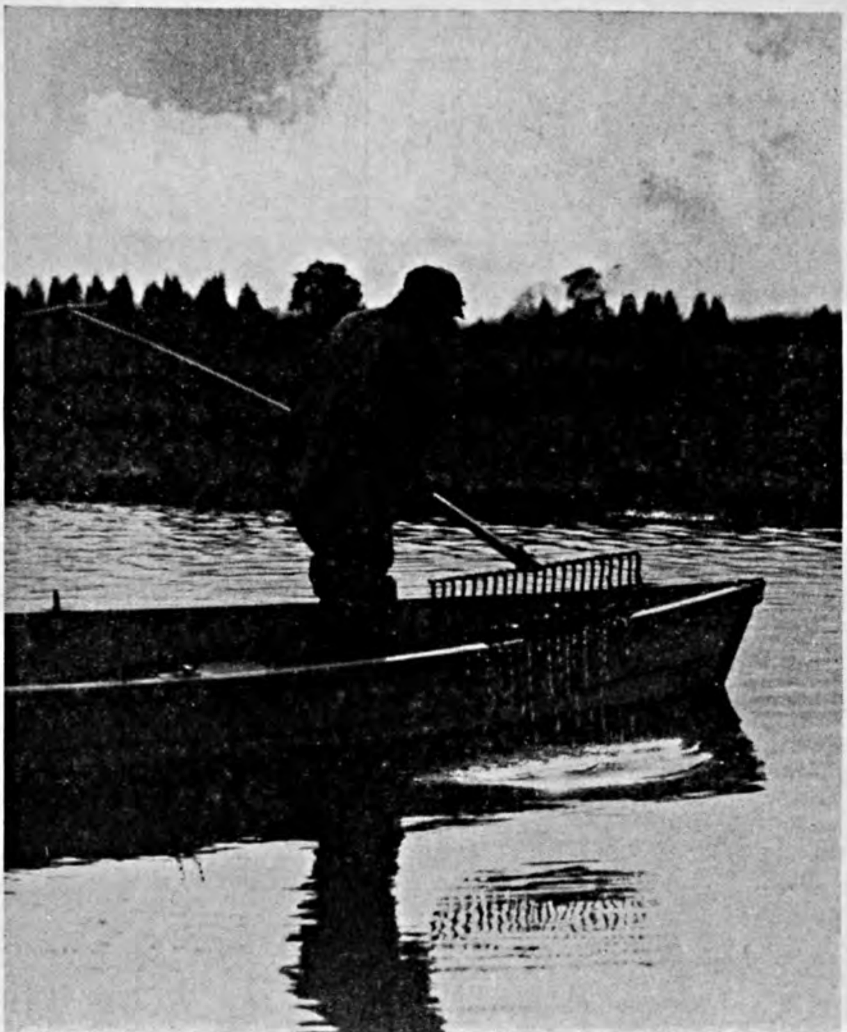
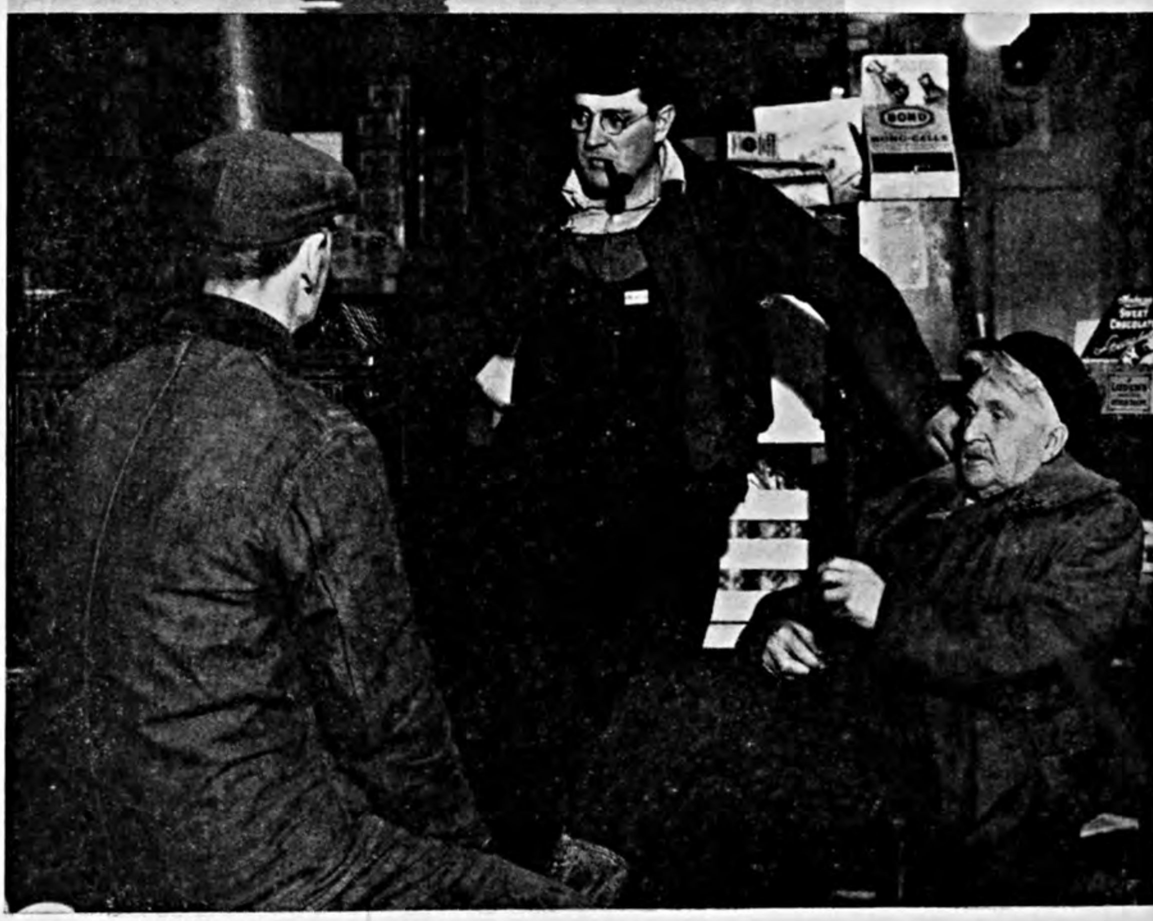
PICTORIAL

MIDWINTER MIRAGE.



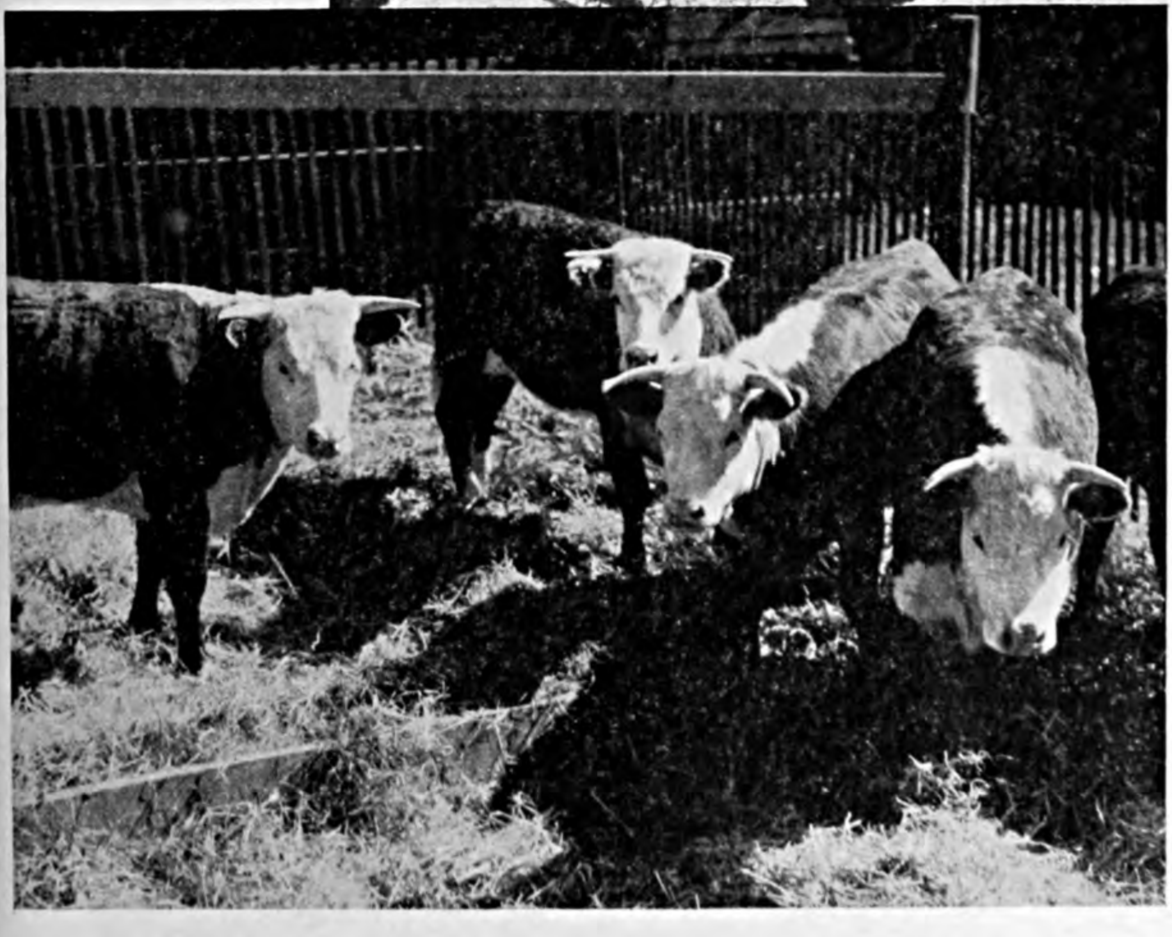
Left: A deep-water farmer at his harvest.

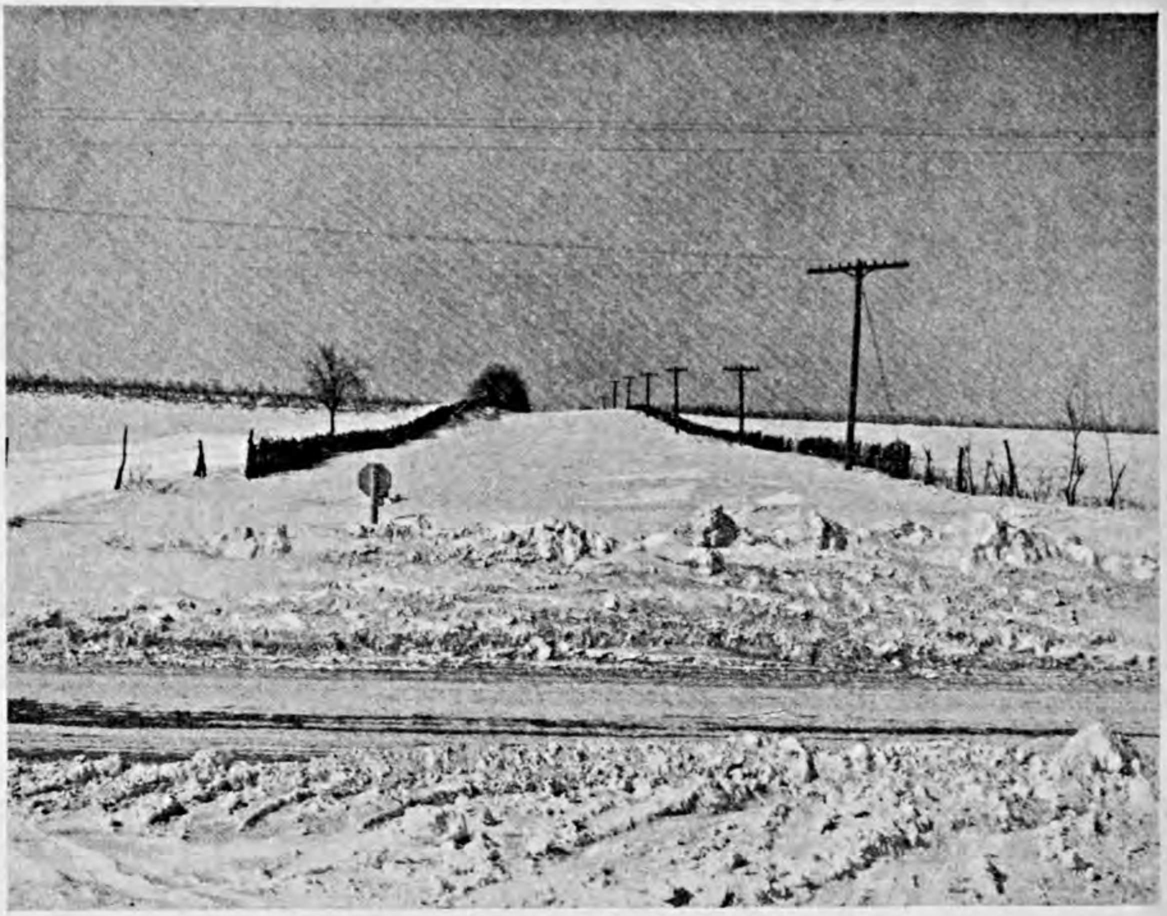
Below: "How many acres are you planting this spring?"



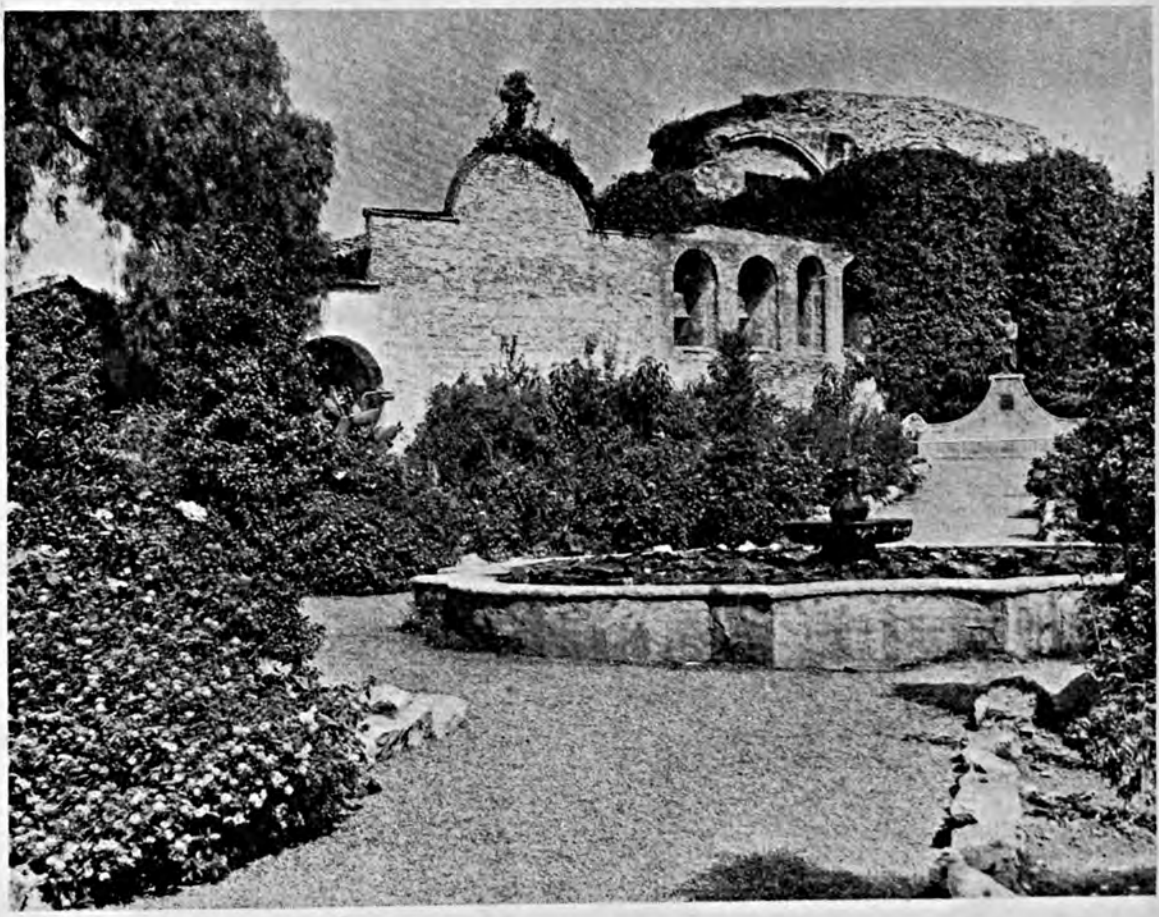
Right: "Farm gold" and good to the touch.

Below: Baby beeves with a tender, juicy future.





AT OPPOSITE ENDS OF THE ROAD.



The Editors Talk

The Size of an Acre

It has been said that the size of an acre depends upon the man who farms it. In other words, the yardstick of an acre is what it will produce, and what it will produce is governed by the man. With conservation a paramount issue in our current agricultural considerations, more and more attention is being turned to increasing the production of the acres in cultivation.

A recent press release from Purdue University carries the statement of Lynn Robertson, farm management specialist, that the average crop yields for Indiana have shown a distinct downward trend since the World War in contrast to an upward trend before the war. He cites this as just one of the indications that the productive capacity of Indiana farms is being rapidly reduced by soil erosion and depletion of fertility. Studies carried on in Indiana during the last two years point to the fact that land-use adjustments are needed in all parts of the state, but the amount of the adjustment and, to some extent, the nature of the adjustments needed vary from place to place.

With conservation programs calling for shifts of rough and unproductive lands into timber; easily eroded lands into pasture; decreasing inter-tilled or cultivated crops and increasing grasses and sod legumes; etc., acres in use are being called upon to produce the large yields and good quality of cash crops necessary to insure the farmer's income. That this involves and can be met with intelligent use of commercial fertilizer is attested by the years of research and experimental work at the various experiment stations.

There probably has never been in this country a greater need for the results of this work than at the present time. Agricultural extension workers who know how to increase the size of an acre are in demand and are rendering an invaluable service not only to the immediate welfare of the farmers but to the stability and preservation of our greatest national resource—the soil—for future generations.

Marketing Plant Food

"The farmer is only a marketer of plant food," is the oft'-quoted statement of Professor T. B. Hutcheson, head of the agronomy department, Virginia Polytechnic Institute. It does not matter whether you are a dairy farmer, cattle farmer, truck farmer or any other type of farmer, all that can be sold from the soil or farm is plant food. Perhaps you are marketing milk on a near-by city market. You use hay, grain, etc. to feed these cows to produce the milk; but going back a little further plant foods, such as phosphorus and many other elements, are required to produce the feed. If you are a truck farmer you sell plant food through your truck crops. Nitrogen, phosphorus, potash, and many other plant foods that are removed must be replenished through fertilizers, manure, and crop residues. If this plant food is not returned, then the soil is rapidly depleted of these essential nutrients and profitable yields decrease.

An interesting example of the depletion of plant food is found on many pastures. For many years no fertilizer was needed to produce profitable pasturage. Today plant food must be added, for most of it has been marketed through cattle. A 1,000-pound animal carries the equivalent of a 100-pound bag of 16 per cent superphosphate in its bones. A dairy cow giving 20 pounds of milk per day will take out of the soil in one season the equivalent of 15 to 20 pounds of nitrogen, 45 to 50 pounds of phosphoric acid, and 45 to 50 pounds of potash. This depletion of plant food brings about a change in the vegetation of the pasture: broom sedge replaces the Kentucky blue grass.—*Virginia Polytechnic Institute, Extension Division News, Vol. XVIII, No. 7, May, 1936.*

County Councils

A very worth while cooperative project has been recently reported in Extension Service Review, U. S. Department of Agriculture. County Councils in 44 of Florida's 67 counties were organized late in 1935. The membership of these councils includes the county agent as chairman of a group of successful farmers and leading farm women, the home demonstration agent, vocational agriculture teachers, representatives of civic clubs, and others interested in and familiar with the county's agriculture. The Federal Extension Service has supplied the councils with available agricultural data pertinent to the respective counties and has aided in the division of the State of Florida into 13 different areas by type of farming.

As noted, "Florida is a land of diverse soils, and a knowledge of the soil types in the county is necessary before intelligent recommendations can be made as to the use of this land for the production of crops or for timber, pasturage, or other purposes." All soil survey information available is being assembled by the Extension Service for the use of the councils. The councils serve as a medium for obtaining farmer approval of plans proposed by the State and Federal officials and for submitting pertinent suggestions for county, State, and National agricultural programs. They permit quick contact with a group of important farmers in each county for discussion of specific problems. They also enable farmers of each county to meet voluntarily to discuss their production and marketing problems.

These county councils, particularly in states where there are no farm bureaus, National Grange, or similar farm organizations, would seem a great step toward planning for a more profitable local agriculture. In a short space of six months they proved their usefulness in Florida, and it is to be hoped that their inauguration will find favor in other sections of the country.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

Much information pertaining to the importance of potash on Vermont pasture soils and ways that it may be used most economically are contained in Vermont Agricultural Experiment Station Bulletin 403, entitled "Need and Use of Potash on Vermont Pastures," by A. R. Midgley and V. L. Weiser. The publication presents the results of several plant-food combinations that were used on pastures from 1931 to 1935 in order to determine the effects on the nature and composition of the herbage. A large part of these studies involved chemical soil tests, plant response in greenhouse, field plot tests on the major soil types, and determinations of potash fixation and crop growth with different rates of application.

Most Vermont soils, particularly pasture soils, are likely to be somewhat deficient in potash and crops growing thereon respond well to potash applications. This is especially the case where clover is predominant. Clover, being a desirable plant which readily responds to mineral fertilization, is likely to increase in growth with each additional amount of potash. Increased yields of white clover when three times the usual rate of minerals is applied indicate the high mineral requirement of this plant. Maximum yields of grasses usually result from applications of 75 to 100 pounds muriate of potash per acre. Chemical soil and plant tests indicate Champlain Valley soils contain enough potash for some crops, although pastures on these heavy soils sometime respond to added potash.

The increases obtained in pasture field tests were significant when potash and superphosphate were applied to the soils studied. In these tests the pasture mixture included timothy, red top, Kentucky bluegrass, alsike, red and white Dutch clovers. Liming proved advisable in practically all cases, and substantially increased yields were obtained from nitrogen applications.

Other subjects discussed are the potash fixation properties of a number of important Vermont soils, the importance of close grazing, and selection and establishment of desirable strains of pasture plants. Several excellent illustrations portraying the responses of different pasture fertilization appear in this interesting bulletin.

"Influence of Commercial Fertilizers on Yields, Grades, and Net Value of Potatoes in Hood River Valley, Oregon," Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 343, June 1936, Gordon G. Brown.

Soils

The unprecedented activities of the Soil Conservation Service, U. S. D. A., during the past year are revealed by H. H. Bennett in his "Report of the Chief of the Soil Conservation Service, 1936." It is significant to note the advance this Service has realized toward better husbandry of our national soil and water resources. Federal State, and private enterprises began for the first time to move in unison through several avenues of action toward wiser use of the land in a basic pattern for permanent cooperative effort in the field of soil conservation. The report states that landowners and operators throughout the country took full advantage of new opportunities to protect and preserve their lands, which indicates that a brighter future for coming generations is in the making through this concerted action. The vast responsibilities confronting these agencies and every landowner and agricultural worker to protect and preserve our natural resources, maintain navigable rivers and harbors, and a great many related problems cannot be minimized. A broad conception of these functions underlying the purposes of the Soil Conservation Service is the theme of Chief Bennett's Report. It is full of educational information that should prove very valuable to many who are interested in securing a wider knowledge of what the conservation movements mean to this great Nation.

Methods of establishing a successful field of alfalfa under Missouri conditions are clearly outlined in Missouri Extension Service Circular 354, "Soil Treatment for Alfalfa," by O. T. Coleman. Usually little trouble and expense are experienced where alfalfa is grown on some of the fertile, well-drained river and creek bottoms that do not overflow frequently. According to this publication, most upland soils of the state are too deficient in lime, phosphorus, and often available potash, to grow alfalfa successfully. It will make favorable growth, however, when such soils are well suppied with these elements, provided they have fairly open subsoils, are well drained, and the proper seeding practices followed. Liberal amounts of lime, phosphorus, and potash must be supplied where the soil is low in these necessary nutrients. If the soil is somewhat light in color and has not received manure or no green manure crop turned under in 3 or 4 years, the use of complete fertilizers as 4-12-4 or 4-16-4 is recommended. Where the land has been heavily cropped to grain preceding alfalfa or if the land has grown alfalfa for several years, an 0-14-6 or 0-14-7 usually produces satisfactory returns. Proper inoculation for alfalfa is important and methods for this procedure are given. When once a good stand of alfalfa is obtained the author states this crop should not be plowed up for at least 4 or 5 years.

"The Hydrolysis of Calcium Carbonate and Its Relation to the Alkalinity of Calcareous Soils," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 64, Oct. 15, 1936, T. F. Buehrer and J. A. Williams.

"Soil Management Systems in a Young Bartlett Pear Orchard," Agr. Exp. Sta., Wooster, Ohio, Bul. 578, Dec. 1936, Freeman S. Howlett.

"The Comparative Moisture-Absorbing and Moisture-Retaining Capacities of Peat and Soil Mixtures," U. S. D. A., Washington, D. C., Tech. Bul. 532, Sept. 1936, I. C. Feustel and H. G. Byers.

"What Kind of Agricultural Policy Is Necessary to Save Our Soil?," U. S. D. A., Washington, D. C., Bul. DS-7.

Crops

According to E. Y. Floyd in North Carolina Extension Circular 212, "Factors Affecting the Quality of Flue-Cured Tobacco," the fertilizer used in the production of bright flue-cured tobacco is very important. In a rotation preceded by corn or cotton the average tobacco should receive an application of 800 to 1,000 pounds of 3-8-5 tobacco fertilizer per acre. On some soils 8 per cent potash is required. In all cases the chlorine content should not exceed 2 per cent. Sources of potash should be from muriate, sulphate or sulphate of potash-magnesia, and the phosphate from superphosphate. One-fourth nitrate nitrogen, one-fourth ammonium nitrogen, and one-half organic nitrogen should be the sources of nitrogen. It is recommended that 1 to 2 per cent magnesium oxide should be contained in the fertilizer. While there are a number of minor nutrients which are essential, these are carried in the materials mentioned above.

In addition to the fertilizer requirements so necessary for producing good quality tobacco there are many other factors to consider, such as proper cultural practices. The selection of favorable varieties, correct handling of the seed bed, preparation of the field, transplanting, and cultivating are described. Among the other necessary practices for successful tobacco production detailed in the circular are control of insects, topping and suckering, harvesting, curing, and tobacco grading.

"Growing Seedlings in Sand," Agr. Exp. Sta., New Haven, Conn., Cir. 117, Dec. 1936, A. A. Dunlap.

"Annual Report of the Extension Service in Agriculture and Home Economics," Agr. Ext. Serv., Newark, Del., Bul. 24, Apr. 1936, C. A. McCue, Director.

"Alfalfa in Georgia," Agr. Ext. Serv., Athens, Ga., Cir. 264, Sept. 1936, E. D. Alexander and Dr. John R. Fain.

"Triennial Report of Agricultural Extension Work in Louisiana—1932-'33-'34," Agr. Ext. Serv., Baton Rouge, La., J. W. Bateman, Director.

"The Well-Gardened Home," Agr. Ext. Serv., Baton Rouge, La., Vol. I, No. 15, "Fall Flowers for Louisiana," and Vol. II, No. 2, "General Orchard Management," June 1936, Bertha Lee Ferguson.

"Permanent Pastures for Cattle Production in the Rice Area of Southwestern Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 276, Oct. 1936, J. Mitchell Jenkins.

"Effect of Date of Seeding on the Length of the Growing Period of Rice," Agr. Exp. Sta., Baton Rouge, La., Bul. 277, Oct. 1936, J. Mitchell Jenkins.

"Factors Affecting the Cooking Qualities of Potatoes," Agr. Exp. Sta., Orono, Me., Bul. 383, July 1936, Marion Deyoe Sweetman.

"Agricultural Experiment Station Report for Two Years Ended June 30, 1936," Mich. St. Col., East Lansing, Mich., V. R. Gardner, Director.

"Pruning and Care of Ornamental Trees and Shrubs," Agr. Ext. Serv., East Lansing, Mich., Bul. 172, Nov. 1936, O. I. Gregg.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 19, No. 2, Nov. 1936.

"Sagrain in the Yazoo-Mississippi Delta," Agr. Exp. Sta., State College, Miss., Bul. 314, Aug. 1936, Roy Kuykendall.

"Work of the Agricultural Experiment Station," Agr. Exp. Sta., Columbia, Mo., Bul. 370, Nov. 1936, F. B. Mumford and S. B. Shirky.

"Fruit Varieties for Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 371, Dec. 1936, T. J. Talbert.

"Some Factors Affecting the Cooking Quality of the Pea and Great Northern Types of Dry Beans," Agr. Exp. Sta., Lincoln, Nebr., Res. Bul. 85, Oct. 1936, Edna B. Snyder.

"Fifty-fifth Annual Report for the Fiscal Year Ended June 30, 1936," Agr. Exp. Sta., Geneva, N. Y., U. P. Hedrick.

"Some Studies of the Degree of Maturity of Peaches at Harvest in Relation to Flesh Firmness, Keeping Quality, and Edible Texture," Agr. Exp. Sta., New Brunswick, N. J., Bul. 606, June 1936, M. A. Blake and O. W. Davidson.

"Oats in North Dakota," Agr. Exp. Sta., Fargo, N. Dak., Bul. 287, June 1936, T. E. Stoa, R. W. Smith, and C. M. Swallers.

"Twenty-second Annual Report of the Extension Division for Year 1935," A. and M. Col., Stillwater, Okla., Cir. No. 337, Gen. Series 284, E. E. Scholl, Acting Director.

"The Panhandle Bulletin," Panhandle Agr. & Mech. Col., Goodwell, Okla., No. 61, Dec. 1936, Hugh J. Thomson and Harley A. Daniel.

"Influences of Irrigation Upon Important Small Fruits," Agr. Exp. Sta., Corvallis, Ore., Bul. 347, June 1936, W. S. Brown.

"Lespedeza," Clemson Agr. Col., Clemson, S. C., Cir. 151, June 1936, B. E. G. Prichard.

"Pyrethrum in Tennessee," Agr. Exp. Sta., Knoxville, Tenn., Cir. 59, Sept. 1936, Brooks D. Drain.

"Wheat Varieties in Washington in 1934," Agr. Exp. Sta., Pullman, Wash., Bul. 338, Sept. 1936, E. F. Gaines and E. G. Schafer.

"Cultural Methods for Winter Wheat on Non-irrigated Lands in Northeastern Wyoming," Agr. Exp. Sta., Laramie, Wyo., Bul. 218, Oct. 1936, P. K. Thompson.

"Report of the Chief of the Office of Experiment Stations, 1936," U. S. D. A., Washington, D. C., James T. Jardine, Chief.

"Report of the Chief of the Bureau of Plant Industry, 1936," U. S. D. A., Washington, D. C., Frederick D. Richey, Chief.

"Cucumber Growing," U. S. D. A., Washington, D. C., Farmers' Bul. 1563, Rev. Sept. 1936, W. R. Beattie.

Economics

It is of interest to note the broad scope and the many functions of the Bureau of Agricultural Economics, U. S. Department of Agriculture, as outlined by A. G. Black, Chief of the Bureau, in his report to Secretary Wallace covering the fiscal year ending June 30, 1936. According to the report, the drought was the outstanding physical fact in American agriculture, and the improvement in farm prices and income was the outstanding economic fact. The social cost of the drought will be very great. It has reduced drastically and even wiped out the very limited resources of many farmers who, except for the prompt assistance provided by government action, would have fared far worse. Mr. Black believes that this drought has emphasized the need for measures that will contribute to the security and stability of farm income.

In spite of the severe drought, agricultural income has increased considerably as compared to last year, and the outlook for agriculture next year is favorable. Supplies in most lines of production are no longer excessive. However, it is further pointed out that it is necessary that the outlook for agriculture be not judged in terms of a single year since there are fundamental weaknesses in the position of agriculture that will require vigilance and action. The nation's capacity to produce agricultural products is far in excess of the existing market demand even allowing for considerable expansion in domestic requirements. Increases in foreign markets are taking place very slowly, and domestic demand cannot be expected to advance to a point that will assure an ample market with satisfactory prices for all American farmers can produce.

How to dispose of surpluses that we have reason to expect in future years with return of normal weather in the face of greatly reduced foreign demand for farm products is a problem the nation must be prepared to meet. A most serious factor, of course, continues to be the bars that have been erected by practically all nations against the international exchange of goods. While some inroads have been made on this problem, the need still continues for emphasis on the fundamental problem of disposing of farm surpluses through normal trade processes.

It is indicated that the Soil Conservation Program may be one solution to the agricultural problem. There is a need for increasing the emphasis on the program of the proper land use and upon soil and water conservation and unless steps are taken to check the great waste resulting from soil erosion, the unit cost of food must inevitably rise steadily. In this connection the possibility of maintaining a steady farm income by storing products in years of overproduction to be used in years of shortages is believed to be a sound plan. However, farmers should be compensated for contributing to an adequate and continued supply of farm products by being given a more secure income. Crop insurance and the principle of the ever-normal granary have been advanced as possible ways to produce this result, and the Bureau in addition to many other activities is now in the process of investigating the field of crop insurance in an effort to develop principles for a program of action.

"Classification of Fertilizer Sales Reported to Date for the Quarter Ended September 30, 1936," St. Dept. of Agr., Sacramento, Calif., Dec. 7, 1936, Dr. Alvin J. Cox, Chief, Div. of Chemistry.

"Commercial Fertilizers Report for 1936," Agr. Exp. Sta., New Haven, Conn., Bul. 390, Oct. 1936, E. M. Bailey.

"Annual Report State Board of Agriculture, 1935-1936," Dover, Del., Quarterly Bul., Vol. 26, No. 3.

"Fertilizer, Lime, Feed, and Seed Report for January-June 1936," St. Bd. of Agr., Dover, Del., Quarterly Bul., Vol. 26, No. 2, H. H. Hanson.

"Agricultural Outlook for Illinois—1937," Agr. Exp. Sta., Urbana, Ill., Cir. 464, Dec. 1, 1936.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., No. 19, Dec. 1936.

"Report of Analysis of Commercial Fertilizers for Season 1935-1936," La. Dept. of Agr. and Immigration, Baton Rouge, La., Harry D. Wilson, Commissioner.

"Tabulation Showing Tonnage of the Different Grades of Fertilizers Shipped to Each

Parish in the State from September 1, 1935, to June 30, 1936," and "Tabulation Showing Tonnage of Fertilizer Shipped in Each Parish from September 1, 1935, to August 31, 1936," La. Dept. of Agr. and Imm., Baton Rouge, La., Harry D. Wilson, Commissioner.

"The Production-Consumption Balance of Agricultural Products in Michigan. Part III. Field Crops," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 278, Dec. 1936, G. N. Motts and H S. Patton.

"Farm Economics," Col. of Agr., Cornell Univ., Ithaca, N. Y., No. 98, Dec. 1936.

"Ohio Agricultural Statistics for 1935," Agr. Exp. Sta., Wooster, Ohio, Bul. 577, Oct. 1936, G. S. Ray, L. H. Wiland, and P. P. Wallrabenstein.

"Public Expenditures in Oregon," Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 346, June 1936, W. H. Dreesen.

"Commercial Fertilizers," Agr. Exp. Sta., Burlington, Vt., Bul. 409, Oct. 1936, L. S. Walker and E. F. Boyce.

"Virginia Farm Statistics for 1935-1936," Va. Dept. of Agr., Richmond, Va., Bul. 12, Oct. 1936, Henry M. Taylor.

"Farmer Bankruptcies, 1898-1935," U. S. D. A., Washington, D. C., Cir. 414, Sept. 1936, David L. Wickens.

"The Farm Real Estate Situation, 1935-36," U. S. D. A., Washington, D. C., Cir. 417, Oct. 1936, B. R Stauber and M. M. Regan.

"What Should Be the Farmer's Share in the National Income?," DS-1; "How Do Farm People Live in Comparison with City People?," DS-2; "Should Farm Ownership Be a Goal of Agricultural Policy?," DS-3; "Exports and Imports, How Do They Affect the Farmer?," DS-4; "Is Increased Efficiency in Farming Always a Good Thing?," DS-5; "What Should Farmers Aim to Accomplish Through Organization?," DS-6; "What Part Should Farmers in Your County Take in Making National Agricultural Policy?," DS-8, U. S. D. A., Washington, D. C.

Ingenuity In Irrigation

Realizing the need of moisture at critical periods in crop growth, farmers, especially fruit and vegetable producers, have invented many ingenious devices for irrigating small plots for intensive cultivation, says F. E. Staebner, of the Bureau of Agricultural Engineering.

Old auto engines provide the power in most instances. Old pipes, used lumber, and second-hand odds and ends have been utilized to build inexpensive watering devices on land not level enough for ditch irrigation.

Supplemental irrigation has been recognized as an asset even in the more humid areas of the eastern United States, Staebner declared. Practically all of the farmers report material benefits from being able to water their crops when they need moisture most.

U. S. Grows Most Apples

The United States is the largest producer and exporter of apples in the world, according to the Bureau of Agricultural Economics. On an average, during the five years, 1931-35, approximately 31 per cent of the world apple production of 500 million bushels was produced in the United States.

Of the average of 155 million bushels of apples produced in that five-year period in the United States, the Bureau reports approximately 84 million bushels (54 per cent) were consumed as fresh fruit, about 6 million bushels (4 per cent) were canned, roughly 3 million bushels (2 per cent) were used for making brandy, about 7 million bushels (4.5 per cent) were dried and evaporated, and about 55 million bushels (35.5 per cent) were used for other apple products (including vinegar and cider), used on the farm, fed to stock, or left unharvested.

There are a total of roughly 450 million apple trees in the world, one-fourth of which are in the United States.

Farmers' Returns Higher

Ottawa, Canada.—One of the most encouraging features of the recovery witnessed in Canada during 1936 was the narrowing of the spread between prices of farm produce and prices of the things the farmers buy. At the low point of the depression in 1932, it is estimated that farmers were receiving only 35 per cent of the 1926 level of prices for their produce, while prices of things farmers buy had fallen only to 82 per cent of the 1926 average. By the end of 1936, farm prices had risen to 65 per cent of the 1926 level, while prices for goods purchased by the farmers have not yet risen above 1932 levels.

The market for Canadian farm produce at home depends to a very large extent on the activity in other industries. Material recovery was recorded by most of these industries during 1936. Preliminary estimates show that the average level of production in 1936 was at least 8 per cent above 1935. The manufacturing industries showed an improvement of 11 per cent for the first ten months of 1936, while newsprint production and the output of electrical power reached new all-time high levels. Construction has lagged behind other industries, but the increase in private building rather than public enterprise is an encouraging sign. Employment has shown a material advancement in the numbers actually employed.

A 4 per cent rise in retail sales and increases in merchandise car loadings indicates that consumption during 1936 was higher than in 1935. The income received by farmers was above that of the preceding year, and indications are that for the first six months of 1937 a further increase will be recorded.

Meet Indiana's 1936 Onion King

(*From page* 15)

does Andy know that acts like a magnetic force in piling onions high on his crop acres?

Andy's 1936 onion crop comprised 40 acres, and the nation's record-breaking acre that produced the 1,471.98 bushels of U. S. No. 1 onions was situated in one of his 7-acre fields.

There is no doubt about how Andy feels regarding the use of commercial fertilizers. A peep at the crop history of this 7-acre field would be evidence enough. In 1933, following a 200-pound per acre application of 2-8-16 fertilizer, 25 pounds of mint oil per acre were obtained. Then, the following year, 35 pounds of oil per acre were produced, and 200 pounds of 3-9-18 fertilizer were applied on each acre. In 1935, onions were planted that produced only an average yield. That year 700 pounds of 2-8-16 fertilizer were used on each acre.

This year, Andy applied 500 pounds of 0-20-20 fertilizer broadcast and then used 300 pounds of 2-8-16 under the row. His muck soil, which has a reaction of pH 5.7 (medium acid), was plowed on April 2 to a depth of 12 inches, and later it was double disked and dragged. On April 21 "King Andy" seeded his onions, placing the seed in the soil with about an inch of covering, with the fertilizer that was being put into the row drilled under the seed about 2 inches deep. The growing crop was wheel-hoed five times and hand-weeded three times. By September 7 the onions were ready to take out of the soil. They were harvested within the next 4 days.

The seed used to produce the record onion yield was imported from Denia, Spain, and is of the Sweet Spanish variety. Andy says that right now he can't get any more seed from Spain, because of the revolution in that country. However, he has some left from last year. Last spring he sowed 3¼ pounds of seed per acre.

Andy has other ideas about onions besides producing high yields. For instance, he says:

"The onion is a member of the lily family. If we develop it properly, we can invade the floral markets and grow flowers and food from the same bulbs. In the future, people will be wearing onions as well as eating them."

In regard to what the "King" is planning for his muck farm, he says: "We are diversifying our farming business now, planting equal acreages to onions, mint, and potatoes. It is my belief that farming as a business in the next few years is going to pay handsome dividends, provided, however, a farmer keeps up with research, modern equipment, and is not too smart to be taught new methods. The value of fertilizer in an onion crop cannot be overestimated."

Present Trends in Fertilizer Usage

(*From page* 22)

reduced erosion from one-half to one-fifth of that occurring on unfertilized soil.

The soil conservation program attracting national recognition at the present time is based primarily upon a farming system that will maintain a more effective plant cover, through crop rotation with grass and legumes to form dense sods that hold the soil. An improved stand of grass in the Great Plains that increased the protection from 16 per cent to a 40 per cent cover, cut down erosion more than half. The conservation of water is dependent upon getting more of the rainfall into the soil and holding it there for crop growth. Humus and plant roots about control water penetration into the soil. In Missouri, old soils depleted of their humus held only half the water of virgin soils rich in humus and retentive of moisture.

Fertilizers have an important place in bringing back grass and legumes to our fields. Fertilizers make vigorous plants and deep root systems that enrich the soil. With abundance of vegetative growth dense sods and branching roots there is little cause to worry about loss of either the soil or its moisture, except as the water is used by growing plants.

In highly developed areas the use of fertilizers is already well established. A county agent from an Oregon county with city markets recently stated that vegetable and small fruit growers in his territory used 1,000 pounds to a ton of high-grade complete fertilizer to the acre. In some cases as much as 1½ tons to the acre were used.

These successful growers in a specialized industry have taught the farming public much about possibilities in the use of fertilizers. The importance of liberal and complete fertilization to bring high yields and superb quality has been particularly evident. Nitrogen produces a tender succulence, much sought after in some crops, but with it a high susceptibility to disease. Potash plays an important part in increasing resistance to fungus diseases. Phosphorus produces roots and seed, while potash favors production of sugar and starch. These various functions of the plant nutrients are given consideration by the vegetable grower. Other things than the standard N-P-K sometimes need attention. An investigator recently stated "Every plant must have a complete and adequate supply of nutrients for maximum growth. What the soil does not furnish the grower must supply with fertilizers."

Controlling Factors

Future crop yields in a given locality depend upon adequate evaluation of three important controllable yield factors; (1) tillage including proper seed-bed preparation and planting, and weed control after planting, (2) crop rotation which introduces a sufficient number of sod crops to hold the soil and renew the humus, (3) fertilization and liming to grow desirable types of crops and obtain yields that are profitable. W. W. Weir states that it took 3,000 years to learn the significance of crop rotation, and perchance we have not all learned yet. The fertilizer industry is about 85 years old. Let us hope that much less than 3,000 years will be needed to develop an adequate system of soil fertilization. Present signs indicate that considerable progress has already been made and that more is in the making.

During the past 10 years marked progress has been made toward more effective placement of fertilizers with reference to the seed. More adequate fertilizer distributing machinery recently developed has perhaps doubled returns obtained through fertilization. With all our progress there is yet much to learn and even more to do in the way of practicing the best we know. Our attitude in this respect at present is more favorable than it has been before. Farmers and growers when met in conferences seem anxious to obtain the latest information on soil problems. They want to know how to conserve fertility and to increase yields through economic fertilization.

Mineral Fertilizers for Pasture Improvement

(*From page* 8)

had been stimulated by the use of minerals on soil previously limed, to such an extent that it produced more nitrogen for growth than sulfate of ammonia at the rate of 150 pounds per acre.

This 2-year greenhouse test substantiated field experiments, indicating that superphosphate applied alone or simultaneously with lime, on soils of high phosphate-fixing power, is not fully effective in stimulating plant growth. Since available phosphorus is generally low on pasture soils, the addition of potash is not stimulating until the supply of available phosphorus has first been increased. Lime applied well in advance of other mineral treatments has a beneficial effect on the availability of phosphate fertilizers on certain depleted soils.

In March of 1936, tests of lime and fertilizer treatments were established on 24 typical permanent pastures in New Jersey, to survey the type of response which might be expected from various fertilizers on a wide range of soils. Although it will require a longer period to fully demonstrate the principle indicated by the controlled greenhouse experiments, the field results of the first year are rather convincing. Immediate favorable response to simultaneous applications of lime, phosphate, and potash was observed only on soils with relatively mild acidity and high content of available bases, particularly calcium and magnesium. Such types as Dover loam, Washington loam, and Chester gravelly loam showed favorable response, but none of the red soils of the Piedmont formation, the Coastal Plain soils, or the acid soils of the Appalachian highlands showed marked improvement during the first season after spring treatment. Lime alone was applied to plots in all 24 pastures in 1936, and mineral treatments are to follow in 1937.

It is obvious that indiscriminate use of mineral fertilizers may be disappointing, particularly on many depleted soil types, even though soil tests indicate a serious shortage of mineral nutrients. It has been shown that a full season is required for lime to penetrate pasture sod and appreciably change the soil to a depth of 1 inch. Apparently it would be a safer procedure to lime well in advance of other soil treatments rather than apply lime and mineral fertilizer together, unless the soil type is one which is known to respond satisfactorily to simultaneous applications.

Analyses for available soil nutrients were made on each of the 24 test pastures in New Jersey, with interesting results. In general, the supply of available phosphorus was quite deficient, and in many cases the calcium and magnesium supplies were quite low in spite of acidity values that were only mild to moderate. The situation on 24 permanent pastures was as follows.

Supply of Available Nutrients	Number of Pastures Observed			
	Potash	Phosphate	Calcium	Magnesium
Medium to high	6	0	4	2
Below medium to low	14	3	11	9
Very low to trace	4	21	9	13
Total pastures	24	24	24	24

It is clear that the supply of available minerals is inadequate on the majority of these permanent pastures which have not received treatments in recent years. The most impressive feature of these tests was the fact that every pasture was deficient in at least one of these essential nutrients, and some were deficient in all four.

The Urgent Problem

The immediate problem in pasture improvement is to find the most economic way of raising the supply of the essential soil nutrients to a higher level. The rewards are great for using treatments which actually increase the availability of the mineral nutrients. Perhaps the best index as to the degree of success obtained in such treatments is the increase in abundance of legumes, particularly white clover. In the field experiments cited earlier in this report, the total nitrogen content of the herbage on the lime-phosphate-potash plots for the year was 123.9 pounds per acre in contrast to 47.5 pounds on the untreated plots, a difference of 76.4 pounds. Assuming a normal efficiency of 40 per cent in utilization of nitrogenous fertilizers by crops, it would have required 830 pounds of sulfate of ammonia to produce a similar improvement in protein yields of pasture herbage, without the aid of clover. Such tremendous yields of nitrogen (or protein) will be provided by clover without cost, where conditions are made suitable for this species. Moreover, nitrogen fertilizer cannot completely take the place of clover, since the legume is deeper rooted than grasses and thus is able to make more growth during the critical dry months of July and August.

Nitrogen fertilizers undoubtedly are of predominant importance in pasture improvement. The question is primarily whether the nitrogen may best be supplied by encouraging growth of a legume, or by application of commercial fertilizer. The immediate response obtained by applying sulfate of ammonia, nitrate of soda, and other soluble nitrogen compounds makes them an attractive treatment to recommend to farmers, even though such applications may not be the most valuable in the long run. Aside from this point, nitrogen fertilizers do have a definite place in pasture management, whenever the problem of stimulating legumes has not been solved. The use of nitrogen fertilizer, however, actually increases the need for minerals, since greater growth of herbage means more rapid exhaustion of soil minerals.

As a matter of fact, the most efficient use of nitrogen may be made only when the current supply of mineral elements is adequate. Striking evidence on this point is provided by the following comparisons made on 3 permanent pastures in 1936.

The available soil phosphorus was quite low, the pH values were 5.8 to 6.0, and the calcium content medium to high on these 3 soils. The low yield on the Penn loam soil was partly due to the severe drought which affected the region in which this test was located. The treatments were made in late March, with the fertilizers broadcast all on the same day. The nitrogen was derived equally from nitrate and ammonia fertilizers. Since much of the seasonal growth on the nitrogen plots occurred within 2 months after treatment, the beneficial effects of the minerals must have been due largely to the potash supplied. Neither the lime or phosphate could have penetrated sufficiently in that period to be of great value.

It is of course not a new principle that potash is essential for efficient utilization of large amounts of nitrogen. However, it has frequently been assumed that there is a sufficient reserve of minerals in the soil to provide grass with all the nutrients it may need for at least a year or two under heavy nitrogen feeding. In these experiments, nitrogen fertilizers alone did increase yields substantially over the untreated plots, but the addition of the mineral treatment more than doubled the response to the same amount of nitrogen on those soils not rich in potash. Apparently, the supply of available potash in pasture soils must be relatively high to provide full response to liberal dosages of nitrogen fertilizers. The returns per unit of nitrogen will doubtless be even

Soil Type	Available potash in Soil	Yearly Yields of Dried Clippings		
		Nitrogen Fertilizer Alone (60 Lbs. N. per A.)	Nitrogen Fertilizer Plus Lime and Minerals	Per Cent Increase
		Lbs.	Lbs.	
Penn loam (shallow phase)	Medium	1,160	1,847	59.2
Bermudian silt loam	Medium plus	2,620	3,446	31.5
Sassafras loam	High	2,857	3,119	9.2

greater where the available phosphate and calcium supplies are also high.

Successful improvement of pastures involves factors other than proper soil treatment, critical as this may be. The elimination of shrubs, trees, and other non-productive vegetation must precede liming and fertilization, in order to facilitate the use of broadcasting machines and permit maximum plant response. On many pastures the superior forage species are not present because of low soil fertility, and must be introduced to fully utilize the soil resources after these have been restored to a favorable level. In addition, the plant growth produced must be utilized by efficient grazing practices, or the value will be lost. It has not only become evident by experiments in several states of this region that proper soil treatment does pay handsomely on pastures, but that a study of each soil type and pasture will be well worth while to determine the most effective way of improving soil fertility to support productive and nutritious types of pasture herbage.

Learn Your Soil's Limiting Factors

(*From page* 20)

constantly cropping up, like magnesium in various parts of New England, to work havoc with plant growth and yield unless the symptoms are recognized and overcome with proper treatment.

Many of these special conditions have already been recognized and remedied in a broad general way, such as the application of sulphur on soils of the Pacific northwest. It is quite possible that the humid northeast region would be suffering from a sulphur deficiency were it not for the fact that fertilizers carrying sulphates, such as the ammonium sulphate and calcium sulphate in the superphosphate, have been constantly applied.

The use of copper on the Florida Everglade soils is another case in point. According to Superintendent Daane of the Belle Glade Substation, before cropping is in any wise successful, an application of copper sulphate must be applied to this type of soil. Once this is made, response is secured from potash and phosphorus, but until copper is applied there is little use to fertilize with anything, so serious is copper deficiency.

This appears to indicate a very delicate balance of soil nutrients for correct plant growth. Unless this balance is maintained, yield results are unsatisfactory and the growth is often accompanied by symptoms of malnutrition either on the foliage or in the roots, fruit, or in the quality of the crop produced.

All this discussion about boron is pertinent in this connection. So many instances of nutritional difficulties with cabbage, cauliflower, turnips, and other crops have been noted and traced to boron deficiency that there can be little doubt that boron is the guilty member of the plant-food group. However, a couple of decades ago this element was considered merely an accidental one in plants, absorbed by plant roots merely because it was in solution in the soil, but not utilized in plant nutrition.

It is, of course, unfortunate that boron in large quantities is toxic to plants. This fact, apparently indisputable, has tended to obscure the beneficial effects of the substance when applied in limited quantities. So many favorable effects have now been reported for its use that a new avenue of research has been opened up involving the limits of tolerance, the losses that occur to the element by leaching,

Lack of phosphorus resulted in stunted potato vines.

its effect on a whole range of crops in regions where it has been found to be deficient, and particularly, accurate soil tests for the availability of the substance, if any is present in the soil, to the extent that it may be predicted with more or less accuracy whether its application is necessary for optimum plant growth. Furthermore, a whole range of crops must be examined to ascertain whether boron need for one crop is greater than that for another in regions where the element is found to be deficient.

It would be ideal if all crops were like tobacco and would show by characteristic growth habits which element is lacking as a nutrient deficiency, so that the lack could be directly met. Most of them probably do to a greater or less degree, and it remains for these symptoms to be diagnosed for proper remedy. Even if these symptoms are patent to the trained investigator, they are still mostly beyond the ken of the farmer, and in his mind any difficulty that crops up is more likely to be diagnosed in the light of his information as disease symptoms rather than those of malnutrition.

A good many of the soils of the northeast region are on a rather delicate balance with respect to nutrient elements, as well as with soil acidity. In some cases acidity is at the point where the application of an acid fertilizer will depress the yield when compared with one which has had enough limestone added to neutralize the acids developed by the fertilizer itself.

Another point of particular interest to potato men with respect to neutral or basic fertilizers is that these are applied with the planter in narrow bands, and the acid-forming elements may leach out and not be neutralized by the lime that has been added, which would tend to leave zones of soil in which there would be enough lime to promote potato scab.

Copper is not likely to be a limiting factor on potato farms. On other farms where bordeaux sprays are not applied this element may cause plant disturbances, although its lack is probably more pronounced on organic soils, such as the mucks and peats sometimes used for vegetables and special crops. The same is true of manganese, but this element is often thrown out of availability by overliming operations, and it may be necessary to remedy the difficulty by applying manganese in a form suitable for fertilizer use.

Constant Deterioration

No one is ready yet to state that boron and these other elements should be mixed into all the fertilizers in the northeast. The extent to which the soils have suffered by leaching, by crop removal, by the sale of livestock and its products, and by other means through which fertility is lost is yet to be ascertained. Certain it is that leaching and cropping, pasturing, etc., still go on, taking their toll of valuable and limiting elements that sooner or later must have attention by farmers and fertilizer manufacturers. This whole question of acid-forming fertilizers needs study and experimenting with to determine whether their neutralization is necessary and in all cases desirable.

The pioneer age in land settlement in the United States is now a matter of history. More and more the fact is impressed upon us that we must use the soil we have and discover its needs for profitable crop production. Its use in the future is bound to take us back into the pioneering age, for the processes of soil deterioration are constantly present in one form or another tending toward the depletion of precious stores of this element or that, any one of which may be fundamental, not only for plant, but likewise for animal and human nutrition.

These problems even now engage the attention of scientists and farmers in an absorbing struggle. They involve the fertilizer manufacturer to an even greater degree than ever before. An even pace must be kept with the destructive forces if all is to go well. Whatever occurs, the struggle is bound to be interesting.

Potash for Cotton in the Delta Foothills

(*From page* 10)

this average increase due to potash amounts to $14.24 per acre. Mr. Atkinson says the first year's results with potash have been worth $10,000 to him on his plantation.

Potash increased the yield 232 and 310 pounds per acre respectively for 1935 and 1936 at the Schaeffer field. The 2-year average increase for potash at the Schaeffer field is 271 pounds of seed cotton per acre over the yield with nitrogen alone. Valuing seed cotton at 4c per pound, this average increase due to potash amounts to $10.84 per acre.

The average increase due to potash in all fields in 1936 amounts to 174 pounds of seed cotton per acre over

RESULTS OF ELIMINATION FERTILIZER TESTS ON COTTON

	Pounds of Seed Cotton Per Acre						
	Delta Foothills Proper			Coldwater-Tallahatchie-Yazoo River Basin			
Treatment	Atkinson field	Hemphill field	Ladd field	Smith field	Schaeffer field	Gary field	Av. all fields
	1935			1935			
N	728	734			1,813	1,290	1,141
NP	844	756			1,964	1,388	1,238
NPK	1,112	909			2,048	1,401	1,368
NK	993	815			2,045	1,342	1,299
	1936			1936			
N	1,077	1,442	1,317	1,339	1,459	1,106	1,290
NP	1,074	1,491	1,342	1,384	1,811	1,121	1,371
NPK	1,504	1,501	1,713	1,347	1,848	1,179	1,515
NK	1,524	1,394	1,583	1,389	1,769	1,122	1,464
	Average 1935-1936			Average 1935-1936			
N	903	1,088			1,636	1,198	1,206
NP	959	1,124			1,888	1,255	1,307
NPK	1,308	1,205			1,948	1,290	1,438
NK	1,259	1,105			1,907	1,232	1,376

the average yield with nitrogen alone. In four fields the 2-year average increase due to potash is 170 pounds of seed cotton per acre.

These results indicate that future fertilizer recommendations for cotton in the foothills area will tend toward a complete fertilizer. It must be borne in mind, however, that these results are for only 1 and 2 years and may be materially changed within the next few years.

The Tung Oil Industry

(*From page* 18)

izer, 4-14-10, applied at the rate of 200 pounds per acre gave a yield of 1,317 pounds of nuts.

Checked against the fertilized plots was an acre of the same age trees on the same type soil and handled with the same care which, relying wholly on the original fertility of the soil, produced only 755 pounds of nuts.

Research in horticulture at the Louisiana State Experiment Station has resulted in tentative recommendation of a 4-8-4 fertilizer for tung oil trees, applied at the rate of 1 pound per year of age of tree until the tree is 4 years old. Like the Poplarville Experiment Station in Mississippi, they recommend the use of legumes, such as soybeans, cowpeas, and crotalaria.

For Future Success

All persons making a study of the possibilities of tung oil as a potential cash crop agree that a lot of experimentation is necessary before any definite value of the industry can be arrived at. Among the things that they are interested in are the segregation and breeding of trees that are high producers; the production of a nut that is high in oil content; the proper methods of planting, cultivating, and fertilizing the trees; and numerous other data that are highly desirable in properly establishing the industry.

Summer and winter legumes have been grown to determine the value of cover crops alone as soil-improvement agents. All have proven beneficial, but the cover crops are being varied in an effort to determine which are giving the best results. "The object," Dr. Robert says, "is to increase the humus content of the soil and the nitrogen turn-over for the tung trees. Check plots, which were not planted to legumes, produced 306 pounds of nuts per acre from trees planted in 1932. On the plots where legumes were grown, 700 pounds of nuts per acre were harvested."

Trees, it is found, grow and produce more satisfactorily when cultivated. Shallow cultivation at intervals of 6 to 8 weeks, depending on the vegetation, reveals a marked increase in growth and production over uncultivated plots.

Tung trees, like any other crop, are affected in growth and production by the quality of the soil. Poor land, minus the necessary plant food, will not produce tung trees profitably. If the kind and quality of plant food is not available, it must be put there in some form if the orchard is to prove profitable. And Dr. Robert states, "the pitfalls of the industry lie in the failure of over-zealous individuals to recognize that good soil and the proper treatment of young and old trees, along with certain natural requirements, are essential in a profitable venture in the production of tung oil."

Care should be exercised in planting tung trees. They should not be spaced closer than 25 to 30 feet on an equilateral triangle basis. Trees spaced 30 feet apart in this manner would give about 50 per acre, and 25 feet apart, 70 per acre. Since these trees live and grow for a half century or more, if properly handled, ample space should be allowed for them to expand. One 30 years old, is 41 feet tall, has a limb spread of 40 feet, and measures 72 inches in circumference 1 foot above the ground.

It has been found advisable in transplanting tung trees to leave all roots possible. The tap root should be not less than 15 to 18 inches long, and the holes for planting 2 to 3 feet square and 2 feet deep. A few shovels of stable manure or decayed vegetable matter mixed with top soil and placed in the bottom of the hole, the top soil carefully sifted between the lateral roots, and 1½ to 2 gallons of water siphoned around the tree are helpful in getting the young trees away to a good start. A little grass, straw, leaves, or other vegetable matter spread around the tree will aid in keeping the soil moist, and in eliminating baking and hardening.

Young seedlings, as a rule, should be cut back to within 6 or 8 inches of the ground, and only one bud—the strongest one nearest the ground—should be left, allowing only one body from the roots, which will branch from 3 to 5 feet from the ground. One-year old seedlings are normally better than 2-year old ones which require more careful handling than the younger ones.

Unlimited Market

The two major problems of all cash crops, economic production and profitable marketing apply to tung trees. However profitable marketing as far as tung oil is concerned, is solved for many years, in the opinion of Dr. Robert, since the amount of tung oil used is now limited by the amount available. Present use of this oil, if supplied by the American market, would require from 400,000 to

Four-year-old tung tree which produced an extra heavy crop of nuts in 1936. It was cultivated twice a year and planted with a summer cover crop of cowpeas and a winter crop of Austrian peas.

500,000 acres of trees. In addition, the United States annually imports linseed oil, which is inferior to tung oil for paint purposes, and it would require a minimum of 300,000 acres to supplant these imports. Moreover, new uses for tung oil are constantly being discovered by manufacturers, thus opening up new potential demands for the product.

Land Grant Landmarks

(*From page 5*)

ing and engineering, they no doubt "bothered" and bored some individuals beyond measure. But no less a worthy statesman than Henry Wallace himself is particularly disgusted with the methods of the "get 'em quick" squads and their restless lobbying; and if I mistake not, he is listed with those who first grew line-bred hybrids instead of depending on half measures with wind-pollinated mother ears alone. Abolish or crush out rugged individualism and you close new frontiers of scientific truth.

NO complete record could ever be compiled of those who helped carry the ball toward our first land grant college touchdown. Here and there in obscure pamphlets, aged farm journals, yearbooks, and almanacs the names of old heroes of the hoe are uncovered like stray kernels beneath the dust of ancient threshing floors. All one can do is to select for praise a few veterans of the vernal craft and bless the rest vicariously.

Staid burghers rattling over corduroy roads in wagons and chaises shortly after the redcoats decided to do their farming in England were amazed at what they beheld on a hillside meadow near Burlington, N. J. Rubbing the specks from their vision, they halted the nags and gazed again. Woven in rich green hues of rank timothy and fescue, in contrast to a duller, shorter growth of grasses, were the words, "This Has Been Plastered." Maybe they figured that the one who spread the minerals across the meadow was also plastered, just as students remarked about Jefferson's wobbling wall at the University of Virginia.

"Lack-a-day! Methinks this is just another of Ben Franklin's noddy notions," they said, pushing onward to the market place, in some concern over the Postmaster General's peculiar state of mind. They knew the erratic printer was addicted to all manner of cultural kinks on his plantation, such as writing a treatise on gardening and grafting, and bringing into America some roots of a new herb called "rhubarb," unexcelled for a spring tonic to be taken in the pleasant form of pies. And not a few of the gentry in the colonies had Poor Richard's almanac dangling from a kitchen peg.

Apparently the redoubtable Ben did some grafting on the scion of his own house, for his son, William Franklin, kept up the agricultural tradition by further monkeying with nature while he was governor of New Jersey. At any rate, we find him granting the charter to Rutger's (Queen's) college in later years, and this institution claims fame as the first college to branch out under state aid for the folks who got callouses on their hands.

The Franklins helped form the pioneer agricultural body, the Philadelphia Society for Agricultural Promotion, and this group of worthies made quite a ceremony when the first medal ever struck for farm achievement in America was presented with double-barreled oratory to Colonel George Morgan for his neat farm landscape scheme. He and John Stevens, of Hoboken, were the first men who made the astounding prophecy before 1800: "No subject of rural economy will eventually be of more importance to agriculture than the cultivation of lucerne."

To the north were other restless souls whose zeal for better farming in the mass led them to travel and debate at a time when fees for such services would not keep them in one red flannel suit required for a hard winter. The generous-minded old zealot for better fairs, Elkanah Watson, of Massachusetts, organized his brethren and then sashayed hither and yon over adjacent colonies when hithering and yonning was no limousine luxury.

HIS plans for attracting dirt farmers to exhibit at fairs where the classifications were up to snuff, and therefore something to sneeze at, meant that the spirit of competitive zeal had come to the aid of agricultural education. This has ever since been the best way to get something done in farming—make a contest of it. Nothing so inspires strong men to find better methods than to get the daylight licked out of them in their own business! Even the 4-H clubs use Uncle Watson's idea, and don't know it!

Two other long-sighted men emerged about this time, but far ahead of their era. Both of them outlined clearly the need for an agricultural college under public support, probably the first times this was urged on the slow-witted but nimble-bodied citizenry. Jesse Buel in 1825 petitioned the legislators at Albany for an agricultural college like Switzerland enjoyed; and as a judge and publisher, he exerted wide influence. Much earlier, Thomas Budd, a West Jersey Quaker, advanced the plan of granting the rentals of public lands for the support of farm schools and vocational education. The whole Quaker concept of learning was directed broadly toward reaching the submerged 95 per cent as fast as funds and liberality would permit.

No sketch of this sort would be complete minus a few fancy foreign names. We haven't always accomplished every good and wise project on our own brain power alone. Some hunches have been imported, and, of course, improved upon under our masterly attention. As space is scarce, one only need be mentioned as a contributor to farm education leading eventually to land-grant establishment. But the name is flowery enough to serve for all of them—J. Hector St. John de Crevecoeur of Normandy. He ran two farms as experimental stations in Orange County, New York, and in Sussex County, New Jersey. He wrote voluminously and lectured about his wide and observant travels. Known as "Agricola" to his eager readers, this French savant is said to have introduced sainfoin, alfalfa, and vetch to our shores. I might wedge in one more, a pioneer nurseryman, botanist, and breeder, Andre Michaux, contemporary with the long-named Frenchman. And so return to Yankee notions again.

THE year that George Washington died on his peaceful farm at Mount Vernon, where the annals of Young had been his guiding star, a doughty New Yorker, graduated from Queen's college of New Jersey, stepped to the bat at various times and used his revolutionary war language with effect in asking loudly for an institution where husbandry might be taught as consistently as Plato and Aristotle. Put a wreath on the grave of Simon DeWitt, another booster for land-grant learning.

At the turn of the nineteenth century more people began to expect a different and a better system of training for vocations, as well as a richer background of research so that old empirical doctrines might vanish. Among the schools that feebly organized themselves to fill this need are: Boston Asylum and Farm School; Rensselaer Institute of Troy; Trinity College, Hartford; Union Academy and Freehold Institute of New Jersey; Amherst College, Massachusetts; the Farmers' College near Cincinnati; and that peculiar, individual academy run by James Mapes of Newark. Mapes was a real promoter, as his graduates scattered over the scenery and advertised in *The American Farmer* and *The Ploughboy* as being prepared to sell their services as "consulting agriculturists." When things get to such a pass it signifies that farming is emerging as a profession.

SOME of this eastern, fashionable, farming fever must have been carted across the prairies to the new developments along the Mississippi, for the scene soon shifts to the last ditch struggle that occurred in good old Illinois prior to Lincoln's graceful act in 1862. We must not forget that in the interval a few enterprising states launched forth with limited courses in the arts of food production and mechanics. Among the prominent ones Michigan heads the list. But what everybody wanted was a national policy, a Federal recognition, a move to unite the forces pleading for a better rural culture. As everyone knows, the actual granting of some wild land to colleges provided only a meager sum and an unreliable one at best. It was the principle of the thing that makes us salute this mile-post. The robust farmer and his professors wanted to get their feet wedged into the door. That's all—just a good pushing chance! That they have been successful pushers can be told by the graduates and finances of the fifty or more land-grant institutions doing business today.

When we reach the last furlong of our story, it is perplexing to know whether Jonathan Baldwin Turner of Illinois and Yale, or Justin Morrill of Vermont should be credited with drafting the land grant magna carta. Turner attended a few fiery farm meetings in Illinois and saw to it that the heat was kept under the boilers. He got next to both Senator Douglas and Candidate Lincoln at a period when the promises of honest but ambitious men really meant something. Morrill was equally persistent among his Coolidge Calvinistic fellow New Englanders, who probably wanted to trade off some Government property for a college rather than buy one. For once East and West made a team in double harness for a common agrarian cause. Put that down in red ink in these days when regional farm blocs act like blockheads.

After the first bill of 1857 was vetoed by Buchanan, Morrill removed his coat and vest, snapped his suspenders up tighter, expectorated on his digits, and waded in to educate Congress in earnest, and Turner handled the proletariat. Both Lincoln and Douglas had promised, if elected, to sign the University Bill. Our readers know the contents of said document, which had the vestiges of "state bribery" in it to the consternation of holier folks. I believe Iowa and Vermont and Connecticut were the first ones to be bribed. Iowa has never gotten over it! Her "Ames" for agriculture have been fairly remunerative despite her rashness.

FILES tell me that the Morill Act passed the Senate thirty-two to seven, and the House endorsed it ninety to twenty-five. Nobody saved the pen Lincoln used to sign it. Other pressing business drove mementoes of that kind into the discard, and no flash bulb artists were there to say, "Smile, Uncle Abe; and grin, Mr. Morrill!" History is silent on smiles and congratulations. That is reserved for us!

(*Warning—To be continued*)

"BUTTON, BUTTON"

In a crowded bus, a stout woman vainly endeavored to get her fare out of the pocket of her cloak, which was tightly buttoned as a protection against pickpockets. After she had been trying without effect for some minutes, a man seated on her right said:

"Please allow me to pay your fare."

The woman declined with some anger and renewed her attacks on the pocket. After some little time, the man again said:

"You really must let me pay your fare. You have already unbuttoned my suspenders three times."

An Irishman's attic caught fire. His wife, running for the nearest available water, seized the kettle from the fireplace. On her way up the stairs she was met by Paddy. He stared aghast at the kettle in her hand. "Mrs. O'Toole," he said sadly, "but it's a regular fool ye are an' all. Fancy trying to put out a fire with hot water!"

Mandy: "Boy, how did yuh-all get that soot on yo' coat?"

Rastus: "That ain't soot. That's dandruff."

GLADLY

"Mr. Jones, dad wants to borrow your corkscrew."

"All right, sonny," said Jones, reaching for his coat. "You run along home; I'll bring it over."

Golfer (to players ahead): "Pardon, but would you mind if I played through? I've just heard that my wife has been taken seriously ill."

W'en Sis Mandy tell her gal to behave an' have a good time, she say,

"Which you mean, Mammy?"

BLOOD SERGE

A man appeared at the gate of a nudist colony, rang the bell, and waited.

From inside, "What do you want?"

"I want to join."

"You can't join with that blue suit on."

"That isn't a blue suit, sir, I am just cold."

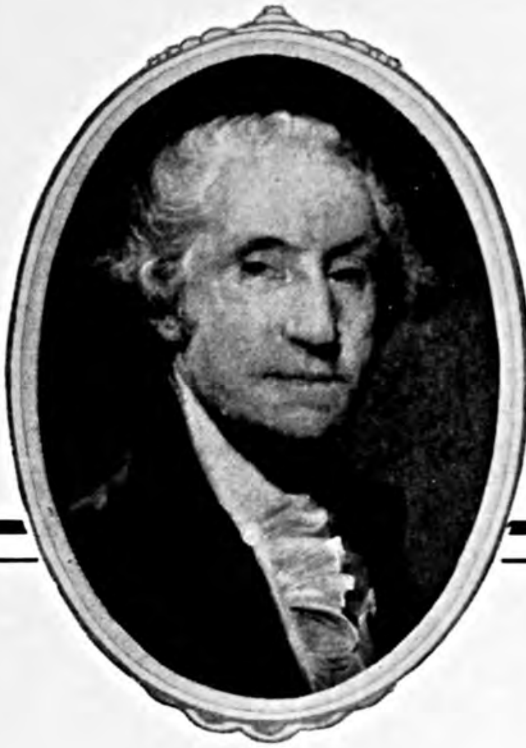
Judge: "Do you wish to marry again if you receive a divorce?"

Liza: "Ah should say not. Ah wants to be withdrawn from circulation."

A woman and child are riding on a Long Island train. As the conductor approaches, the lady opens her purse and says, "A fare for me and a half fare for the boy."

The conductor looks at the boy and replies, "Lady, that boy's got long pants on!"

"In that case," says the lady, "a full fare for the boy and a half fare for me!"



Better Crops
WITH PLANT FOOD

March 1937 10 Cents

The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

Editorial Offices: **Investment Bldg., Washington, D. C.**

VOLUME XXI NUMBER FIVE

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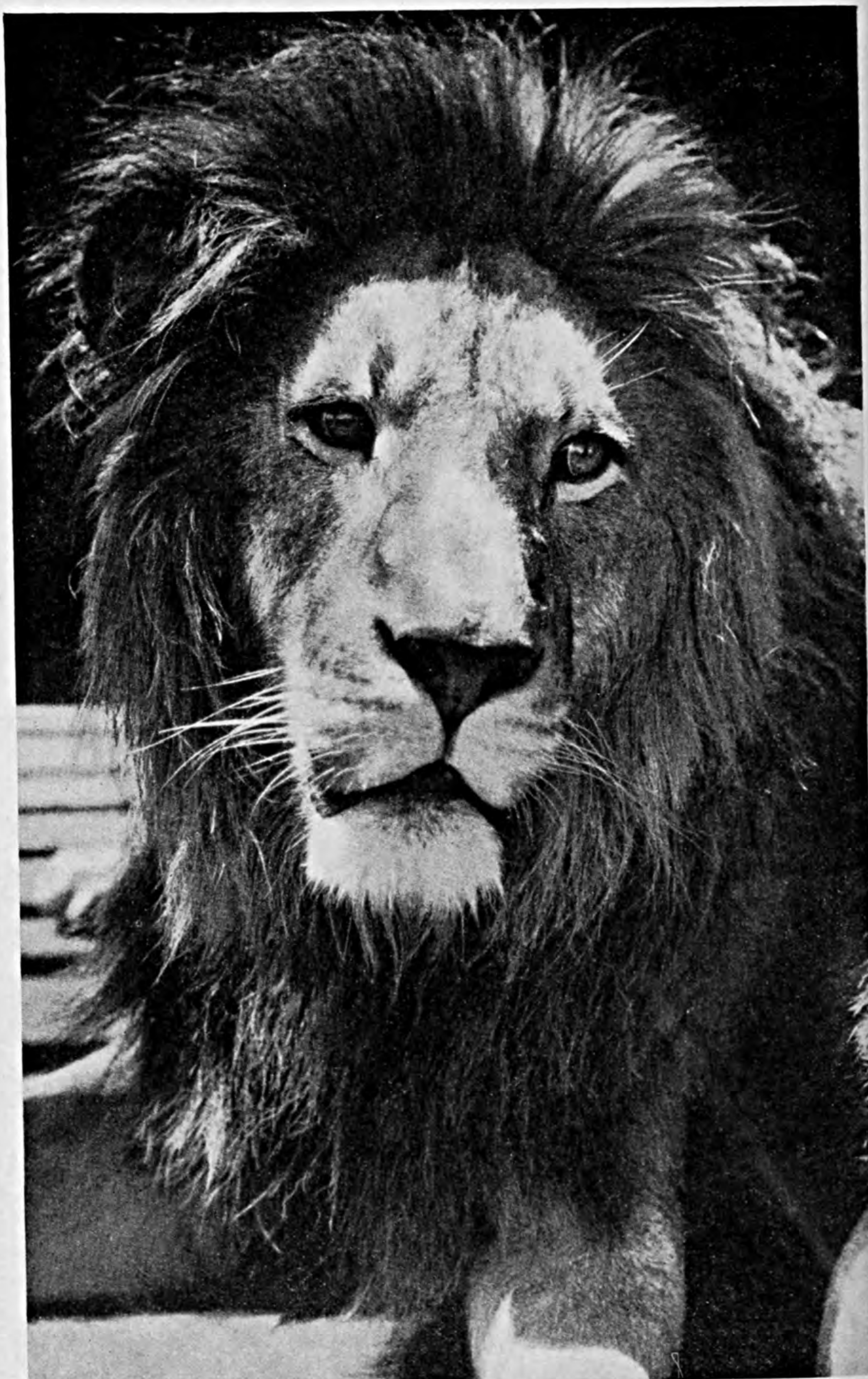

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THE MARCH LION

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., MARCH 1937 No. 5

Jeff gets us ready for--

The L. G. Jubilee

Jeff McDermid

IF I study a stone in the foothills and then jump at elementary conclusions concerning the geology of the Sierras, I might well go right ahead like a sap and tell you what reforms the land-grant colleges should embrace after I have consulted a flunked frosh, a library janitor, and the queen of the junior prom.

But the gentle art of "bunco publico" in the style set by newspaper guess-givers hardly becomes one who has received everything from land-grant institutions, except a passing mark. Hence I shy from the dangers of over-simplification so common to commentators. I have not their talent for designing the destiny of a city after 10 minutes' rest at a gas-house comfort station.

I turn the tables on them by frankly admitting no authentic data for this anniversary excursion, save that gathered during 20 years "riding the range" of dreary junctions and murky depots and hotels with the extension specialists and other by-products of the Morrill and Hatch enactments. If I am wrong, blame it on my land-grant informants; and when I am right, kindly inform the publishers. They will be more surprised than you are!

At any rate, you are assured of dispassionate, disinterested service from this corner of mine anent the responsibilities of the land-granters, after mesmerizing economical taxpayers long enough to reach a diamond jubilee! For if you observe, each land-granter has his own pet improvement to advance.

WERE you to consult the teaching staff, they might desire better formulas for releasing unwanted numbers of cluttering freshmen, contrasting this era of excessively fashionable (not popular) education with that of the days of Father Lincoln and his borrowed tomes. They would, in short, transmit to you the semester's accumulation of indoor auto-intoxication induced by too much steam in the radiators and not enough of it in the students, and prove beyond cavil that the crooners have missed an academic hit by not immortalizing the "bluebook blues."

Should you seek advice on new pathways of human progress from the test-tube fraternity, hidden behind rat-cages, or underneath heaps of fermenting cereals, or disemboweling Wyandottes, with all the eclat of the fellows in Gulliver's Travels, you would probably be lucky to elicit a grunt. Peradventure one of them might emerge from a trance to beg for a few more generous philanthropists and nobler fellowships, with fewer importunate students and impatient extension workers.

Were your next attempt in the direction of the extension group, there at last you would see the power of speech and gesture arise like a lark above the feebleness of dictum and dogma. They are the veins and the capillaries which carry the fluids of life from the academic arteries to the hoi polloi. They are the exposed portions of the great body of learning! They get the perfume and the boils, the kisses and the kicks! They must find the ready answer to the yokel's prayer and come up ever smiling with a fresh excuse for every dilatory digression chargeable to lax administration or unfinished research.

And so, my friends, this begins to look a lot like the supreme court situation—too big a case for the time we've got left! Yet I do not anticipate that it will prove to be so vast and horny a bone of contention.

In measuring the past and "periscoping" the future of land-grant colleges, too many critics forget that these institutions cannot escape the common fate of mortals, that of being intensely human and replete with the idealism and theories, the viewpoints and vagaries of historic Americanism. Specialization often sharpens and intensifies the vision to a limited range on the American target. Each one, whether collegiate or illiterate, aims at his favorite bull's eye.

Hence the deans and directors within land-grant portals embrace some of the dreams of magnificent planning and grandiose scheming, characteristic of LeEnfant, Aaron Burr, Jim Hill, Rockefeller, and Frank Lloyd Wright. Others have the inventiveness of Morse and Edison, DeForest and Ford. Some possess in generous degree the showmanship and flamboyant salesmanship of Barnum, Ringling Brothers, and D. W. Griffiths—and perhaps a much fewer number have the self-reliant trail-blazing, issue-facing spirit of Daniel Boone, Lewis and Clark, or Ezra Meeker.

MAGNIFICENCE, invention, salesmanship, and dramatics are all nationally typical and decidedly helpful in a broader life for the common people, in whose interest the land-grant colleges exist.

But if these hobbies of the mode are pursued to the exclusion of courageous pioneering in the face of derision, deprivation, and defeat, then the land-grant college is losing its grip on reality. What Thoreau said is still true, "Our frontiers are not east or west, north or south, but wherever a man fronts a fact. . . . Be a Columbus to whole new worlds within you!" In jotting this observation down, I must include the four-point spiritual index of land-grant programs given a few years ago by the dean of Oregon

Agricultural College, namely, helpfulness and service, growth and progress, equal opportunity and democracy, and finally, initiative and pioneering.

THIS sage text reminds me of an interview sought with a retiring director of a successful mid-west experiment station, wherein I hoped to tease him into some reminiscences of red-letter days of achievement during the two decades of his administration there. Turning his shaggy head toward me, he remarked, "As you know, I am going into fields of specialized research upon leaving this place. Therefore, knowing as we do that there were moments of pride and periods of disappointment left behind us, I much prefer to talk with you about the future and its opportunities rather than glorify the past, which is dead and immortalized." Coming from a man nearly seventy, this philosophy seemed to me one worthy of wide preachment to that hopeless class of land-grant (or other) leaders, who merely point with pride to the past and weave garlands for moss-grown monuments. Old glories may well serve as a stimulant, but should not be our time-table.

The age-defying character of the best minds in our land-grant colleges remains as the real spur to fresh effort. Dr. Stephen Moulton Babcock was not content to let folks praise him for his contribution to dairy science. He spent his last years silently and busily working both at home and in the laboratory on an involved theory of physics, which was not, as you may suppose, the pottering time-killer of octogenarian whimsy, but a real "lead" which new minds may finish.

TRADITION may well point the way to ambition, or it may cause inhibition, depending on whether one regards academic history as all made or still in the making. We may hastily pass over the small weaknesses and frailities of land-granters, acknowledge their presence, but minimize their effect upon future developments. The "reformers" on the platform who are "deformers" in the classroom, the paper-planners, the splash-water scientists, and others who are long on diagnosis but poor on operations—it is needless to dwell on these few hard kernels in a mess of flaky pop-corn.

One often hears duplication of research as a common fault laid at the land-grant doorway. To the layman like myself, with but a small tithe to pay toward these institutions, I see more difficulty and danger of wasted effort in the realm of animal breeding and veterinary science than I do in the field of plant industry. Plants vary in their soil and climatic needs, making state research fundamentally important; whereas "what ails my bull" in Kansas may likewise cause impotence in Maine or Vermont. Breed a better barley for Iowa, and it may not thrive in Wisconsin or Mich-

(*Turn to page* 44)

The effect of a lack of potash on the ability of corn plants to stand erect. The amount and severity of lodging may often be used as a guide to potash needs.

Better Crops of Better Quality

By M. S. Kipps

Virginia Agricultural Experiment Station, Blacksburg, Virginia

(Graphs prepared by the V. P. I. Office, Virginia State Planning Board from data furnished by author)

HIGH up on the Alleghanies where floods, tornadoes, severe droughts, dust storms, and earthquakes are unknown, but where fertile silt-loam soils and an annual average of 42 inches of rainfall prevails with occasional sub-zero days in winter and 90-degree temperatures in summer, an experiment has been under way for 23 years, attempting to answer some of the difficult questions of farmers. There is one question, however, which farmers forgot to ask until recent years. Is potash needed on our soils for best results?

It has been known that our soils were originally derived from limestone rock and were thought to be high in potash, and because of that fact we have not been exactly potash-conscious. Accordingly, we have been neglecting that part of our fertilizer program. It is true we have been including from 2 to 5 units of potash in our fertilizer mixtures, because we knew that potassium was needed as a proper balancing agent for nitrogen and phosphorus and that perhaps the quantity and quality of the crops were increased. But perhaps we did not know how much this increase would be, especially over a long period of years.

In recent years farmers have begun to ask what the effect of additions of potash to nitrogen, to phosphoric acid, or to both nitrogen and phosphoric acid had on yields of crops in a rotation. Also from the quantitative point of view, farmers wanted to know what effect potash had on the quality of crops, such as percentage of marketable corn, pulling resistance of corn plants, and percentage of leaning and broken stalks.

Effects of Potash

These questions as well as many others have been answered by an experiment on which corn, wheat, clover, and grass hay have been grown in a 4-year rotation. Several of the treatments of this experiment have been selected to tell the story of the beneficial effects of potash. With the aid of table and graphs, this story is more easily told. The bars of the graphs show increases or decreases produced by the addition of potash to nitrogenous and phosphatic fertilizers, when used alone and in combination.

Considering first the effects of potash on yields of the four crops in the rotation, it is readily observed that in every case additions of potash to nitrogen and phosphorus fertilizers increased the yields of the crops. The average increase in yields of all the crops has been over 34 per cent. The greatest response has been on wheat. The yields of wheat in the four comparisons where potash was added were 53 per cent greater than where the other two fertilizers were used alone or in combination. The other three crops were from 24 to 32 per cent greater in yield where potash was added. In studying the increased percentages of yields of the four comparisons, it was found that where potash was added to phosprorus and nitrogen, an increase of 53 per cent was obtained. In like manner, potash added to nitrogen produced an increase of nearly 46 per cent in crop yields. There was an increase of over 29 per cent where potash was added when compared to plots receiving no treatment. The increase in percentage of yields produced by adding potash to phosphorus fertilizer was nearly 10 per cent.

Marketable Corn

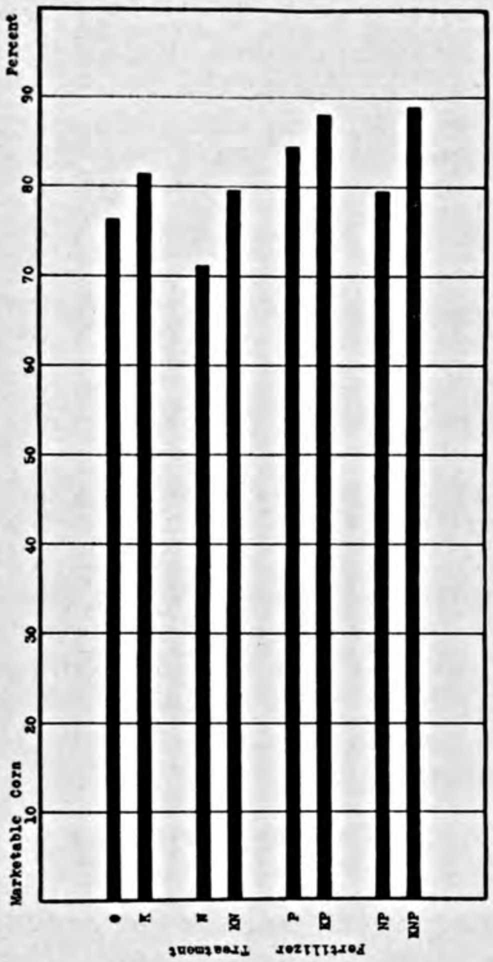
The term percentage of marketable corn is used to designate the amount of good, sound corn harvested. There was a greater amount of good corn on the plots which received potash as a fertilizer. The increase was small—nearly 9 per cent—but its quality was improved just that much.

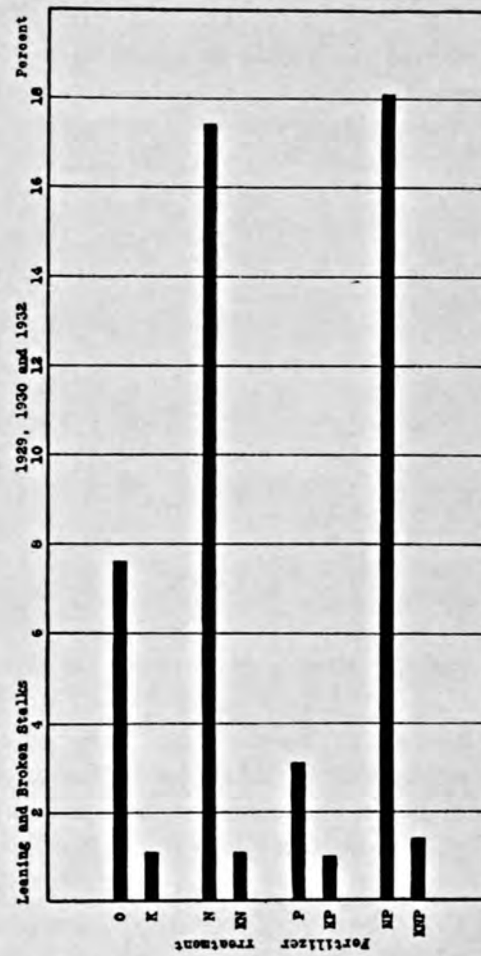
Corn stalks are anchored to the ground by a system of roots. The

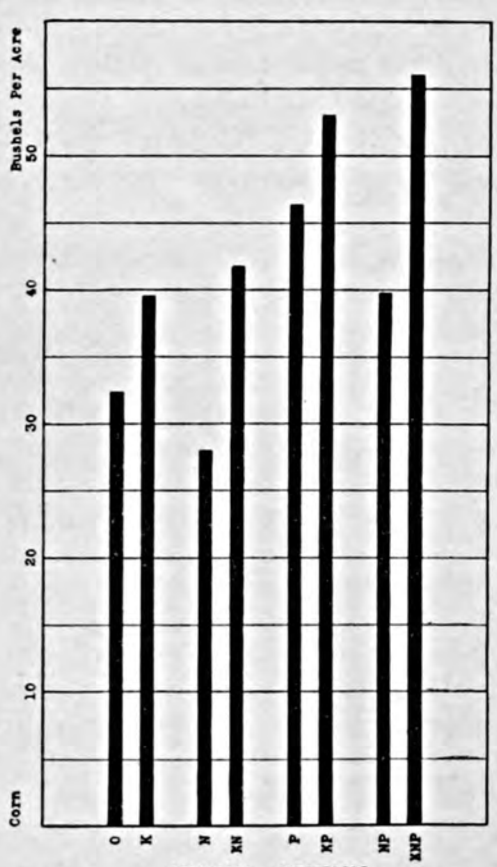
TABLE OF QUANTITATIVE AND QUALITATIVE VALUES PRODUCED BY THE ADDITION OF POTASH TO NITROGEN AND PHOSPHORUS IN A CORN, WHEAT, AND HAY ROTATION.

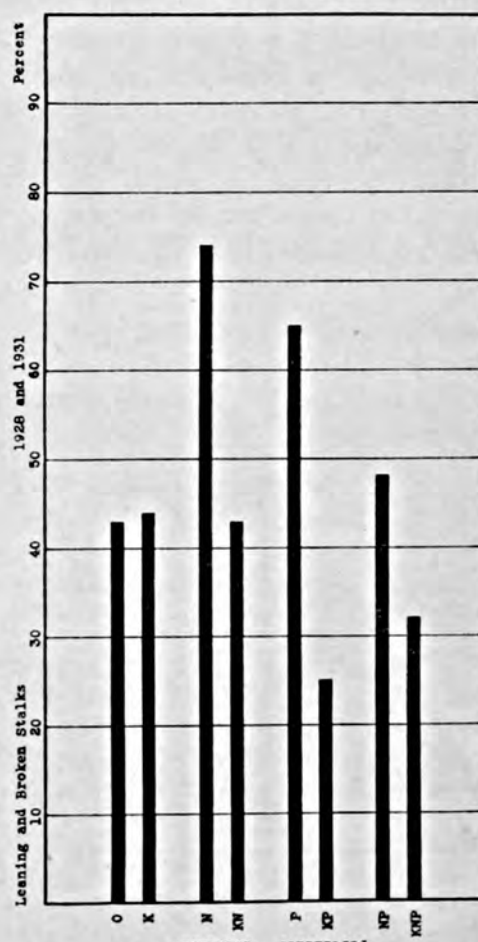
* Treatment	Average yields of crops grown in rotation (1914-1936) Corn Bus.	Wheat Bus.	Clover Hay-Tons	Grass Hay Tons	Percentage marketable corn	Ratio in lbs. Corn to stover	Wheat to straw	Pulling resistance of corn plants, 1927 to 1932	Percentage leaning and broken stalks 1928 1931	1929 1930 1932
O	32.34	6.40	.82	.96	76.33	.94 :1	.48 :1	111	43.0	7.6
K	39.52	10.17	1.01	1.11	81.49	1.00 :1	.58 :1	154	43.7	1.1
N	27.91	5.48	1.01	1.13	71.10	.85 :1	.41 :1	103	73.9	17.4
KN	41.74	10.66	1.19	1.37	79.61	.97 :1	.48 :1	174	43.0	1.1
P	46.34	19.28	1.67	1.87	84.53	1.03 :1	.58 :1	145	65.1	3.1
KP	53.03	19.63	2.03	1.88	88.24	1.00 :1	.58 :1	208	25.1	1.6
NP	39.78	14.93	1.42	1.51	79.51	1.05 :1	.52 :1	131	48.2	18.1
KNP	55.97	23.94	2.14	2.43	88.86	.96 :1	.57 :1	215	32.3	2.1

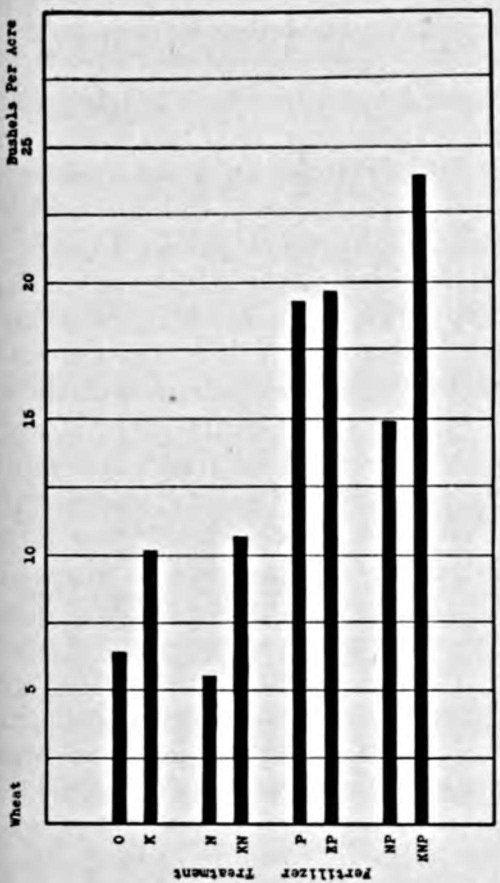
* O—no fertilizer; N—308 lbs. dried blood annually; P—438 lbs. superphosphate annually; K—200 lbs. muriate of potash annually

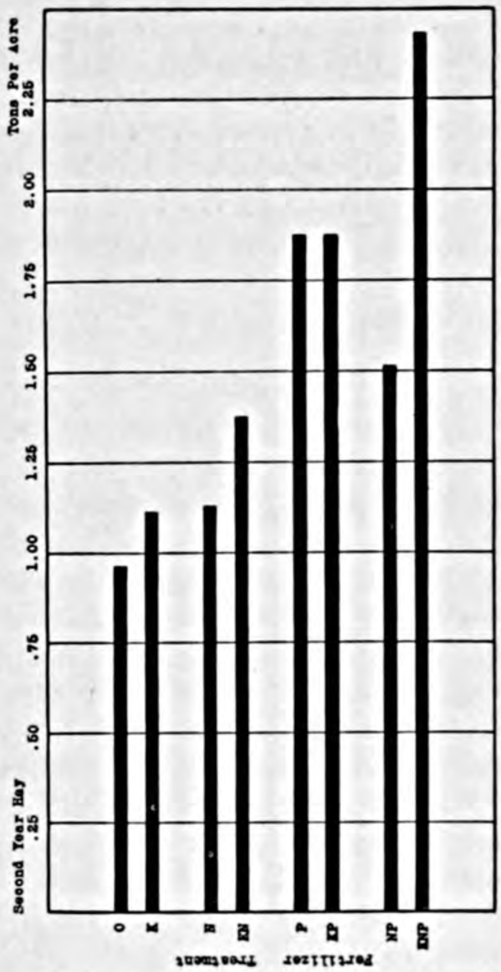

Marketable Corn
Percent
O K N KN P KP NP KNP
Fertilizer Treatment

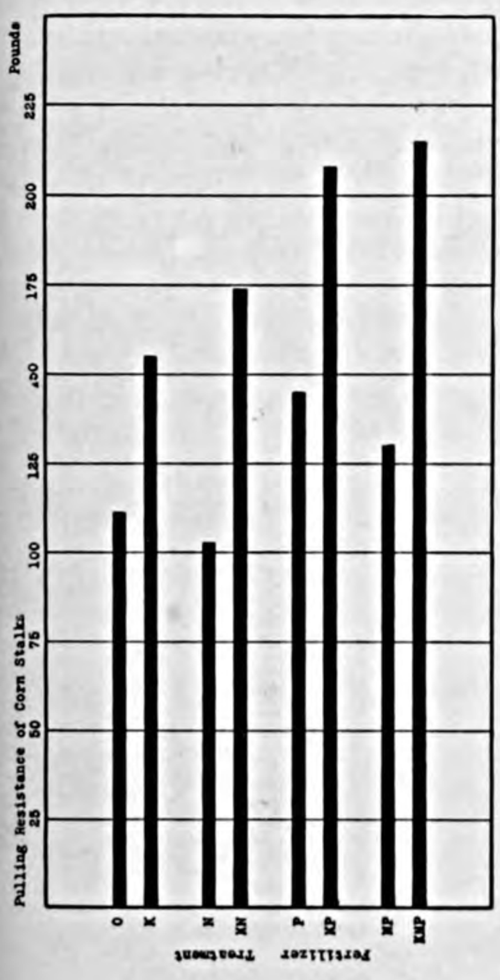

Leaning and Broken Stalks 1929, 1930 and 1932
Percent
O K N KN P KP NP KNP
Fertilizer Treatment

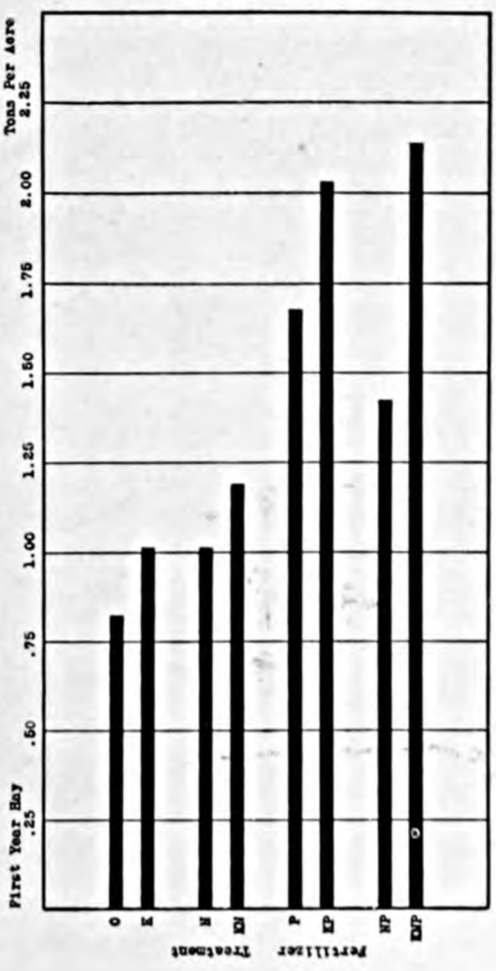

Corn Bushels Per Acre
O K N KN P KP NP KNP
Fertilizer Treatment


Leaning and Broken Stalks 1928 and 1931
Percent
O K N KN P KP NP KNP
Fertilizer Treatment


Wheat
Bushels Per Acre
5
10
15
20
25
O
K
N
KN
P
KP
NP
KNP
Fertilizer Treatment


Second Year Hay
Tons Per Acre
.25
.50
.75
1.00
1.25
1.50
1.75
2.00
2.25
O
K
N
KN
P
KP
NP
KNP
Fertilizer Treatment


Pulling Resistance of Corn Stalks
Pounds
25
50
75
100
125
150
175
200
225
O
K
N
KN
P
KP
NP
KNP
Fertilizer Treatment


First Year Hay
Tons Per Acre
.25
.50
.75
1.00
1.25
1.50
1.75
2.00
2.25
O
K
N
KN
P
KP
NP
KNP
Fertilizer Treatment

more extensive these roots the better will be the anchorage. It has been known that near harvest time, and especially in certain years, corn sometimes lodged which made harvesting more difficult. It has been noticed in these series of fertilizer plots that the corn lodged more on some plots than on others.

What Causes Lodging?

During a 5-year period, an answer was sought to the question of the effect of fertilizer treatments on this lodging. A count of the leaning and broken stalks on the plots showed conclusively that potash greatly reduced the number, both in wet and dry summers. There were approximately one and one-half times as many leaning and broken stalks in 1928 and 1931 on plots which did not receive potash in the fertilizer treatment as on plots where potash was used. During these 2 years, the total rainfall during the months of July, August, and September averaged 16.4 inches. During the 3 years of 1929, 1930, and 1932, when the total rainfall in July, August, and September averaged 6.4 inches, there was approximately eight times as much lodging on plots not receiving potash as on those receiving potash.

In the 2 years in which lodging was severe (1928 and 1931), about two and one-half times as much rain fell during July, August, and September as fell in the same period in years when relatively little lodging occurred (1929, 1930, and 1932). Weather charts indicate that lodging was encouraged by the concentration of rainfall during the month of August. Thus in years when lodging was severe, nearly one-half of the total amount of rain for the 3 months' period was precipitated in August, while in years in which relatively little lodging occurred only about one-fourth of the total rainfall came during August. Since the rainfall during August in these 2 years of severe lodging was almost twice the average during a 33-year period, the belief is that the excessive rainfall encouraged shallow root development to some extent, and thus lodging was more easily accomplished.

The pulling resistances of corn plants were obtained by ascertaining the number of pounds necessary to remove the plants from the soil by a vertical pull. This pulling resistance

(*Turn to page* 43)

The leaves on the left show burning on the margins, which is typical of potash deficiency. The leaves on the right are normal.

Alabama's Forward March In Fertilizer Practices

By L. O. Brackeen
Editor, Agricultural Extension Service, Auburn, Alabama

A PRACTICAL way of keeping fertilizers which contain ammonium compounds from increasing the acidity of the soil has been developed in Alabama and has proved successful for the past 2 years. It also has shown farmers that it is useless to pay large sums of money for sand as fertilizer filler when valuable materials can be used.

The First Step

That the plan is popular is indicated by the fact that most fertilizers used under general crops in the State are "non-acid forming" and carry dolomite or dolomitic limestone instead of sand as filler. Before the plan was put into operation in 1934 the opposite was true. Records show that in 1933 most all mixed fertilizers purchased in the State were acid-forming, and experiments by the State Experiment Station show that the per-acre cotton yields were being reduced because of the increased acidity of the soil. The seriousness of this increasing soil acidity and the use of sand as a fertilizer filler was called to public attention early in 1934 by the Alabama Experiment Station and the U. S. Department of Agriculture.

"It is estimated that in 1933 approximately 40,000 tons of fertilizer filler were used in Alabama," said Dean M. J. Funchess in reporting the findings of the Alabama station. "This means that approximately 30,000 tons of sand as a filler must have been placed in fertilizers of the State, since about 10,000 tons of limestone or its equivalent were used. This amount of sand represented about 11.3 per cent of the weight of the mixed fertilizers, or 226 pounds a ton. No one would argue that this sand was beneficial to crops, yet delivered to the mixing plants it cost the fertilizer dealers more than $30,000.

"After the sand was mixed with the fertilizer it required the fertilizer freight rate. At $3 a ton the freight alone on the sand after it was mixed with the fertilizer amounted to $90,000. Furthermore, this sand required about 304,510 shipping bags, at 12 cents each, costing about $36,000. Together these items totaled $156,000, all of which was added to the cost of fertilizers to the farmers. In addition to this expense, the filler had to be handled and hauled by the fertilizer companies and by the farmers—a heavy expense for an article as useless as sand.

"The cost items mentioned above are not the only factors affecting the ultimate loss in money to the farmers. The use of sand rather than limestone as a filler has probably meant the loss of approximately 50 pounds of seed cotton per acre on 3,000,000 acres of acid soil in Alabama which should have a total value of $4,500,000, assuming that the increase from limestone in the fertilizer will be as great when a small amount of fertilizer is used per acre as when a large amount is used. A continued decrease in the yield of cotton will undoubtedly result if the use of sand is continued as the principal filler. On the other hand, if sufficient limestone is added to produce non-acid forming fertilizers then the farmer will be assured that these fertilizers will not reduce the productivity of the soil."

Limestone Replaces Sand

After presenting the above facts Dean Funchess recommended to a joint meeting of the Alabama State Board of Agriculture and leading fertilizer manufacturers, in Montgomery in May 1934, that "most of the sand which is used as a filler for fertilizer should be replaced by limestone." A second joint meeting was held on June 20, at which time manufacturers assured the State Board of Agriculture that they would "gladly cooperate" in producing "non-acid forming" fertilizers by substituting dolomite or dolomitic limestone for the sand filler. The agricultural board then passed a regulation requiring that each sack of fertilizer sold in the State carry a tag labeled "acid forming" or "non-acid forming." Farmers were advised to purchase fertilizers labeled "non-acid forming" for their general crops. As a result, most of the fertilizers, except those bought for truck crops, used in the State do not increase the acidity of the soil because they carry limestone or dolomitic limestone as a filler instead of sand.

Fertilizer manufacturers and dealers have cooperated with farmers and farm leaders during the past 2 years in popularizing another fertilizer practice in Alabama. After years of experiments, the Alabama Experiment Station in 1934 recommended that farmers fertilize their cotton with 600 pounds of 6-8-4 per acre, and asked manufacturers and dealers to assist in making it possible for farmers to obtain this mixture. This they did, with the result that almost 25 per cent of the 468,000 tons of fertilizer used in the State in 1936 was 6-8-4. Farmers all over the State are reporting outstanding results where their cotton was fertilized with this mixture.

"The best fertilizer for cotton on average Alabama land is one that supplies at least 36 pounds of nitrogen, 40 pounds of phosphoric acid, and 24 pounds of potash per acre," said Dean Funchess in recommending the new mixture to farmers. "To supply these amounts of plant food it would require 225 pounds of nitrate of soda or the equivalent, 300 pounds superphosphate, and 48 pounds of muriate of potash, or a 6-8-4 fertilizer applied at the rate of 600 pounds per acre."

"This amount of fertilizer per acre," he said, "may seem excessive, since the average amount of low grades of fertilizers is about 300 pounds per acre. However, tests show that 600 pounds per acre of a 6-8-4 fertilizer produced 221 pounds of seed cotton per acre more than a 300-pound application. After considering the cost of these amounts of a 6-8-4 fertilizer and the value of the seed cotton (4 cents per pound) the 600-pound application was more profitable than the 300-pound application by $5.38 per acre.

Applying Fertilizer

"If a 6-8-4 fertilizer is used at the rate of 600 pounds per acre it should be applied in a wide stream at the bottom of the furrow marking the row, and mixed thoroughly with the soil which should be bedded at least a week before planting. Allow time for a rain to fall and settle the bed. In the event that 300 pounds of 6-8-4 are used (even though it is not the most profitable rate) it may be applied in any manner in which 300 pounds of any other grade of fertilizer may be applied.

"In using a 6-8-4 fertilizer at any rate up to 600 pounds per acre a farmer is saved the time and expense of side-dressing cotton. This fertilizer contains sufficient nitrogen and the cotton which received it should not be side-dressed.

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Will Potash Benefit Your Apple Orchard?

By J. K. Shaw
Pomologist, Massachusetts State College, Amherst, Massachusetts

A PRODUCING orchard draws from the soil more potash than nitrogen. Yet the results of many years of experimentation prove that apple trees respond to nitrogen-carrying fertilizers far more distinctly than they do to potash, either alone or added to nitrogen. In fact the majority of investigators report no direct benefits whatever from the use of potash in the orchard. Consequently most but not all Experiment Stations have recommended the use of only nitrogen in orchard fertilization. This would seem to indicate that apple trees are able to absorb the required potash from the reserve in the soil to a greater extent than do many other farm crops, many of which very often respond to potash-carrying fertilizers.

The total amount of potash in most good agricultural soils is large, especially, if we take into consideration the soil to the depth to which apple tree roots may penetrate. Most good soils contain enough to satisfy the demands of large crops of apples for more than 100 years. But most of this soil potash is locked up in unavailable forms and it is difficult to see how the trees obtain their supply more readily than other crops. It has been shown that tree roots may be more or less active through the entire year and possibly they may be able to take up potash more or less constantly as it is slowly made available by natural processes going on in the soil. The deep rooting habit of apple trees in well-drained soils may be a factor; they have a large body of soil to draw from. Possibly apple roots may in some way be able to render more of the soil potash available than do some other plants, though there seems to be no proof that this is true.

Severe potash deficiency in the apple shoot at the right shows the short slender growth and burned leaves characteristic of severe potash shortage.

In the last few years there have appeared from several sources reports more favorable to the value of potash in orchards. In England and other European countries it is generally regarded as quite as important as nitrogen. There seems to be a slowly increasing belief among investigators in this country that potash should not be entirely neglected in orchard fertilization. Is this belief well founded or should we go slow in recommending potash?

It is well known that when soluble forms of potash are applied to the soil it may be quickly locked up in unavailable forms before the plants are able to absorb it. Some of our orchards at the Massachusetts Experiment Station are clearly suffering from a potash deficiency. In one of these orchards we have applied potash for three successive years at the rate of about 3 pounds each to 20-year-old trees growing under strip cultivation. In the first year there was no indication of any effect whatever. In the second year there was a clear indication of an increased potash content in the fertilized trees but no change in their growth or appearance. In the third year the trees grew better, had a greater leaf area, and a noticeably improved appearance when compared to the check trees that continued to receive only nitrogen fertilizer. Other experiments in our orchards suggest that it may be 3 years or more before potash-deficient trees respond with better growth and heavier production.

Severe potash deficiency on the peach. The two shoots at the right are badly injured from lack of potash.

Results of Test

We have at the Massachusetts Experiment Station one of the old soil test fields. It contains 13 plots which since 1889 have received moderate annual applications of nitrogen, phosphorus, and potash, alone and in combination. Up to 1921 various field and market garden crops were grown. In that year the field was planted to apple trees and other fruit plants. The plots are too narrow to allow trees to come to maturity, so in 1930 the trees were removed and other apple trees on their own roots planted.

The growth of the apple trees on these plots has been most unusual. Half of each plot has been limed to maintain a soil pH of about 6.25; the other half has never been limed, and during the period under consideration the soil pH has been about 4.50 to 5.00. Whenever potash is used either alone or in combination, trees on the limed half of the plots have grown better than the unlimed trees, while the reverse is generally true on plots fertilized with nitrogen or phosphorus or both. The entire nitrogen plot presents a rather sorry sight. The largest trees are to be found on the unlimed half of the nitrogen-phosphorus plot and for some reason these trees contain abundant potash which is not true on the limed half. And this plot has had no added potash for nearly 50 years.

Under the conditions of this field potash seems to be more helpful than nitrogen though both appear to be beneficial and a complete fertilizer plus lime seems the proper fertilizer.

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Prevent Blackening Of Irish Potatoes

By E. O. Adair
Madison, Wisconsin

POTATO growers and housewives are welcoming the news that blackening of cooked potatoes is less likely to occur where the right amount of available potash has been supplied to the soil and that it is not due to the variety of the potato, immaturity, methods of storage or cooking. These facts are becoming known as the result of scientific research carried out at the University of Wisconsin under the direction of Dr. W. E. Tottingham.

The blackening of cooked potatoes displeases housewives and other consumers who not only want potatoes to furnish wholesome food, but to be tempting and attractive when served. Potato growers, anxious to meet discriminating consumer demands, are interested in overcoming the difficulty. For these reasons and the fact that the undesirable condition is appearing in various parts of North America, Dr. Tottingham and his assistants attacked the problem.

Distinguishing Features

This type of blackening occurs soon after harvest. Since it appears then, the condition may be distinguished from the darkening which frequently accompanies advanced stages of sprouting in spring storage. The discoloration in question is usually most prevalent in the layers of the tissue which lie just beneath the skin. It is usually found in the stem end of the potato, although it may affect all portions resulting in a more or less gray or even blue appearance throughout.

Consumer responses indicated that the trouble was particularly serious in 1931 and 1933. Both of those years were hot and dry during the early and late summer and especially in the principal potato producing areas of Wisconsin. The blackening occurred therefore in the potatoes that were grown when the availability of the plant food should have been low and when the plant processes should have been affected by the intense heat. Then, too, the fact that less fertilizer was purchased during the depression is another factor which should be considered contributory to the crop condition during those years.

Early History

The discoloration of cooked potatoes was observed, however, before the recent drought or depression. As early as 1921, Wallace of England reported this condition in one of two varieties which had been fertilized with manure and commercial nitrogenous fertilizers following a hot dry summer. In this case the trouble was largely overcome by the addition of a low plane of potash to the other fertilizers.

Dr. Tottingham states that one of their first concerns in approaching the problem was the possibility that the abnormality was caused by disease. If this were true, it might be transmissible from the parent to the succeeding crop. This, however, was disproved when trials in two seasons on field plots at several locations failed to disclose the relation suggested. It appeared that the discoloration was dependent upon physiological factors in the growth of the plant.

"Early in these investigations, potatoes from the same parent stock were obtained. These potatoes were grown on peat soil to which had been added equal amounts of 0-20-0 and 0-20-20 fertilizers. The tubers grown on soil fertilized with potassium remained white throughout after cooking while the others were bluish throughout and the tissue black at the stem ends," Dr. Tottingham says.

Potassium Deficiency

"From the preliminary observations, we proceeded to a study of potato discoloration in relation to the potash content of the soil. In making the study, we tested varieties including Burbank, Cobbler, Katahdin, and Rural New Yorker. Plots of one-eighth acre were laid out on the silt loam at Madison, sandy loam at Arnott, and silt loam at Antigo. At the time of planting the available amounts of potash in the soils (as measured by the Truog method, a rapid means of determining the readily available potash of soils) were respectively 300 to 400, 200 to 250, and 150 to 200 pounds per acre.

"Application of a 2.5-10-18 fertilizer was made at the rate of 600, 400, and 740 pounds per acre at the respective stations. The fertilizer was placed in the furrow. The responses obtained showed a general relation of discoloration to potassium deficiency, irrespective of the variety of potato. The findings are presented in the table. Similar results were obtained in a greenhouse on a synthetic sandy soil containing 125 pounds of available potash."

Similar results were obtained from all varieties of potatoes used in the experiments. Application of 1,200 pounds of 4-10-20 fertilizer produced Cobbler and Russet Burbank tubers in yields approaching 150 bushels per acre free from blackening after cooking. However, an equal amount of potash-free fertilizer produced less than 100 bushels of potatoes per acre, which discolored.

The effect of the rare elements in this connection is significant too, states Dr. Tottingham. "Tubers from heavy yields of different varieties containing low proportions of potash as produced on pure sand supplemented

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COMPARISON OF AVAILABLE POTASSIUM IN THE SOIL WITH DISCOLORATION OF BOILED POTATOES IN THE 1935 CROP.

Location and available K_2O content of soil	Fertilizer elements applied	Plot number	Variety of Potato: Burbank	Cobbler	Katahdin	Rural New Yorker: Normal seed stock	Rural New Yorker: Discoloring seed stock
Antigo 150-200	N-P-K	1	*	0	*	0	0
		2	0	*	0	*	*
	N-P	1	*	*	*	*	*
		2	*	*	0	*	*
	none	1	*	0	*	*	*
Arnott 200-250	N-P-K	1	*	0	0	*	0
		2	0	0	0	0	0
	N-P	1	*	0	0	0	*
		2	*	0	0	0	*
	none	1	0	0	0	0	0
Madison 300-400	N-P-K	1	*	0	0	0	0
		2	0	0	0	0	0
	N-P	1	*	0	0	0	*
		2	0	0	0	0	*

0—White after boiling *—Gray to black after boiling

New Fertilizers for Ontario Tobacco

By H. F. Murwin
Superintendent, Dominion Experimental Station, Harrow, Ontario

QUALITY of the tobacco produced is one of the factors responsible for recent developments in the tobacco industry of Ontario. Out of the rapidly changing picture of a few years back has developed an industry which is now furnishing a steady source of income for several thousand farmers in the southern peninsula. Flue-cured tobacco will constitute approximately 80 per cent of the 60,000-acre crop planned for 1937. Due credit also must be given the buyer-grower organizations for their guidance and stabilizing influence in the matter of production and marketing of tobacco during this development. These are the things that make for a successful industry.

Tobacco manufacturers' requirements change, thus necessitating changes in fertilizers as well as varieties and cultural practices. Aside from these changes, improvements are being made in fertilizer mixtures. A newly recommended tobacco fertilizer is not simply a new model. Such a fertilizer is so made up that it will produce better-quality tobacco if given a fair chance. The same as in other industries, ways are discovered to improve an article offered for a specific purpose. One of the older models, the 3-8-4, has served its time. The 2-10-8 mixture, a better-balanced fertilizer for flue-cured tobacco, has taken the road and is "going places." But, how and why have such changes taken place?

Each year the information obtained from tobacco fertilizer experiments

Chlorosis or mottling, indicating potash starvation, begins at the leaf tip. The leaves curl under and localized dying of th, tissue occurs.

conducted in the Province of Ontario is reviewed by the Standing Committee on Tobacco Fertilizers. Fertilizer recommendations for tobacco are formulated by the committee and are discussed in detail with the fertilizer manufacturers before being passed on to the producer. The splendid co-operation received from representatives of the fertilizer trade has afforded an opportunity for putting into practice mixtures that have proved superior in experiments. From this has developed the registration of certain mixtures by various manufacturers as "tobacco fertilizers."

For Quality and Yield

Although fertilization of tobacco is but one of the factors responsible for quality, it is a very important factor. Experiments have proved the value of commercial fertilizers for tobacco. If an unbalanced fertilizer is applied, however, either the quality or the yield may be lowered even with the best of soils, varieties, and cultural practices. Likewise, proper soil must be available, one of the better varieties must be grown, and proper soil management must be practiced to receive maximum results from the fertilizer applied.

Experimental work has been conducted over a period of years at the Dominion Experimental Station, Harrow; at the Dominion Experimental Substation, Delhi; and on farms throughout the tobacco districts in an effort to determine the fertilizer mixtures best suited for the different types of tobacco. The information obtained from these studies is based on field growth, maturity, yield, and quality of tobacco produced in field-plot experiments, and is further supported by commercial tests based on experimental results.

Less nitrogen and more potash are now required for best results in the production of flue-cured tobacco. Recent experiments definitely indicate that a flue-cured tobacco fertilizer should contain 2 per cent nitrogen, about 10 per cent phosphoric acid, and at least 8 per cent potash for best results under average conditions. In these tests potash was found to be the most important part of the fertilizer mixture affecting the quality of tobacco. A 2-10-8 fertilizer is recommended under average conditions for flue-cured tobacco. The recommended rate of application is 800 to 1,000 pounds per acre.

Soil fertility and drainage vary considerably in some of the flue-cured districts, and it is fully realized that one fertilizer may not best suit all conditions. Where potash levels in the soil are low, the potash should be increased in the fertilizer used. In such cases a 2-10-12 fertilizer may be used to advantage. Likewise, where slow maturity has been experienced on some of the low-lying soils, a 2-12-6 fertilizer will tend to hasten maturity and may better suit such conditions.

Some of the experimental results upon which the recommendations are based are given in table 1. This information shows the value of nitrogen, phosphoric acid, and potash in a flue-cured tobacco fertilizer and serves to illustrate the general trends obtained. Each figure on yield and value represents the average of four treatments conducted over a 3-year period and covers a range of seasonal conditions.

TABLE 1. FLUE-CURED TOBACCO FERTILIZER TESTS AT DELHI SUBSTATION, 1933-35 INCLUSIVE.

Fertilizer Formula	Acre Yield, lbs.	Value, ¢ per Pound	Value, $ per Acre
Varying Nitrogen—			
1-10-6	1,010	23.4	236.34
2-10-6	1,070	22.2	237.54
3-10-6	1,120	20.6	230.72
Varying Phosphoric Acid—			
2-4-6	1,130	19.3	218.09
2-10-6	1,140	19.8	225.72
2-16-6	1,080	21.2	228.96
Varying Potash—			
2-10-3	1,010	19.5	196.95
2-10-6	1,090	21.7	236.53
2-10-12	1,220	24.6	300.12

Soil type: Fox coarse sand.

The low average values are principally due to low prices in 1933 and low yields due to frost damage in 1934. The 1935 season was a very favorable one, and during that year average yields and values per pound were

Tobacco requires a well-balanced fertilizer, as shown by the greatly improved growth on the left from 1,000 lbs. of 4-8-12 per acre when compared with 1,000 lbs. 4-0-12 on the right.

about 1,550 pounds and 33 cents, respectively.

Potash is equally as important in the fertilization of burley tobacco. A fertilizer carrying high potash is required to produce the best burley, particularly on the sandy-loam and gravelly-loam soils. The clay-loam soils in general respond somewhat differently, requiring high phosphate in the fertilizer for best results. There is not as much response from potash applications on clay-loam soils as there is on the lighter burley soils.

Recommendations

Tests conducted over a period of years by the Experimental Station at Harrow definitely show the value of potash on the sandy-loam soils. Recent experiments also definitely indicate that high potash is required on the gravelly-loam soils and on some of the other intermediate soils in the tobacco area. As a result of these tests a 4-8-10 fertilizer is recommended on the sandy-loam and gravelly-loam soils. Where potash levels are low, still higher applications of potash may be used to advantage. In contrast, a 2-12-6 is recommended on the clay-loam soils because on these soils a greater response is obtained from phosphate than from potash.

With the wide range of soils utilized in the production of burley tobacco, it is readily understood that neither of these two fertilizers will best suit every condition. Tests during the past season throughout the burley tobacco districts indicate that some of the heavier gravelly-loams as well as some of the intermediate loam soils would require a fertilizer high in both phosphate and potash. A 4-12-10 or a 2-12-10, depending on the nitrogen levels in the soil, gave best results on these soils. The recommended rate of application is 500 to 1,000 pounds per acre. At least a 500-pound application has always given better results than a lower quantity, and the tests show that higher rates pay good returns for the extra investment. An application of barnyard manure is rather taken for granted in this discussion of burley fertilizers. A combination of manure and a well-balanced fertilizer has given best results. The recommended

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A Winning Campaign Against Wheat Smut

By E. R. Jackman

Agronomist, Oregon Agricultural Extension Service, Corvallis, Oregon

SMUT has always been one of the stoutest foes in the army constantly threatening the wheat grower. If it isn't one thing, it's two in his troublous existence anyhow. Hail, drought, freezes, untimely rains, too much heat or cold—all of these things lie ready to smite him hip and thigh, and he can't do much about it. Smut and rust are the twin wheat diseases. For years they were considered somewhat resignedly, in the same list as weather hazards, but both are now on their way out, and by the same means, resistant varieties.

The most common wheat smut, named bunt by the scientific gentlemen and called by the unlovely name of stinking smut to distinguish it from loose smut, is ordinarily the worst of the twins, because in order to develop it needs no favorable climatic conditions such as rust needs. It will develop most any time, anywhere. Annual losses in the U. S. run into the millions.

Losses From Disease

These losses occur in several ways. First, is the direct loss in yield; second, the loss because of smut dockages and washing charges assessed against the wheat; third, the freight on the dockage which the farmer pays whether he knows it or not; and fourth, the cost of seed treatment. Losses are much higher in some sections than in others. Seed treatment, for example, is a pretty sure remedy east of the Mississippi River. But in the areas where not much but wheat is grown, and especially in the summerfallow areas of the Pacific Northwest, seed treatment may be ever so thorough and still the loss may be severe through soil infection.

Seed or Dust?

The first organized fight against it and the one still going on in some sections took the form of seed treatment. Originally formaldehyde or bluestone was used as a wet treatment. Both were dangerous and frequently led to yield reductions which were more serious than losses from smut. Then the Australians showed us how to use copper carbonate as a dust treatment. This was adopted with enthusiasm in the Pacific Northwest, and by 1923 nearly 100 per cent of the wheat growers used it. It was not many years until it had spread all over the wheat states.

But the copper carbonate had disadvantages, too. It was acutely uncomfortable to the user; grain left over night in drills tended to "cake," causing broken grain drills; equipment for treating had to be bought or made. Chemists therefore began to search for other forms of dust, and after several false starts evolved a mercury compound which is both cheaper and better than copper carbonate. It is available on the market wherever wheat is grown.

So that brings us to the resistant

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The Agricultural Future of Puerto Rico

By D. E. Haley
Pennsylvania State College of Agriculture, State College, Pennsylvania

A VISITOR to Puerto Rico soon realizes that he is enjoying a rare privilege. As the ship nears the northern coast, plowing through the deepest waters in the seven seas, the first view of the Island is of rugged mountain ranges, which extend east to west through the interior. These do not exceed 4,400 feet in height, but are quite distinctive and beautiful, with rather sharp peaks and ridges, covered with vegetation. Graceful cocoanut palms, with occasional royal palms, fringe the Island. To one who views tropical vegetation for the first time, the experience is long to be remembered. As seen by Columbus (this was the only "American" soil he visited) it must have been even more beautiful. Some of the native forests still stand. One on the summit of El Yunque Mountain is said to be the most outstanding example of a rain forest in the world. Here giant ferns grow over 20 feet high.

As the steamer approaches the splendid port of San Juan, the largest city on the Island and the point where most visitors land, there appears on the sky line the rugged outlines of Morro Castle. This fortress, which is also beautiful in architectural design, played a prominent part in the early history of Puerto Rico. It was here that Drake, Hawkins, and Cumberland were repulsed when they tried to capture San Juan from the sea. It was here that a shot was fired at a German ship during the World War; this was the only shot fired at an enemy from American soil during that war. Close to Morro Castle is the Governor's Palace, a marvelous structure rich in historical background. It now is occupied by the Hon. Blanton Winship, the Governor of the Island, an able and conscientious administrator, of whom Americans may well be proud.

Not far from the point of disembarkation is the cathedral in which are the bones of Ponce de Leon, who sought to find in the New World the "Fountain of Eternal Youth." Ac-

The Federal Experiment Station at Mayaguez.

cording to some enthusiasts, his mission would have been partially fulfilled if he had discovered Coamo Springs in southern Puerto Rico, the medicinal value of which is internationally recognized.

San Juan is a very interesting city, and is rich in history and traditions. If one expects to find here the modern conveniences of an American city, he is doomed to disappointment. The Spanish rather than the American type of architecture will no doubt prevail for years to come.

Puerto Rico is said to have both a summer and a winter season. To a visitor from the American mainland, however, it seems to have but one continuous summer season. If the Island is visited during the so-called summer season and an auto ride is taken into the interior, the highways are lined with flamboyants which form a beautiful archway over the road. Fragrant, scarlet flowers cover these trees; the petals slowly fall and blanket the road. It is a driveway of "living fire;" the wind, lifting the fallen petals, gives a weird effect of "pulsing flames."

Unrivaled Scenery

At some points, especially on the old Spanish Military Road, one rides dangerously near the edge of a bare precipice. At other points from high elevations there is a view of scenery not duplicated in any other part of the world. One of these high points is Las Mesas, near the city of Mayagüez, where the Federal Experiment Station (headed by Dr. Atherton Lee) and the Agricultural College are located. If this is viewed at the time of a gorgeous Puerto Rican sunset, the grandeur of the scene — mountains, lowlands, and the sea — beggars description. It may be fittingly described only by a poet, an artist, or romanticist—certainly not by a scientist.

The wild life found in similar tropical regions elsewhere is absent here. A stillness permeates the Island. It implies peace. But the Island has not always been peaceful. In the early days, the Caribs, the most warlike of American Indians, were found here. They fought the Boriqueños—people from Boriquen, "Fatherland of Valiant Men," and other Indians, as well as the whites who discovered and colonized Puerto Rico.

Continuous Growing Season

Records at San Juan show a mean temperature of 77.9° F., a maximum of 94° F., and a minimum of 62° F. This is characteristic of the lowlands, but it is cooler in the mountains. Nowhere, however, has frost been known. This temperature assures the Island of a continuous growing season, but some plants thrive better at one time of the year than at another. The sunshine is brighter and more active in Puerto Rico than on the American mainland, since there are less dust particles to obstruct the rays. It is interesting to note that there is an average daily illumination equal to 10.9 hours, notwithstanding the cloudiness of many rainy days.

In the Luquillo Mountains the rainfall averages 145 inches annually. At Ensenada, in the western end of the south coastal plain, it is 26 inches. Here, and in certain other areas, irrigation is practiced. On the average the rainfall is ample over the major part of the Island. Excess rainfall is now turned into an asset, being used for the generation of electric power.

The time is not far distant when illiteracy will be unknown. Even now, most of the laborers are literate. Puerto Ricans are the soul of hospitality. Contrary to what one might expect of those living in a tropical environment, the people are hard-working and ambitious. They are an agricultural people and are willing to undergo hardships in order to obtain a living from the soil.

Puerto Rico is one of the most

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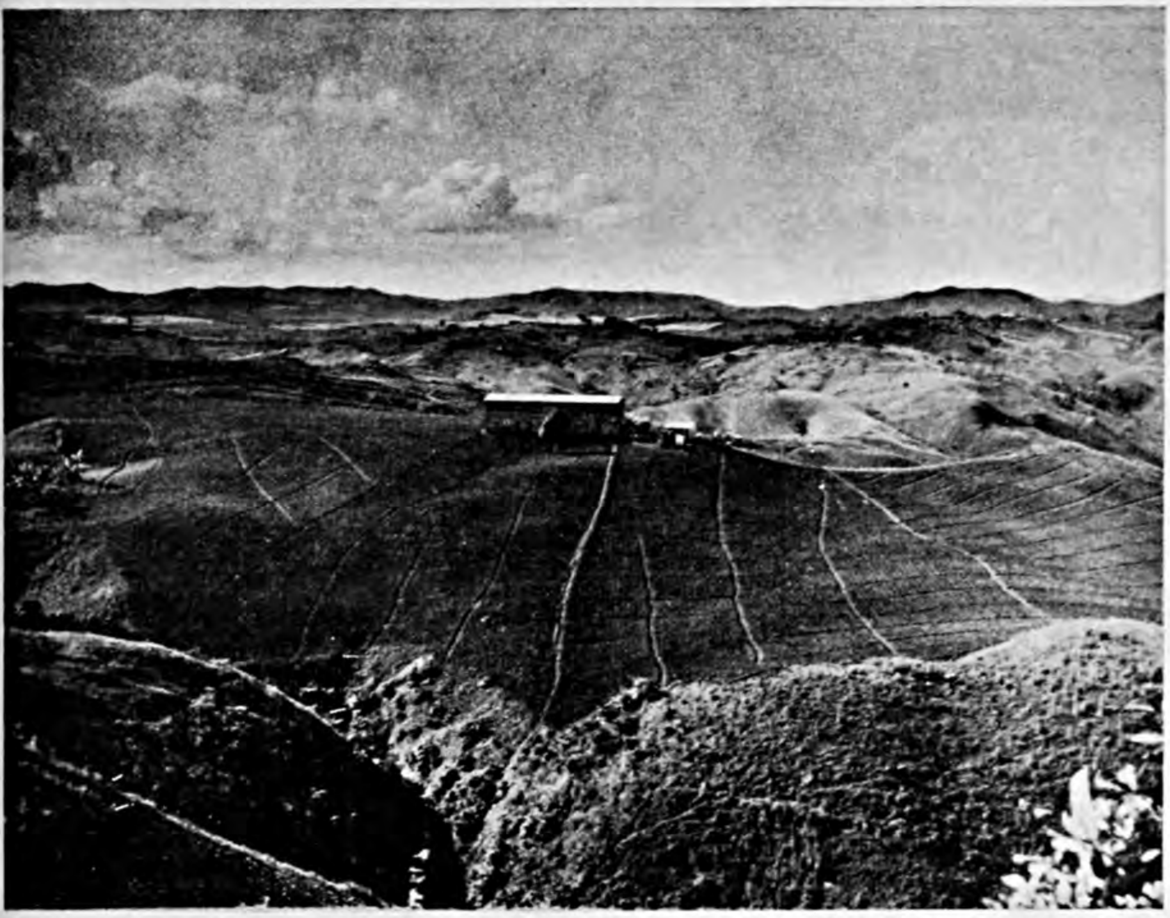
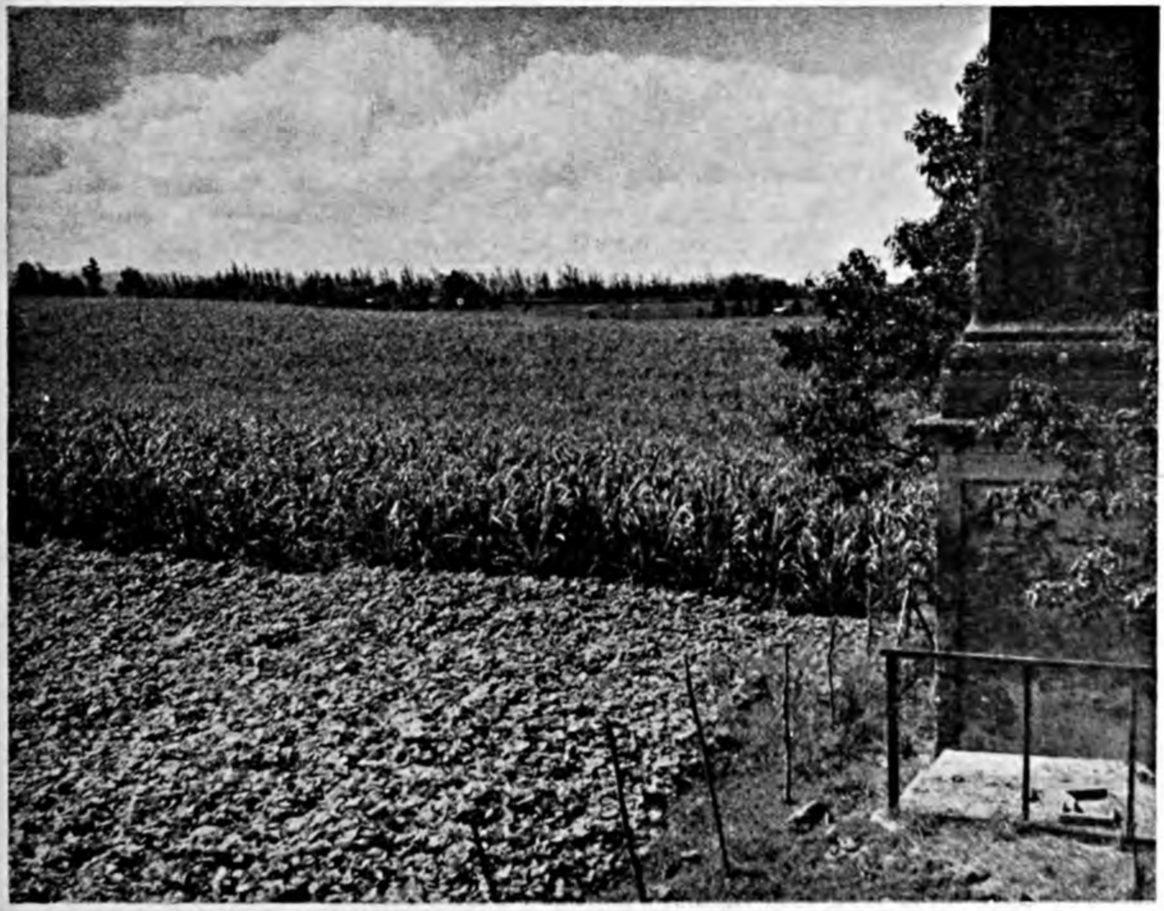
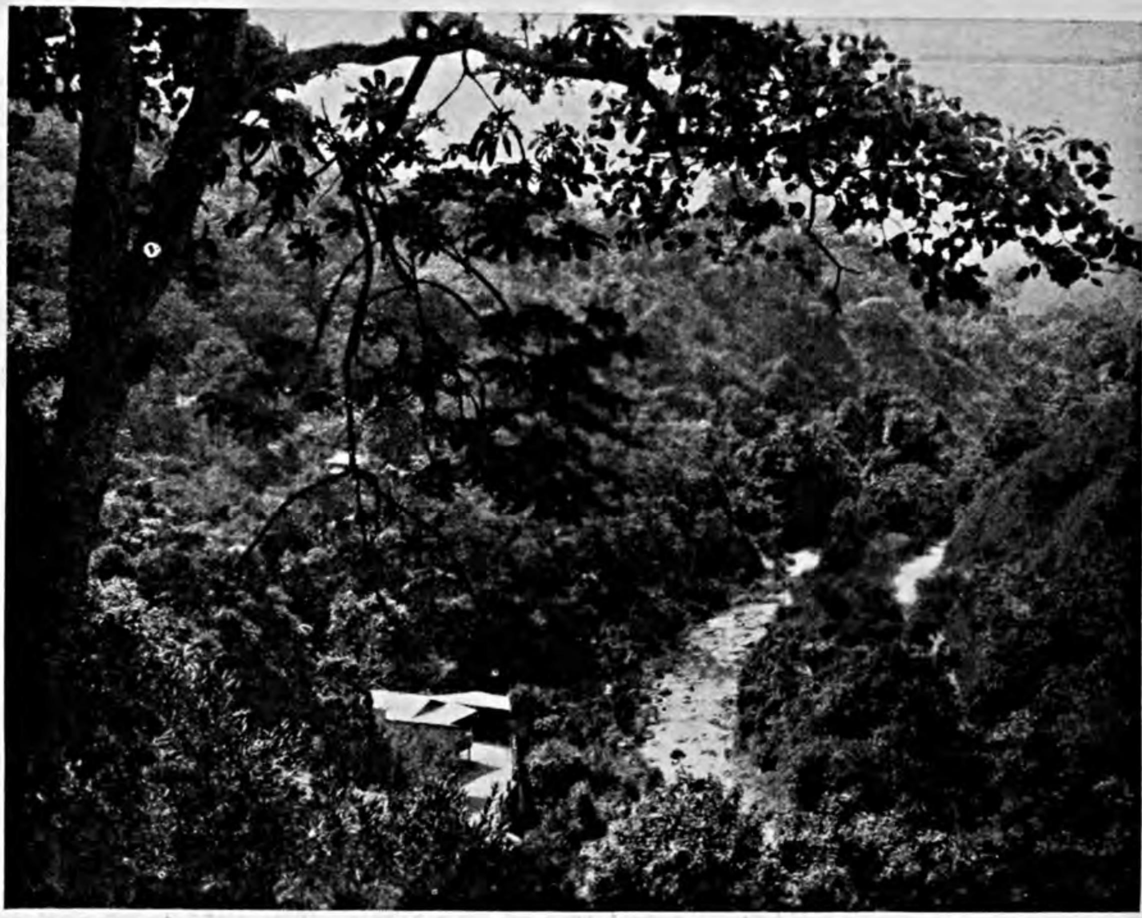
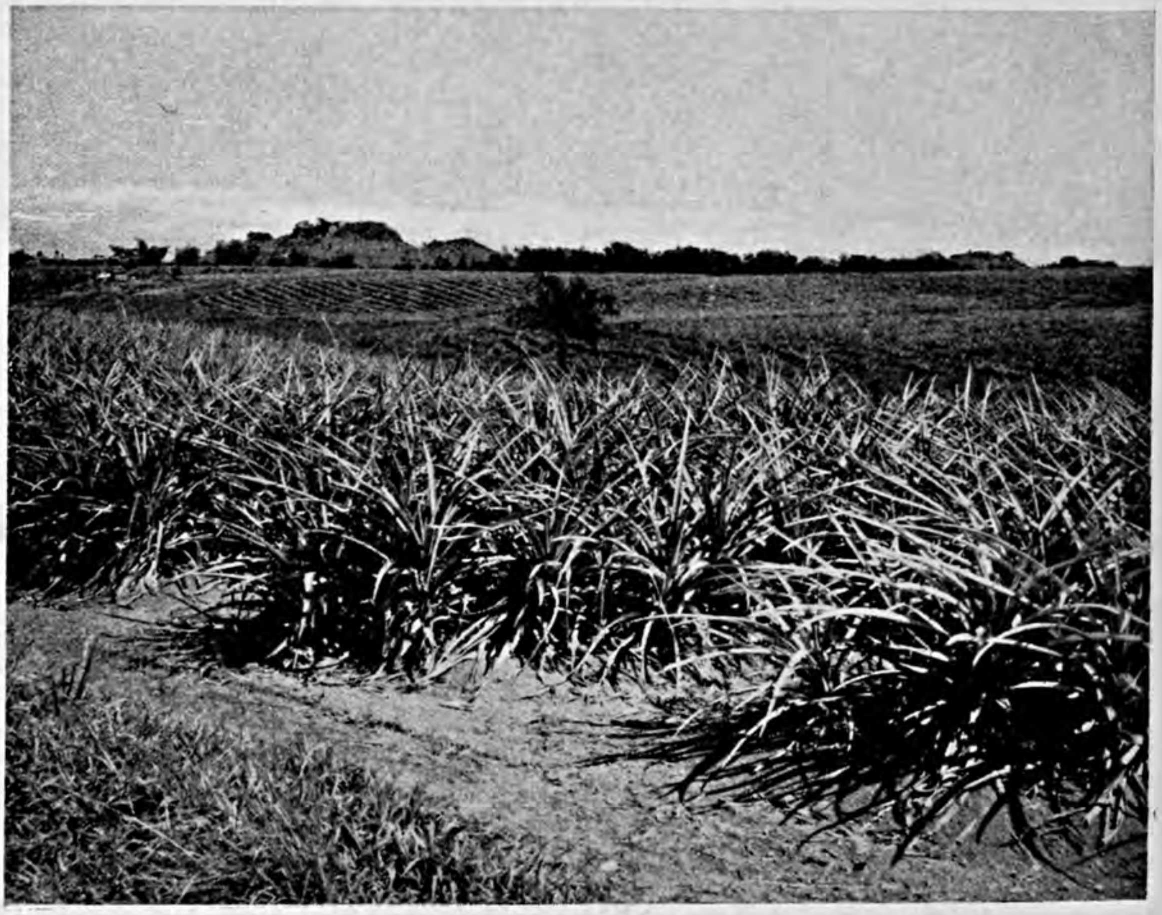


Above: Tobacco is the second largest export crop of Puerto Rico. This scene taken from a typical farm shows the soil ready for planting. Below: Sweet potatoes growing in the foreground, with sugar cane, the largest export crop, furnishing an appropriate background.

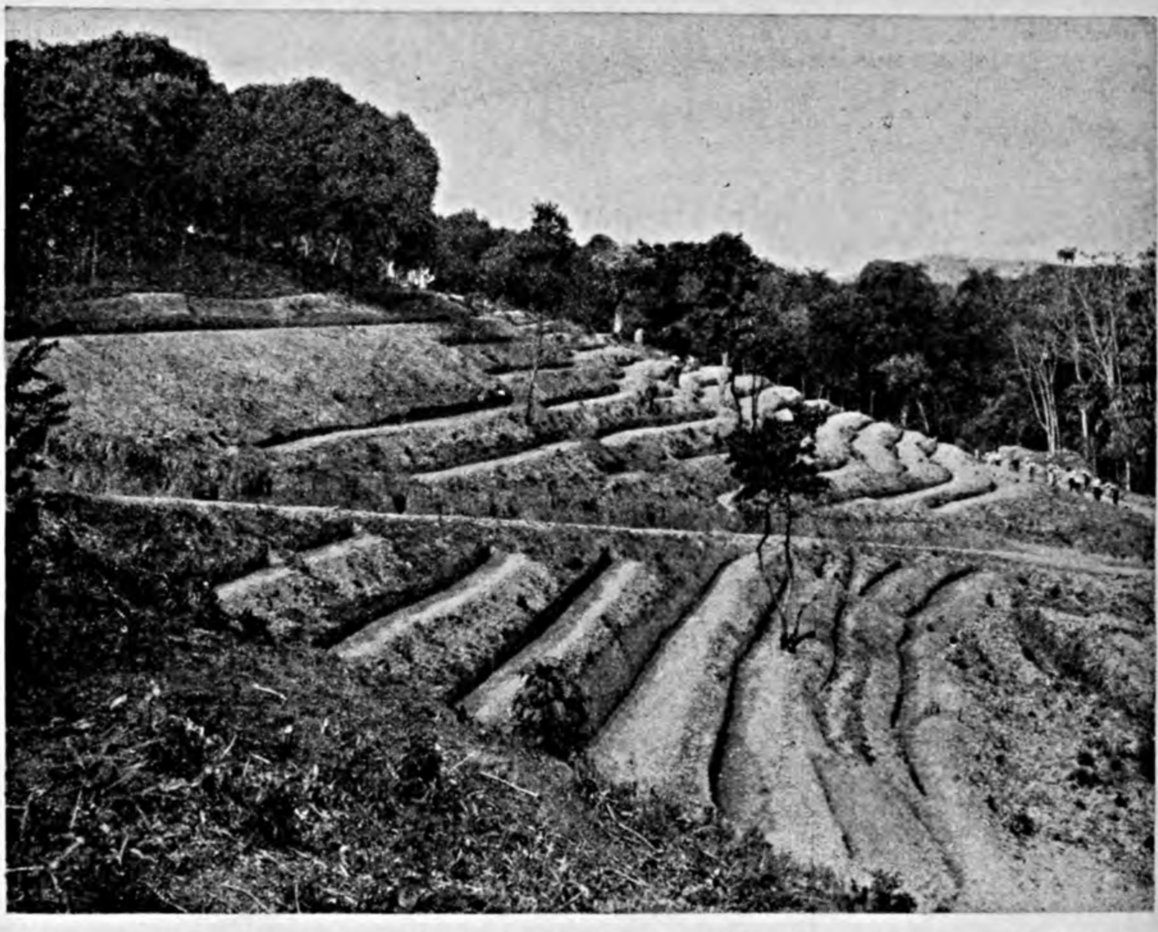




Above: A "hacienda" coffee farm near Ponce. Below: Fields of pineapple contribute to the picturesqueness of the landscape.



Above: A tobacco district in the La Plata Valley. Below: Cucumbers growing on the Garcia farm located between San Juan and Cagas.



Above: Experimental work on "terracing" at the Federal Experiment Station at Mayaguez. Below: An experiment field of Puerto Rican tobacco which received a high potash treatment.

The Editors Talk

Soil-Builders or Exhausters?

When is a soil-builder not a soil-builder? The answer is being found by thousands of conscientious farmers who for years have thought they were using soil-improving practices and then discover their crops showing symptoms of plant-food starvation and their yields decreasing. For instance the lime-phosphate-legume system, once felt fully adequate for the fertile soils of the Midwest, has proved itself a soil-depleting practice. So great has been the drain on the available potash in these soils, that much corn is showing the yellow streaking and edge scorching of leaves, root rots, lodged stalks, and yields of chaffy ears of poor feed value, which are the characteristic signs of potash starvation.

C. B. Williams, Head of the Department of Agronomy, North Carolina Experiment Station, in a published article appearing in the South last fall tells how crops must be used to justify the term—"soil-builders." He points out that when crops are grown on any land and, after their growth, they leave the land more productive for the crops which follow, they can be termed soil-improving. If the only limiting factor of a piece of land is the poor physical condition of the soil, the growth on it of non-leguminous crops like rye, oats, and millet and turning these under after growth should in most cases remedy this defect and materially improve the productiveness of the soil. On the other hand, if the trouble with the soil is lack of sufficient quantities in available forms of any one of the essential constitutents, like nitrogen, phosphoric acid, potash, lime, and magnesia, no reasonable amount of turning under of non-leguminous crops will be likely to make the soil a productive one.

He further points out that when legumes, the only class of crops that can gather and store in the soil any essential plant-food element, and these only nitrogen, are cut and removed from the land, they will not ordinarily add any more nitrogen to the soil than they removed from it. Legumes grown on land and removed for hay or any other purposes can hardly be classed as soil-improving crops. Under such a system of management, the nitrogen supply of the soil will just about be maintained and there will be a loss of from 8-16 pounds of phosphoric acid and 26-54 pounds of potash from the available supplies in the soil for each ton of legume hay removed. To replace these plant foods, it would require the addition to the soil of from 50-100 pounds of 16 per cent superphosphate and 51-108 pounds of muriate of potash for each ton of legume hay removed.

Professor Williams tells North Carolina farmers that they may be surprised to know that legumes, generally, grown and removed from the land are much more exhaustive upon the available phosphoric acid and potash reserve per hundred pounds removed than are most of the other crops so grown and removed. For the growth of legumes to be of help in building up the productiveness of any land, at least a good portion of them must be turned back into the land either in their entirety or after picking or harvesting the seed. This does not mean they will add to the supplies of available phosphoric acid, potash, and lime, which they cannot possibly do; but they will add organic matter, which many soils need, and will increase the nitrogen content of the soil.

The increasing use of soil tests is playing an important role in ascertaining present levels of availability of the essential plant foods. Farmers taking advantage of this knowledge and applying fertilizers well balanced accordingly are on the way to real soil-building.

Placed for Full Value

Growers who would get full value from the fertilizers which they are buying this spring must place these fertilizers where the respective crops can get to them and make the most efficient use of them. It is estimated that around 7,500,000 tons of commercial fertilizer will be used this year. About half the cost of this plant food can be returned to the farmers by additional yields, over and above the normal increased yields from the use of fertilizer, which will be obtained by putting the fertilizer in the right place, thus increasing profits.

To illustrate: B. E. Brown of the Bureau of Plant Industry and G. A. Cumings of the Bureau of Agricultural Engineering, U. S. Department of Agriculture, tabulated results of fertilizer placement studies on potatoes over 4 years in Maine and Virginia and 5 years in New Jersey. In Maine the yield from side placement of fertilizer averaged 35 bushels more than when the same quantity of fertilizer was placed in a band under the seed, and 43 bushels more than when the fertilizer was mixed in the row. In New Jersey the corresponding averages were 44 bushels and 24 bushels greater; in Virginia 33 and 20 bushels. These additional yields, they point out, are strictly the result of the placement of the fertilizer where it will do the most good in feeding the plant. In these states growers commonly apply a ton of fertilizer to the acre for potatoes, and this amount was used in these tests. This fertilizer ordinarily costs from $30 to $40 for each acre of potatoes. How large a share of this expense can be written off by improving the placement of the fertilizer depends, of course, on the extra yield and on the price of potatoes, but Brown and Cumings estimate that at normal prices the extra yield would ordinarily pay approximately half of the fertilizer cost.

Placement studies have been made on corn, cotton, sugar beets, potatoes, white beans, wax beans, peas, lima beans, kale, cabbage, spinach, tomatoes, and tobacco. Results indicate that in general the fertilizer is of the greatest benefit to the crop when applied in a band at each side of the row. Placement about 2 inches to the side of the seed or plant and about 3 inches below the surface of the ground is the best in most cases. Speediest germination, quickest plant development, and highest yields resulted.

Many growers already possess equipment with which they can govern the placement of the fertilizer. Those who contemplate purchasing new planters or fertilizer distributors should make sure that these machines will meet this requirement.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizer Experiments with Hay Crops in the Connecticut Valley," New Hampshire Agricultural Experiment Station Circular 50, gives a comprehensive report of the trials with fertilizers and lime for forage crops that were carried out in an important dairy farming region located in the valley area. The authors, F. S. Prince, T. G. Phillips, P. T. Blood, and G. P. Percival, conclude from these studies that farm manures apparently do not carry sufficient phosphorus and potash for a normal crop of legumes. They state that should enough manure be applied in order to furnish enough of these two elements for such crops, a great waste of nitrogen would result, and at the same time the ratio of the plant-food elements would not be in balance.

The most serious need for fertilizers for the crops studied, as measured by yield increases, is for potash. Although phosphorus, nitrogen, and lime when used caused increases in the alfalfa-timothy mixture grown during the first 3 years of the experiment, potash influenced yields most. Potash was more effective when used with lime or phosphorus, or both, on the alfalfa mixture. The results obtained when used conjointly with these materials were more than additive. The response of red and alsike clovers was striking to both potash and phosphorus. Very significant returns in the value of hay produced from each fertilizer material used alone and in different combinations are shown in the publication. According to these calculations, $1 invested in nitrogen when applied with phosphorus and potassium gave a return of $3.89 in hay. An investment of $1 in potash used with lime and phosphorus returned $5.93, and used alone returned a value of $3 in the hay.

A revised edition of Indiana Agricultural Experiment Station Circular 204, "The Use of Rapid Chemical Tests on Soils and Plants as Aids in Determining Fertilizer Needs," by S. F. Thornton, S. D. Conner, and R. R. Fraser, gives a thorough description of soil and plant tests to obtain valuable indications of available plant-food supply from which better fertilizer recommendations can be made. While only a few changes of the original manuscript are made in this circular, certain considerations are explained more fully and should result in a wider and more effective use of these tests. Rapid chemical tests on soils and plants offer a practical and inexpensive method for determining soil reaction (acidity) and availability of plant nutrients. The system of testing outlined makes use of practically identical reagents, equipment, and technique for both soil and plant tests. With these soil and plant tests, very low results for any nutrient indicate a definite need for this nutrient for all crops under practically all conditions. Very high tests show an adequate supply. It should be evident that no general interpretation of test results, applicable to all crops, at all yield levels, and for all soil and climatic conditions, is possible. Full consideration should be given to other plant-growth factors, such as soil type, water supply, and other physical factors which influence fertilizer efficiency and potential productivity. Full directions for taking soil and plant samples for testing and colored charts to aid in interpreting the results add to the value of this practical and useful handbook on short-method testing.

"Methods of Incorporating Organic Matter with the Soil in Relation to Nitrogen Accumulations," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 249, Dec. 1936, W. A. Albrecht.

"Nitrogen Nutrition and Chemical Composition in Relation to Growth and Fruiting of the Cucumber Plant," Cornell Univ., Agr. Exp. Sta., Ithaca, N. Y., Memoir 192, July 1936, R. B. Dearborn.

"Irish Potato Fertilizer Experiments," Agr. Exp. Sta., Clemson, S. C., Cir. 55, Nov. 1936, H. P. Cooper, W. D. Moore, and R. W. Wallace.

Soils

According to Chief Henry G. Knight in his "Report of the Chief of the Bureau of Chemistry and Soils, 1936," the Bureau planned and organized 3 new projects during the past year as a part of the U. S. D. A. program of basic research in agriculture, provided for in the Bankhead-Jones Act of June 29, 1935. These are: (1) Research into the industrial utilization of soybeans and soybean products; (2) the chemistry of enzymes and enzyme action at low temperatures; and (3) a study of the allergens of agricultural products. In addition, the Bureau planned work in cooperation with the Bureau of Plant Industry on a Bankhead-Jones project for the study of plant viruses. Results of the research activities of this Bureau during the fiscal year 1936 are reported briefly in this report. Since actual experimental work on the new projects mentioned above was just getting under way at the close of the year, no report of progress is included. More information concerning many of the items discussed may be obtained from the 231 publications emanating from the Bureau during the year which are referred to at the end of Dr. Knight's report.

A number of recent bulletins dealing with land and water conservation will be found highly instructive to many who are interested in practical conservation methods. The varied subject matter contained in these publications is, to a large extent, applicable to nearly all regions. The bulletins of greatest interest which we classify under this heading are the following: "Sheet Erosion Studies on Cecil Clay," Alabama Agricultural Experiment Station Bulletin 245, by E. G. Diseker and R. E. Yoder. "Peat Land in the Pacific Coast States in Relation to Land and Water Resources," Miscellaneous Publication 248, U. S. D. A., by A. P. Dachnowski-Stokes. "Silting of Reservoirs," U. S. D. A. Technical Bulletin No. 524, by Henry M. Eakin. "Conditions Influencing Erosion on the Boise River Watershed," U. S. D. A. Technical Bulletin No. 528, by F. G. Renner. "The Use of Bluegrass Sod in the Control of Soil Erosion," U. S. D. A. Farmers' Bulletin No. 1760, by R. E. Uhland. "Soil Defense in the Piedmont," U. S. D. A. Farmers' Bulletin 1767, by E. M. Rowalt.

"How to Build Up and Maintain the Virgin Fertility of Our Soils," Agr. Exp. Sta., Tuskegee Institute, Ala., Bul. 42, Oct. 1936, George W. Carver.

"Reclamation of White-Alkali Soils in the Imperial Valley," Agr. Exp. Sta., Berkeley, Calif., Bul. 601, July 1936, Edward E. Thomas.

"Soils in Relation to Fruit Growing in New York. Part IX. Tree Behavior on Important Soil Profiles in the Newfane-Olcott Area, Niagara County," Cornell Univ., Agr. Exp. Sta., Ithaca, N. Y., Bul. 653, July 1936, Joseph Oskamp.

"Absorption of Bacteria by Soils," Cornell Univ., Agr. Exp. Sta., Ithaca, N. Y., Memoir 197, Sept. 1936, T. C. Peele.

"Soils of Collin, Frio, Galveston, Midland, Potter, and Van Zandt Counties and the Trans-Pecos Area," Agr. Exp. Sta., College Station, Texas, Bul. 533, Oct. 1936, G. S. Fraps and J. F. Fudge.

"Subsoil Waters of Newlands, Nevada, Field Station," U. S. D. A., Washington, D. C., Tech. Bul. 533, Oct. 1936, Carl S. Scofield, C. Lloyd Moon, and Elmer W. Knight.

"The Effect of Thallium on Plant Growth," U. S. D. A., Washington, D. C., Cir. 409, Nov. 1936, E. E. Horn, Justus C. Ward, James C. Munch, and F. E. Garlough.

"Soil Survey of Lauderdale County, Alabama," U. S. D. A., Washington, D. C., Series 1931, No. 26, A. L. Gray, W. E. Tharp, M. E. Stephens, and L. G. Brackeen.

"Soil Survey of the Roswell Area, New Mexico," U. S. D. A., Washington, D. C., Series 1933, No. 2, W. G. Harper.

Crops

Flower lovers in many sections of the South and elsewhere will obtain a great deal of interesting information from Georgia Agricultural Experiment Station Circular 111, entitled "Dahlia Variety Test, 1936," by H. L. Cochran, D. D. Long, Norman LaMotte, and B. E. Phillips. Despite unfavorable weather during most of the growing season causing the loss of quite a few plants, results of the test were highly satisfactory as they revealed a number of newer and better varieties that may be successfully grown in Georgia. Brief descriptions of some 45 varieties and their characteristics are given in the circular. The important points relating to the best cultural practices, including the location and soil preparation most suited, recommended fertilizers and amounts to use, and setting of the plants or roots are explained. Pertinent questions one may ask on how to grow dahlias with best results are concisely answered. The authors tell us that the large dahlia is an expression of growth which is influenced by culture, fertilization, pruning, fighting insects and diseases, and above all, the choice of varieties. All efforts to grow big dahlias fail if the variety is naturally a small one. While the soil most adapted for growing dahlias is a sandy loam well supplied with humus, practically all types in this state are used successfully. Well-rotted manure may be applied around the base of the plant at the beginning of the blooming period with good results. An 8-4-6 or 10-4-7 (P-N-K) fertilizer broadcast at the rate of 100 pounds for a 50 ft. x 50 ft. plot and well worked into the soil in the early spring, or ¼ pound of fertilizer in a circle around the young plant once every 2 weeks after it starts growing, is recommended. There are some growers who apply some form of potash several times during the season. The circular states this should be done with care to prevent plant injury. Control measures for insects and diseases are prescribed as are other precautionary practices that lead to good dahlia growing.

"Forty-eighth Annual Report for Fiscal Year Ending June 30, 1936," Agr. Exp. Sta., Fayetteville, Ark., Bul. 337, Dan T. Gray, Director.

"Fifty-ninth Report of the Connecticut Agricultural Experiment Station for the Year 1935," and "Index to Annual Report," Agr. Exp. Sta., New Haven, Conn., Public Doc. 24.

"Annual Report of the Director for the Fiscal Year Ending June 30, 1935," Agr. Exp. Sta., Newark, Del., Bul. 203, Sept. 1936, C. A. McCue, Director.

"Annual Report for the Fiscal Year Ending June 30, 1936," Agr. Exp. Sta., Gainesville, Fla., Wilmon Newell, Director.

"Miscellaneous Tropical and Sub-tropical Florida Fruits," Agr. Ext. Serv., Gainesville, Fla., Bul. 85, Sept. 1936, Harold Mowry and L. R. Toy. Rev. by H. S. Wolfe.

"A Year's Progress in Solving Farm Problems of Illinois, 1934-35." Agr. Exp. Sta., Urbana, Ill., Forty-eighth Annual Report of H. W. Mumford, Director.

"Illinois Corn Performance Tests. . . . Results for 1935," Agr. Exp. Sta., Urbana, Ill., Bul. 427, Dec. 1936, G. H. Dungan, J. R. Holbert, W. J. Mumm, J. H. Bigger, and A. L. Lang.

"Illinois Corn Performance Tests. . . . Results for 1936," Agr. Exp. Sta., Urbana, Ill., Bul. 429, Jan. 1937, G. H. Dungan, J. R. Holbert, W. J. Mumm, J. H. Bigger, and A. L. Lang.

"Pasture Improvement and Management," Agr. Exp. Sta., Urbana, Ill., Cir. 465, Dec. 1936, W. L. Burlison, H. P. Rusk, and J. J. Pieper.

"Culture of Tung-oil Trees in Louisiana," Agr. Exp. Sta., Baton Rouge, La., Cir. 17, Nov. 1936, Julian C. Miller and W. D. Kimbrough.

"The 'Graduated Space' Method of Thinning Apples," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 281, Feb. 1937, H. P. Gaston and G. L. Ricks.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., July 1936.

"Work of the Agricultural Experiment Station," Report of the Director for the Year

Ending June 30, 1935, Agr. Exp. Sta., Columbia, Mo., Bul. 370, Nov. 1936, F. B. Mumford, Director.

"The Agricultural Extension Service, Missouri College of Agriculture; Annual Report for 1936," Agr. Ext. Serv., Columbia, Mo., Cir. 357, Feb. 1937, F. B. Mumford, Director.

"Twenty-first Annual Report of the New Jersey State Department of Agriculture, July 1, 1935—June 30, 1936," St. Dept. of Agr., Trenton, N. J., Dec. 1936, William B. Duryee, Secretary.

"The Research and Educational Activities of the Station as Relating to Agricultural Trends in New Jersey," Agr. Exp. Sta., New Brunswick, N. J., Bul. 616, Nov. 1936, Jacob G. Lipman.

"Some Factors Influencing Growth and Fruit-setting in the Pepper (Capsicum Frutescens L.)," Cornell Univ., Agr. Exp. Sta., Ithaca, N. Y., Memoir 190, July 1936, H. L. Cochran.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXII, No. 184, Jan.-Feb. 1937.

"Science Serving Agriculture, Report of Director for June 1, 1934 to June 30, 1936," Agr. Exp. Sta., Stillwater, Okla., C. P. Blackwell, Director.

"Growing Black Raspberries and Blackberries in Pennsylvania," Agr. Ext. Serv., State College, Pa., Cir. 170, Apr. 1936, J. Lupton Mecartney.

"Cherry Production in Pennsylvania," Agr. Ext. Serv., State College, Pa., Cir. 172, May 1936, J. U. Ruef.

"Red Raspberry Culture in Pennsylvania," Agr. Ext. Serv., State College, Pa., Cir. 178, Aug. 1936, John U. Ruef.

"Forty-ninth Annual Report of the South Carolina Experiment Station of Clemson Agricultural College for the Year Ended June 30, 1936," Agr. Exp. Sta., Clemson, S. C., Dec. 1936, H. P. Cooper, Director.

"Department of Agriculture—Immigration," Richmond, Va., Bul. 345, Feb. 1937.

"Service to Agriculture, Report of the West Virginia Agricultural Experiment Station for the Biennium Ending June 30, 1936," Agr. Exp. Sta., Morgantown, W. Va., Bul. 278, Dec. 1936, F. D. Fromme, Director.

"Tobacco Culture," U. S. D. A., Washington, D. C., Farmers' Bul. 571, Rev. Sept. 1936, W. W. Garner.

"Growing Sweet Corn for the Cannery," U. S. D. A., Washington, D. C., Farmers' Bul. 1634, Rev. Oct. 1936, J. H. Beattie.

"The Farm Garden," U. S. D. A., Washington, D. C., Farmers' Bul. 1673, Rev. Aug. 1936, J. H. Beattie and W. R. Beattie.

"White Clover," U. S. D. A., Washington, D. C., Leaflet No. 119, Oct. 1936, E. A. Hollowell.

Economics

Of special interest is the General Information Series of circulars recently published by the Agricultural Adjustment Administration. In G-64, issued January, 1937, Cotton Questions and Answers, the U. S. consumption of American cotton in 1935-1936 is given as about 6,221,000 or about 1,000,000 bales above the consumption in 1934-1935 and about 294,000 bales above the average consumption for the 10-year period 1923-1924 through 1932-1933. The lowest domestic consumption of American cotton was 4,700,000 bales in 1920-1921 and the highest was about 6,900,000 bales in 1926-1927.

The foreign consumption of American cotton in 1935-1936 was about 6,455,000 bales which was about 360,000 bales above the foreign consumption of 1934-1935 and 1,100,000 bales below the average for the 10-year period 1923-1924 through 1932-1933. The lowest consumption of American cotton by foreign countries was 5,400,000 bales in 1920-1921 and the highest was 8,900,000 bales both in the 1926-1927 and 1927-1928 seasons.

The world consumption of American cotton in 1935-1936 was about 12,676,000 bales. This is about 1,340,000 bales above the world consumption in 1934-1935 but still about 800,000 bales below the average for 1923-1924 to 1932-1933. The highest consumption was 15,800,000 bales in 1926-1927. The lowest occurred in 1920-1921 when only 10,000,000 bales were consumed.

The world consumption of foreign cotton in 1935-1936 was about 14,123,000 bales. Of special interest is the striking increase of 4,000,000 bales over the 10-year average, 1923-1924 through 1932-1933.

The world consumption of all cotton in 1935-1936 is estimated to be about 26,800,000 bales. This is about 1,600,000 bales above that in 1934-1935 and about 3,300,000 bales above the average for the 10-year period 1923-1924 through 1932-1933. In view of the upward trend in domestic consumption, employment, payrolls, industrial production, farm income, etc., domestic consumption of American cotton this year may exceed that of last year. Factors which may influence the consumption of American cotton in foreign countries are general business conditions, expenditures for war supplies, availability and prices of American cotton in relation to supply and price of foreign cotton and competing fibres, and the trade arrangements including reciprocal agreements, foreign-exchange restrictions, and tariff. In the face of larger supplies of foreign cotton, increased output of competing fibres, and the continued shortage of foreign exchange in some countries, together with the tariff, and barter arrangements for the purchase of foreign cotton, the consumption of American cotton by foreign countries is likely to decrease in 1936-1937 as compared to 1935-1936. This decrease will tend to offset the expected increase in consumption in the United States. Producers of American cotton must remember that the whole crop must be sold in the world market at world prices. World consumption of all cotton in 1936-1937 will probably be larger than in 1935-1936. The world carry-over of American cotton on August 1, 1936, was about 7,000,000 bales. This is the smallest carry-over since the 6,300,000 bales in 1930-1931 season, and is 2,000,000 bales less than the August 1, 1935, carry-over but is almost 1,000,000 bales greater than the average carry-over for the 10-year period 1923-1924 through 1932-1933. It is, however, gratifying to note that this carry-over is 6,000,000 bales smaller than that in 1932.

The total farm value of the 1936-1937 cotton crop in the United States will be about $970,000,000, with a purchasing power about $200,000,000 greater than the 1930-1931 crop and about $200,000,000 less than the average between 1925-1929.

The American cotton producers harvested about 30,054,000 acres in 1936-1937. The average acreage harvested over the 10-year period 1923-1924 through 1932-1933 was 40,500,000. The total base acreage for cotton in the United States in 1936-1937 was 44,500,000 acres and about 75 per cent of this acreage was under the 1936 Agricultural Conservation Program. A crop for the coming season of about 12,000,000 bales will be sufficient to produce a supply equal to the average 18,470,000 for the 10-year period 1921-1922 through 1930-1931. It is estimated that 28,680,000 acres, yielding 200 pounds per acre will be sufficient to produce this requirement. Under normal conditions the required crop for the coming season can be produced on about 65 to 75 per cent of the base acreage of 44,500,000 acres for the United States.

"Economic Digest," Conn. St. Col., Storrs, Conn., No. 66, Jan. 1937.

"Soybean Costs and Production Practices," Agr. Exp. Sta., Urbana, Ill., Bul. 428, Dec. 1936, R. C. Ross.

"Some Characteristics of Cultivatable Land in the Sugar Cane Area of Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 280, Oct. 1936, R. J. Saville and A. L. Dugas.

"An Analysis of Agriculture on the Valier Irrigation Project," Agr. Exp. Sta., Bozeman, Mont., Bul. 330, Dec. 1936, P. L. Slagsvold.

"Determining the Tonnage of Hay in Long Stacks and Round Stacks," Agr. Exp. Sta., Reno, Nev., Bul. 143, Sept. 1936, F. B. Headley.

"The New York State 1937 Agricultural Outlook," Cornell Univ., Agr. Ext. Serv., Ithaca, N. Y., Bul. 302, Dec. 1936.

"An Economic Study of Land Utilization in Chenango County, New York," Cornell Univ., Agr. Exp. Sta., Ithaca, N. Y., Bul. 654, Aug. 1936, H. S. Tyler.

"Farm Economics," Col. of Agr., Cornell Univ., Ithaca, N. Y., No. 99, Feb. 1937.

"The Farm Outlook for 1937," U. S. D. A., Washington, D. C., Misc. Pub. 255, Dec. 1936.

"Federal Seed-loan Financing and Its Relation to Agricultural Rehabilitation and Land Use," U. S. D. A., Washington, D. C., Tech. Bul. 539, Oct. 1936, Norman J. Wall.

"Flue-cured Tobacco," U. S. D. A., AAA, Washington, D. C., G-63, Jan. 1937.

"A Graphic Summary of Farm Tenure," U. S. D. A., Washington, D. C., Misc. Pub. 261, Dec. 1936, H. O. Turner.

A Winning Campaign Against Wheat Smut

(*From page* 20)

varieties. It is evident that no one variety is suitable for the entire United States, even if it is smut resistant. D. E. Stephens, of the Moro Experiment Station in Oregon, was one of the first workers on resistant varieties. He gathered all of the known wheats from all over the world, smutted them, and isolated dozens of smut-resistant kinds. Most of these, of course, were of no value for the arid Columbia River Basin, but out of these trials he found two strains of Turkey Red which were nearly immune. He called them Oro and Rio. Oro has turned out well in many places in the Middle West.

The Washington Experiment Station has been working on smut-resistant wheats for many years. Their attack was different. They found a variety which was highly resistant, crossed it with many of the varieties adapted to eastern Washington, and developed two new white wheats, both having the adaptability to the region of the one parent and the smut resistance of the other. They were called Albit and Ridit.

But in the meantime the geneticists and plant pathologists had discovered something which changed the whole campaign against smut. They found that smut, as well as wheat, had varieties, and a wheat considered immune in one community would be highly susceptible in another place where a different strain of smut was rampant. So this started the work all over again.

With this handicap the new varieties have not appeared so fast as it was hoped they would. After years of work in crossing and selecting, the station worker would finally think he had the ideal wheat only to find in field trials that it had some other bad characteristic, perhaps poor milling quality, or maybe susceptibility to rust or freezing injury, or something else.

But gradually the good resistant wheats are emerging. In the state of Washington, Hymar, the result of a cross between Hybrid 128 and Martin is now being distributed to farmers. About 1,000 acres were planted in Washington the fall of 1935. It is a white club wheat. Its main growing area would seem to be the sections of Washington and Idaho which have 18 inches of rain or more. It is rather late for the lower elevation, drier areas.

In eastern Oregon, Rex, another wheat developed by Mr. Stephens, is something of a sensation. It was planted on 15,000 acres in the fall of 1935. It is a very early white wheat, stiff strawed, extremely resistant to shattering, and a high yielder all over the Columbia Basin. It is a cross between White Odessa and Hard Federation. It is a true winter wheat with a harder kernel than most of the smut-resistant wheats.

The Nebraska station has developed a highly smut-resistant Turkey Red wheat but so far it has not been outstanding in yield like Rex and Hymar. Oregon farmers are very enthusiastic about Rex. It made authenticated yields of more than 60 bushels per acre under ordinary field conditions in 1935.

The Montana experiment station has distributed Yogo, another smut-resistant Turkey Red wheat. Utah has a variety called Relief. All of the western experiment stations are hot on the trail of additional varieties. Unfortunately, the varieties like Rex, which are high yielding and have other good qualities, are not resistant to rust. The wheat breeders still have work to do.

Prevent Blackening of Irish Potatoes

(*From page* 16)

by several rarer elements in addition to complete fertilizer remained white after cooking." The several issues involved in these findings are being subjected to further investigation.

According to authorities at the University of Wisconsin, blackening appears to be associated to a limited extent with higher percentages of nitrogen in the dry matter. In this phase of the problem, a considerable number of both normal and abnormal samples were analyzed by Dr. Tottingham and his assistants. They found that the average percentage of nitrogen in the dry matter of peeled potatoes was 1.69 for potatoes which remained white while the average per cent of nitrogen was 1.87 for the tubers that blackened. Dr. Tottingham expressed the view that the higher nitrogen content may be a factor associated with other conditions to cause blackening of some potato crops.

Immaturity of the potato vines at the time of harvesting is not a primary factor in the blackening of potatoes after cooking. The research workers made a limited survey of tubers dug two or three weeks before the maturity of the vines. Results indicated that the abnormal condition was due to protein digestion occurring after ripening.

Storage at high temperature and with greatly curtailed ventilation does not influence the occurrence of discoloration. Reference has been made to advanced stages of sprouting causing blackening after cooking. That condition, however, is due to the breaking of dormancy rather than to unfavorable factors in the storage conditions, according to Dr. Tottingham.

In determining the relation of storage conditions, choice samples were obtained from the 1934 crop of Russet Burbank and other varieties most extensively grown in Wisconsin. These varieties were supplemented from field plots of the Rural New Yorker which had been produced either from blackening "seed stock" or on a deficient supply of soil potash. Samples of each variety were stored in burlap bags and in paraffined cartons. In addition samples of each were stored at temperatures of about 70 degrees F. to 39 degrees F.

Both raw and boiled samples of the several tuber stocks were analyzed in November and similar examinations made in January and March. The study was repeated on a somewhat smaller scale in 1935. The results obtained, however, indicated that neither storage, temperature, nor ventilation is a primary factor affecting the blackening after cooking.

A summation of results of experiments at the University of Wisconsin on the causes of blackening has led to the following conclusions:

1. The blackening of cooked potatoes does not appear to be associated with transmissible pathological conditions.

2. In 1935, when the soil content of available potash was less than 200 pounds per acre, potatoes of several varieties blackened after cooking; but this response was negligible when the supply approached 400 pounds. Samples showing large proportions of blackening contained an average of less than 1.8 per cent of potash in the dry matter, while the average content was above this level in the normal tuber.

3. This abnormality appears to be associated to a limited degree with higher percentages of nitrogen in the dry matter of the tuber.

4. Immaturity of the plant is not a primary factor in the blackening of the potatoes.

5. Storage at high temperatures with greatly curtailed ventilation does not induce the blackening response significantly.

In concluding the discussion of the problem as a whole, Dr. Tottingham made the following statement:

"A lack of potash in the tuber leads after harvesting to an accumulation of free amino acids. These should be more completely formed into protein. One of two amino acids react with oxygen from the air under the influence of enzymes. They thus form substances which change spontaneously to the blue and black pigments after cooking. This change in the stored potatoes appears to be aggravated by the lack of potash.

Make Potash Available

"This combination of circumstances attending the lack of sufficient available potash is one of the critical factors in potato production. It is not entirely met, however, by supplying large quantities of potash to the soil. On some soil types and in dry seasons the potash does not remain available.

"Apparently, part of the efficiency of irrigation in producing high quality potatoes should be attributed to its favorable effect in supplying to the plant sufficient potash and other soil elements. It is possible that a more complete remedy for discoloration after cooking may be found only by including other mineral elements with potassium in the fertilizer applied."

The Agricultural Future of Puerto Rico

(*From page* 22)

densely populated areas on the earth, having 501 persons per square mile, one to every 1.42 acres, one to every 0.79 acre of improved land, and one to every 0.49 acre of cultivated land. The population increased 18.7 per cent from 1920 to 1930. The people speak both English and Spanish and uphold the ideals and culture of both nations. They are as familiar with Shakespeare as with Cervantes.

The people love their homeland, and rightly so. While some have located in New York City and certain other parts of the United States, relatively few leave the Island to seek a living elsewhere. With justifiable pride they call their homeland "The Paradise of the Atlantic."

Usually tropical soils of varying degrees of elevation are eroded to a marked extent. This is not true in Puerto Rico. In the tobacco areas of Caguas, Cayey, Comerio, Corozal, Cidra, Ciales, and elsewhere, soils cultivated are on slopes of 45 degrees or more, yet in very few instances does erosion occur. This is due, in large measure, to the nature of the soil and to its comparative freedom from quartz grains.

Variety of Soils

There is a wide variety of soil types due to rough topography, native vegetation and its uneven distribution, the unusual amount of precipitation, and the varying nature of the parent material. In the northern coastal plain the soils are redder, more matured, and more leached of soluble salts than in many other areas.

It would be difficult to find more fertile soils, or soils more suitable for cultivation, than those of the lowlands. These are to a considerable extent alluvial in origin. It is in this locality that the greatest export crop of the Island, sugar cane, is grown. Sugar cane also is grown on soils of slightly higher elevation, where tobacco was formerly grown. This further reduces the acreage which is devoted to tobacco, which is the second largest export crop.

The topography of the soil renders it difficult to sterilize seed-beds properly, although the method now used has proved markedly efficient. Moreover, the soils are rather difficult to cultivate on account of their steepness.

Hurricanes (from Hurican, a Carib Deity) are matters for concern, especially from the standpoint of the destruction of curing sheds; this presents an almost insurmountable difficulty.

Soil Fertility

The greatest problem of the tobacco grower, however, is that of the fertility of the soil. Because of the relatively high temperature and the heavy rainfall, the tobacco soils have been depleted of available nutrients to a considerable extent. This holds true for other soils on the Island as well, with the result that in 1935 there were imported 70,783 tons of fertilizer, valued at $1,434,415. Much of this was used for fertilizing tobacco.

Because of the favorable conditions for nitrogen fixation, these soils contain a considerable quantity of this element. A 6-7-8 fertilizer for tobacco is used in most cases. This appears to have too narrow a ratio for cigar-leaf tobacco; a higher unitage of potash would doubtless prove as beneficial here as it has in other localities where cigar-leaf tobacco is grown.

The Department of Agriculture and Commerce, headed by Commissioner R. Menendez Rámos, who has a well-trained staff, has established a Tobacco Institute, in which the most important phases of the tobacco industry of Puerto Rico are studied. Dr. J. A. B. Nolla, Assistant Commissioner of Agriculture and Commerce, has played a very active and notable rôle in tobacco research in recent years.

At the Insular Experiment Station, studies of Puerto Rican soils are now being made. This work is under the supervision of Director López Dominguez, who has a staff of outstanding scientists, among whom may be mentioned Dr. J. A. Bonnet, who is recognized as an authority on tropical soils.

Research Is Necessary

The value of the research indicated cannot be over-emphasized. Puerto Rico is essentially an agricultural area and has been so since the early days of colonization. While considerable attention has been given in recent years to the processing of agricultural products, to manufacturing, fishing, and the mineral industries; nevertheless, the future of Puerto Rico seems to depend largely on the sugar, tobacco, and other agricultural interests. The rise or fall in the value of agricultural export crops is very closely associated with the well-being of this agricultural people.

Will Potash Benefit Your Apple Orchard?

(*From page* 14)

But the conditions here are most unusual. No sane farmer would handle his soil as these plots have been managed and we hesitate to draw conclusions from this test for application to general orchard practice.

In an orchard of McIntosh and Baldwin trees planted in 1912 we have a comparison of nitrogen and nitrogen plus potash on one plot which is in sod. The two varieties are interplanted. There is another comparison of nitrogen alone on one plot with a complete fertilizer on two other plots all under cultivation.

Table I shows the yields of the two varieties by 2-year periods in pounds per tree. The grouping into 2-year periods is to overcome the irregularity due to biennial bearing. The sod plots in the first part of the table were treated alike for the first 6 years receiving nitrate of soda, 300 pounds per acre. Beginning in 1927 one of the plots has also had sulphate of potash at the rate of 150 pounds per acre. On face of the returns McIntosh has yielded better since the potash fertilizer has been used, but it should be noted that this plot produced better from the start. There is no indication that Baldwin has yielded any better since the potash applications began. It seems doubtful that the two varieties really will respond differently to potash but it may be so.

In another orchard of Wealthy trees planted in 1915 and given uniform treatment up to 1927 we have compared nitrogen alone, nitrogen and potash, phosphorous and potash, and a complete fertilizer. Each treatment is replicated four times and there are normally five trees on each plot. Four plots have only three trees and a few trees are missing. Thus each treatment is applied to a total of 18 trees or nearly that number.

Here there is a little more consist-

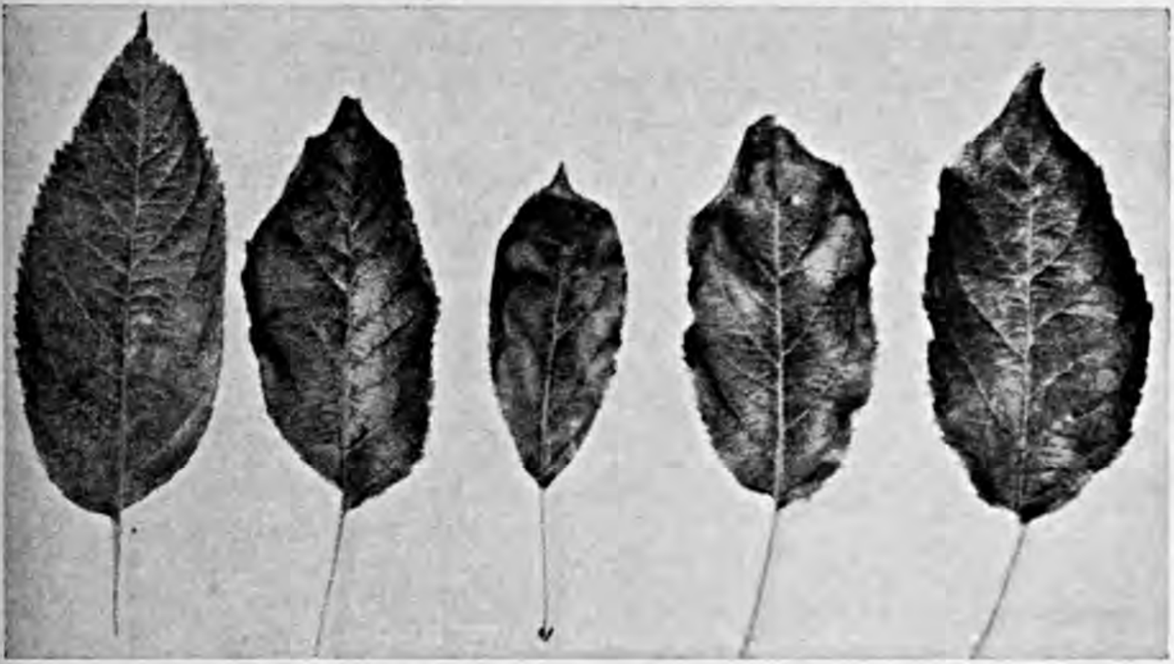
TABLE I. YIELDS OF THE TWO VARIETIES BY TWO-YEAR PERIODS IN POUNDS PER TREE.

SOD PLOTS

1921 1922	1923 1924	1925 1926		1927 1928	1929 1930	1931 1932	1933 1934	1935 1936
Uniform Treatment			McIntosh	Differential Treatment				
461	574	327	No potash	314	656	473	533	844
559	764	483	Potash	680	1003	1064	1019	1121
			Baldwin					
331	553	662	No potash	292	887	183	932	739
354	482	567	Potash	371	737	145	862	664

CULTIVATED PLOTS

1921 1922	1923 1924	1925 1926	1927 1928	1929 1930		1931 1932	1933 1934	1935 1936
Uniform Treatment					McIntosh	Differential Treatment after 1929		
473	254	237	601	938	Nitrogen	845	517	837
34	418	383	506	679	Complete	724	1171	1211
263	426	547	532	648	Complete	537	1266	1034
					Baldwin			
179	66	54	600	923	Nitrogen	692	477	166
11	170	434	841	764	Complete	272	1485	1021
82	272	674	345	725	Complete	358	928	250



The three leaves in the center show "edge burn" due to potash deficiency. While this symptom often accompanies severe potash shortage, it may appear due to other causes. Dry weather is a factor in this condition.

ent evidence of better yields when potash or potash and phosphorus are added to nitrogen in the orchard fertilizer. The behavior of the trees on the nitrogen plots is similar to that of those on other plots where nitrogen has been applied to trees suffering from lack of this element. They respond quickly with increased yields, but this increase is not well maintained. Whether the larger yield of the complete fertilizer plot in the last two years will be maintained in future years remains to be determined.

While these results indicate that in our own orchards the addition of potash to nitrogen has given increased yields with McIntosh and Wealthy, they should be taken with reservations as applying to orchards in general.

We have used the Thornton test for potash in the leaf petiole in an effort to determine if trees were deficient in potash. Results from this test correspond roughly with determinations made by the usual chemical method. While this test shows much variation in individual trees, it indicates more potash in trees that have been fertilized with potash for several years than in those fertilized with nitrogen only. We have tested leaves from many orchards in Massachusetts and have found only a few, less than 10 per cent, that seem to be dangerously low in potash. While we are not yet ready to recommend the general use of potash-carrying fertilizers in our orchards, we feel that this element will be used more commonly in the future than it has in recent years, especially as orchards become

TABLE II. YIELDS IN ORCHARD OF WEALTHY TREES.

1921 1922	1923 1924	1925 1926		1927 1928	1929 1930	1931 1932	1933 1934	1935 1936
Uniform Treatment				Differential Treatment				
12	59	90	Complete	192	261	352	354	497
14	46	227	Nit. Pot.	235	258	358	362	402
18	40	121	Nitrogen	354	246	268	265	274
10	53	94	Phos. Pot.	178	217	251	217	257
17	38	110	Potash	221	222	208	157	236

mature and the roots have more completely exploited the soil.

If it is true that some orchards are suffering from a lack of potash, it becomes important to know which they are. They are more likely to be those on dry, shallow soils, especially soils that have a large portion of sand or gravel. The symptoms observed here are somewhat like those of nitrogen starvation but the leaves do not show as much tendency to become yellowish. Many of the lateral leaf buds fail to start, leaving the twigs bare. Shoots are apt to be slender and many of them may die in severe cases especially in weaker varieties such as Wagener and Yellow Transparent.

Tip burn of the leaves is generally regarded as a distinctive symptom of potash starvation. Our observations are that it appears on most varieties by the time conditions become acute. However, tip burn is often seen in trees suffiering from malnutrition resulting from causes other than lack of potash. Perhaps the most valuable symptom is the failure of the trees to respond to increased nitrogen fertilization. In potash-deficient trees, increasing the nitrogen supply makes the condition of the trees worse instead of better.

If these conditions are present it may be a good idea to try potash on a part of the orchard for three or four years and see if growth and production are increased.

Pictures in this article by the courtesy of the Horticultural Experiment Station, Vineland, Ontario.

New Fertilizers for Ontario Tobacco

(*From page* 19)

application under average conditions is 10 tons of barnyard manure per acre.

In support of these recommendations, a few of the burley fertilizer tests are summarized in table 2. This table illustrates the responses from nitrogen, phosphoric acid, and potash on a sandy-loam soil, and the response from phosphoric acid on a clay-loam soil. This table clearly shows the difference in response from phosphoric acid on these sandy-loam and clay-

Quality of tobacco may be definitely affected by the fertilizer treatment even when differences in the field growth are very small. General view of the flue-cured fertilizer plots at the Harrow Station.

loam soils. The response from potash was not nearly as marked on clay-loam soil. Each figure represents an average of four treatments conducted over a 4-year period. The 4-year averages, therefore, represent 16 repetitions of each test.

TABLE 2. BURLEY TOBACCO FERTILIZER TESTS BY THE HARROW STATION, 1929-32 INCLUSIVE.

Fertilizer Formula	Acre Yield, Lbs.	Value, ¢ per Pound	Value, $ per Acre
Varying Nitrogen (Sandy-loam soil)			
4-8-12	1,357	16.8	227.98
6-8-12	1,462	17.1	250.00
8-8-12	1,454	16.9	245.73
10-8-12	1,492	16.3	243.20
Varying Phosphoric Acid (Sandy-loam soil)			
4-0-12	1,131	13.5	152.69
4-4-12	1,364	15.8	215.51
4-8-12	1,492	16.2	241.70
4-16-12	1,481	16.2	239.92
Varying Potash (Sandy-loam soil)			
4-8-0	1,313	12.3	161.50
4-8-6	1,432	15.0	214.80
4-8-12	1,470	15.6	229.32
4-8-24	1,528	17.8	271.98
Varying Phosphoric Acid (Clay-loam soil)			
4-4-6	1,397	16.6	231.90
4-8-6	1,411	18.2	256.80
4-16-6	1,502	18.9	283.88

The fertilizer tests conducted at Harrow over a period of years in which no manure was applied indicated that a fertilizer high in nitrogen and potash would produce the best dark tobacco. Recent experiments conducted in one of the best dark tobacco districts show that where heavy applications of barnyard manure are made, less nitrogen and potash are required. Where heavy manuring is practised, a 4-8-6 fertilizer is recommended at the rate of 500 to 800 pounds per acre. However, experiments would indicate that where manure is not applied or where only a light application is made, the potash and possibly the nitrogen could be increased to advantage. Likewise, where the potash level in the soil is low, more potash could be used to advantage. A 4-8-10 fertilizer is recommended in such cases.

The nitrogen portion of the fertilizer is usually supplied from several materials. Experiments definitely indicate that at least a quarter of the nitrogen should be supplied from plant or animal organic source, such as from dried blood, high-grade tankage, soybean meal, or cottonseed meal. This portion of the nitrogen becomes available to the plant at a rather slow rate. These tests also show that nitrate of soda is an exceptionally good source of nitrogen.

The recommendation made on the basis of these results is that at least one-quarter of the nitrogen be derived from plant or animal organic sources as listed above, that one-quarter of the nitrogen be derived from nitrate of soda, and that the remainder of the nitrogen be supplied from other standard water-soluble materials. This general recommendation is made for all three types of tobacco in Ontario, as the various tests show that a source of nitrogen that is good for flue-cured tobacco is equally good for burley.

It is recommended that the phosphoric acid be supplied from superphosphate or other easily soluble phosphates.

Source of Potash

The source of potash is also important. While experiments have proved that a tobacco fertilizer is better if a portion of the potash is derived from muriate of potash, the amount of the potash supplied in this form must be limited to protect the burning qualities in the cured leaf. Therefore, a fertilizer is better if the potash is derived from more than one source. The general recommendation for all three types of tobacco is that potash be derived from sulphate of potash and muriate of potash or a portion from sulphate of potash magnesia or other sources of water-soluble potash. It is further recommended that care be taken not to include a larger proportion of muriate of potash than will bring the chlorine above 2 per cent of the total mixture.

Summary of Fertilizer Mixture Recommended

(1) *Flue-cured Tobacco*

A. Use a 2-10-8 fertilizer under average conditions.

B. Where potash levels in the soil are low use a 2-10-12 mixture.

C. A 2-12-6 may be used to advantage where slow maturity has been experienced, particularly on the low-lying soils.

(2) *Burley Tobacco*

A. Use a 4-8-10 fertilizer on sandy-loam and gravelly-loam soils.

B. Use a 2-12-6 fertilizer on clay-loam soils.

C. A 4-12-10 or a 2-12-10, depending on the nitrogen levels in the soil, may be used to advantage on some of the heavier gravelly-loam and intermediate-loam soils.

(3) *Dark Tobacco*

A. Use a 4-8-6 fertilizer where heavy manuring is practised.

B. A 4-8-10 fertilizer may be used to advantage if the potash levels in the soil are low and light manuring is practised.

Alabama's Forward March In Fertilizer Practices

(*From page* 12)

"The same amount of plant food as contained in a 600-pound application of 6-8-4 may also be supplied by an application of 600 pounds of 4-8-4 and a side application of 75 pounds per acre of nitrate of soda or its equivalent.

"Many farmers may wish to buy the separate fertilizer ingredients and mix these materials on the farm in such proportion as to require no side-dressing. If this is the case, the following materials should be mixed and applied per acre: 175 pounds sulphate of ammonia or its equivalent (this amount of sulphate of ammonia would require about 200 pounds of limestone which should be included in the mixture, 300 pounds of superphosphate, and 48 pounds of muriate of potash. This mixture would weigh 723 pounds (including the limestone) and would supply exactly the same amount of nitrogen, phosphoric acid, and potash as would be supplied by the use of 600 pounds per acre of a 6-8-4 fertilizer. The above mixture is satisfactory on light or heavy-textured soils.

"In the event that a farmer has a fairly heavy soil and wants to use nitrate of soda or its equivalent instead of sulfate of ammonia and the limestone, the following materials should be mixed and applied per acre: 255 pounds of nitrate of soda or its equivalent, 300 pounds of superphosphate, and 48 pounds of muriate of potash. This mixture would weigh 573 pounds and would be equivalent to 600 pounds of a 6-8-4 fertilizer in every respect. If a farmer does not wish to use fertilizer at this rate per acre, the mixtures given above may be applied on the desired number of acres.

At the present time Alabama farmers are being advised by farm leaders to fertilize their cotton as recommended in the above statements by Dean Funchess, and indications are that a larger tonnage of 6-8-4 will be used in the State in 1937 than was used the past year when more than 100,000 tons were applied.

Better Crops of Better Quality

(*From page* 10)

was approximately one and one-half times as great on the plots where potash was added as it was on those where potash was not added. This high pulling resistance of plants on potash treated plots was evidently the effect of better anchorage, which in turn was due to better root systems produced by applications of potash. In producing good quality corn, this factor is of great importance.

It has been shown quantitatively and qualitatively that potash, used alone or in combinations, when compared to fertilizers not containing potash, produced higher yields of crops of better quality, brought about better harvesting conditions, and increased the ratio of grain to stalk. No graphs or tables have been shown to indicate the increases due to potash for the shelling percentage of corn, weight of grains, and weight per bushel, but in every case these qualitative factors were distinctly increased by the additions of potash to the fertilizer mixture.

Eliminates Firing

A photograph shows the effects of potash on corn leaves. Potassium-deficient soils cause the tissues around the margins and between the veins of the corn leaves to die prematurely. On the other hand, plants grown on plots receiving applications of either manure or potash were healthy and showed no marginal dead tissues of "firing" of the leaves. A strong relationship exists between "firing" of corn leaves and the small quantities of potassium in the cell sap.

The fertilizer recommendations on these clay-loam soils vary with the farming and cropping systems as well as the productivity of the soil. It is necessary to return at least as much plant food to the soil as is removed by crops, if the fertility of the soil is to be maintained.

In a common rotation of corn, wheat, and clover a large amount of plant food is removed. A 60-bushel corn crop with 2 tons of fodder removes 83 pounds nitrogen, 40 pounds phosphoric acid, and 73 pounds potash. A 25-bushel wheat crop with 1 ton of straw removes 38 pounds nitrogen, 26 pounds phosphoric acid, and 23 pounds potash. A 2-ton crop of clover hay removes 82 pounds nitrogen, 16 pounds phosphoric acid, and 65 pounds potash. This means that in the 3-year period of this rotation 203 pounds nitrogen, 82 pounds of phosphoric acid, and 161 pounds of potash are removed from the soil.

It would require 1,270 pounds of nitrate of soda, 512 pounds of 16 per cent superphosphate, and 322 pounds of muriate of potash to supply this amount of plant food. The clover, however, if inoculated, will normally gather enough nitrogen from the air to equal that removed by the crops, especially if the second crop of clover is returned to the soil. If the produce from this land is fed and the manure carefully preserved and returned to the land, at least half

Potash starvation symptoms on clover and alfalfa are white spots which appear around the border of the leaf and invade toward the center. The border finally turns yellow, dries up, and turns under.

of the mineral matter will be returned to the soil. The net loss of plant food removed by the crops in the 3-year rotation will then be the equivalent of about 250 pounds of superphosphate and 160 pounds of muriate of potash. Therefore, the application of about 200 pounds of 16 per cent superphosphate and 80 to 100 pounds of muriate of potash per acre, or equivalent amounts of these plant foods in the form of ready-mixed fertilizers, under corn and wheat should replenish the plant food removed by the crops and add enough to make up for erosion and leaching losses. If no manure is returned to the soil it will require at least twice the amount of fertilizer as where manure is returned to the soil, in order to maintain the plant-food balance.

Where good rotations are maintained, and by practicing the above fertilizing systems, high-yielding crops will be secured and productivity of the soil will be maintained.

The L. G. Jubilee

(*From page 5*)

igan; but develop a family of cattle of high production and low variability of production, and they will make good from Storrs to Berkeley. Yet against this argument I muster one self-evident truth for the defense of the duplicators. You never have and never will corral all the potential Mendels and Darwins under the roof of any one state institution. If you did, the legislature would balk at the eleventh hour and the whole enterprise would go to the bow-wows! And then, of course, you have the ancient policy of competitive effort, which has turned out more American successes than isolated subsidy. Surely the contest spirit in colleges should not be left entirely to the stadiums!

Consequently, in the matter of duplicated effort herein, I find myself in exactly the same diplomatic position with so many polished professors—astride the w.-k. fence!

Land-granters must not live so much to their own curriculums and corridors that they forget the duty owed by the states to elementary education. No system of universal learning to which these institutions are dedicated can succeed fully by largesse at the top and laxity at the bottom.

With the passing of most of their original doweries, the land-grant colleges must depend on at least three fundamentals for future support, namely: a public appreciation of culture, ability of the people to turn training into living, and the broadening of economic and social opportunity as a safeguard for national welfare. That is, the land-grant teacher stands like a modern auto finisher who can only be sure of his job of polishing fenders and adjusting headlights just so long as the stream of raw ore pours into the smelters and rolling mills. Lectures are no good without listeners, and libraries have no value if left to mice and silver-fish.

To be sure, numerous land-grant grads have switched off the main line to the branch track of vocational, part-time, night-school teaching; but probably it has been no spiritual loss to them. If you doubt it, stand in a corner out of the rush from seven to nine on five nights per week and see work-a-day America return to its books!

Nine out of ten of these eager night-crammers found out the truths which really make education precious—earlier denial or frustration on the one hand, and subsequent proof of their inferiority without it. Vocational courses outside of land-grant colleges deserve land-grant endorse-ment, if for no other reason than because they are also willing to tackle a job which the deans rapidly abandon—the doctoring of the dullard and the conquest of the "con."

AND mark you, moreover, no land-granter may remain satisfied with creating a few "B A's" in the corn-belt, while little district schools are left pinched and penurious on meagerly assessed valuations. Don't forget that famous Iowa supervisor's so-called "ratio of 1-2-3." It stands for the facts as to agricultural conditions, namely, the farmers get one-tenth of the national income, farm women are two-tenths of the nation's women, while they raise three-tenths of the country's children. We doubt much whether as things exist today those three-tenths of our children living in rural school areas obtain anywhere near the rightful share of educational opportunity. Our anniversary program would be incomplete without acknowledgment that not all the barriers to learning have been cut away by the land-grant act alone.

We must not overlook the original principle of higher education in this country, and the careers to which its scattered recipients were dedicated. Our simple ancestors, devoid of classics themselves, insisted on being well-born, well-married, and well-harried. They sought a Greco-Roman background in their physicians, their ministers, and their lawyers. Three noble professions were open to graduates in those days, whereas more than three thousand occupations can be counted up as fields for educated enterprise today. That the research achievements of the colleges have created a major share of those new positions is also a fact.

Charters granted to the colleges of agriculture and mechanic arts dedicated them to the equalization of opportunity to get knowledge for better production as a means of subsistence and comfort. To be sure, culture was provided for, and the land-grant colleges also taught purely abstract subjects, affording a haven for the scholars of a contemplative, temperamental nature.

In the realms of art, literature, pure science, and music the results have been sustaining and inspiring; but we cannot deny that the real purpose of these institutions was to train practical folks for the work-a-day world and to appreciate its beauties and its horizons.

In the production of better tools and finer methods, the land-grant colleges have done wonders for us all, but in envisioning and developing a safer national economy, with fewer bumps and breaks, only a few minor chords have arisen from their cloisters. I hasten to add this saving afterthought—that during all history the land-granters have tried to provide just about what the mass demanded or what the world would accept for the time being. The lust for temporary expediency and material success animating the fast-growing western hemisphere probably set the stage for the land-grant show.

FOR example, in listing the accomplishments of its graduates, one writer for the colleges shows that the directors of the largest industrial laboratories, the presidents of six or more top utilities and manufacturing concerns, and the heads of five or six largest railway companies are graduates of land-grant colleges. But they, too, and more bitterly and directly the farmer-graduates within my personal ken, have nursed the hope of a richer type of human nourishment to come from the land-grant colleges in the wake of the recent depression.

That the land-granters will fulfill expectations in this regard, I have not the slightest doubt. In every crisis facing the country they have done patriotic duty. In the World War 100,000 graduates, including 30,000 officers, served in the army and navy.

Enhanced food production and the speeding up of emergency defense industries kept every land-grant campus humming day and night.

LATER, when we came smack up against the unseen enemy of despair and hunger, unemployment and riot, a few brain-trusters packed their bags and hied to Washington, leaving their fellows a divided camp behind them. To some extent they remain divided today on the issue of the hour, an issue which makes the old go-easy and slip-shod methods of study and extension seem decadent by comparison.

And believe me, the choice is no easy and simple one! We have seen the old adage, "haste makes waste," come true in many state and federal schemes and enterprises set going on the highest of motives. We know that one rule or one system cannot work for all the varied throngs of humanity who look toward some legislative hall for succor. But to veteran land-granters such perplexities and apparent contradictions are not discouraging. For they admit that the same method of trial and error has achieved all the wonders which thus far they have presented to the materialistic world.

Happily a compromise is easy. We must retain in our worthy faculties those wheel-horses who pulled us out of the mud of inefficient production, wasteful marketing, weak and eroded soils, inferior livestock, and who taught diversified agriculture. No safely permanent type of farming can ever be built or maintained on any method which encourages laxity. The self-sufficing, production-improvement group need not hang crepe on their classroom doors or shun the crowded institute halls. Yet they must be tolerant before the new order and be willing to move over and give elbow room to the cosmopolitan, social-minded fellowship whose presence on the land-grant staffs presages another inevitable trend toward the popular will.

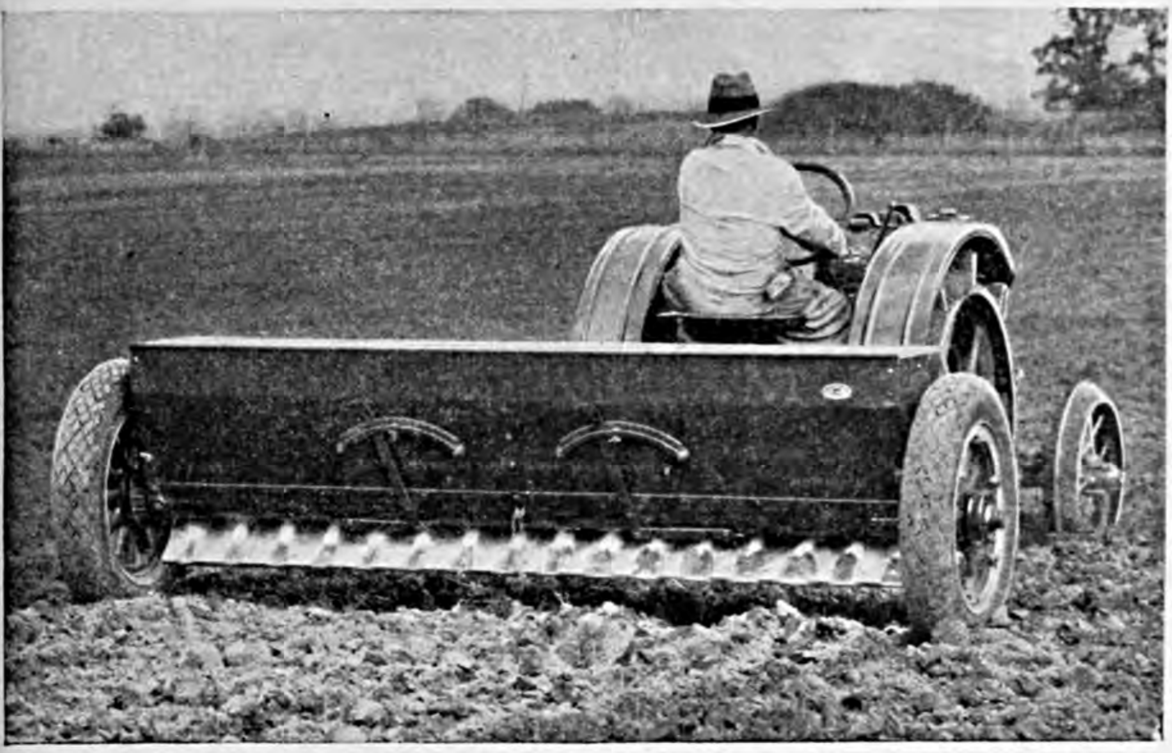
No more auspicious year could be realized in which to find ourselves celebrating the diamond jubilee of the useful land-grant institutions. We have passed beyond the worst aspects of a financial dilemma. We have found millions of farmers able to unite for one purpose in a manner seldom hoped for by the wildest optimists. We have suffered slight court set-backs in realizing that objective, but out of the ashes has come a broader policy of soil renewal and land fertility—and hopes are aroused for other needful correctives in rural social economy. Our physical disasters of sun and flood have tempered our enthusiasm with conservatism and caution. The farmer and the mechanic plan to work together hereafter for a common national stability and security, under the far-flung banner of the institutions to which both look for comfort and advice.

LET me suggest that this summer a general observance of the seventy-fifth anniversary of the Morrill law and the fiftieth milestone of the Hatch experiment station act be a prime objective of every leading college in this category. And if perchance we journey to Washington betimes may we find testimonials and displays of the origin and growth of the United States Department of Agriculture. It also has a diamond jubilee to celebrate this spring.

I intend to recommend this to the Honorable Secretary himself! He is sure to sit up and take notice of anything I have to offer anyhow! Besides, there is nothing in it contrary to the constitution, which puts me in a class of suggesters he will be particularly happy to oblige!

Teacher: "Here's a little example in mental arithmetic. How old would a person be who was born in 1898?"

Pupil: "Was it a man or a woman, teacher?"



OFF THE RECORD

He was applying for County Relief and the young lady official was filling out the customary form.

"Do you owe any back house rent?" she asked.

"We ain't had no backhouse for years," he replied with great dignity. "We got modern plumbing."

Customer: "Have you a book called —'Man, the Master of Women?' "

Salesgirl: "The fiction department is on the other side, sir."

ENGINEERING FEAT

"Did you know, dear, that that tunnel we just passed through was 2 miles long and cost \$12,000,000?" asked the young man of his sweet heart.

"Oh really?" she replied, as she started to rearrange her disheveled hair. "Well, it was worth it, wasn't it?"

"Boss, Ah sees de ladies finally has given in."

"What do you mean, given in?"

"Don't you'all see dat sign, boss? Hit say, 'Ladies Ready-to-Wear Clothes.' "

Aunt Jane: "I want you to promise me never to use two certain words. One is swell and the other lousy. Will you promise?"

Mary Jane: "Sure, Auntie. What are the words?"

Sunday School teacher: "Who gives you your clothing and the food you eat?"

Tommy: "President Roosevelt and Secretary Wallace."

S. S. Teacher: "Who gives you the sun, the stars, and the flowers?"

Tommy: "God."

A little boy sitting next to Tommy, seized his arm and exclaimed: "Sit down, you dirty little Republican!"

HISTORICAL VERSION

A school boy writing a composition on Queen Elizabeth said: "Elizabeth was a queen and a virgin. As a queen she was a great success."

It was one of mother's busiest days. Her small son, who had been playing outside, came in with his pants torn. His mother helped him change to another pair but in an hour or so he was back, his pants torn again.

"You go right upstairs, remove your pants and mend them yourself," his mother ordered.

Sometime later, she thought of him and went upstairs to see how he was getting on. The torn pants were lying on a chair but there was no sign of Johnnie. Returning downstairs she noticed that the door to the cellar, usually closed, was open, and she called down, loudly and sternly, "Are you running around down there without any pants on?"

A deep voice answered, "No, madam, I'm reading the gas meter."

Better Crops WITH PLANT FOOD

April 1937

10 Cents

The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*
Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XXI NUMBER SIX

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Investment Building, Washington, D. C.

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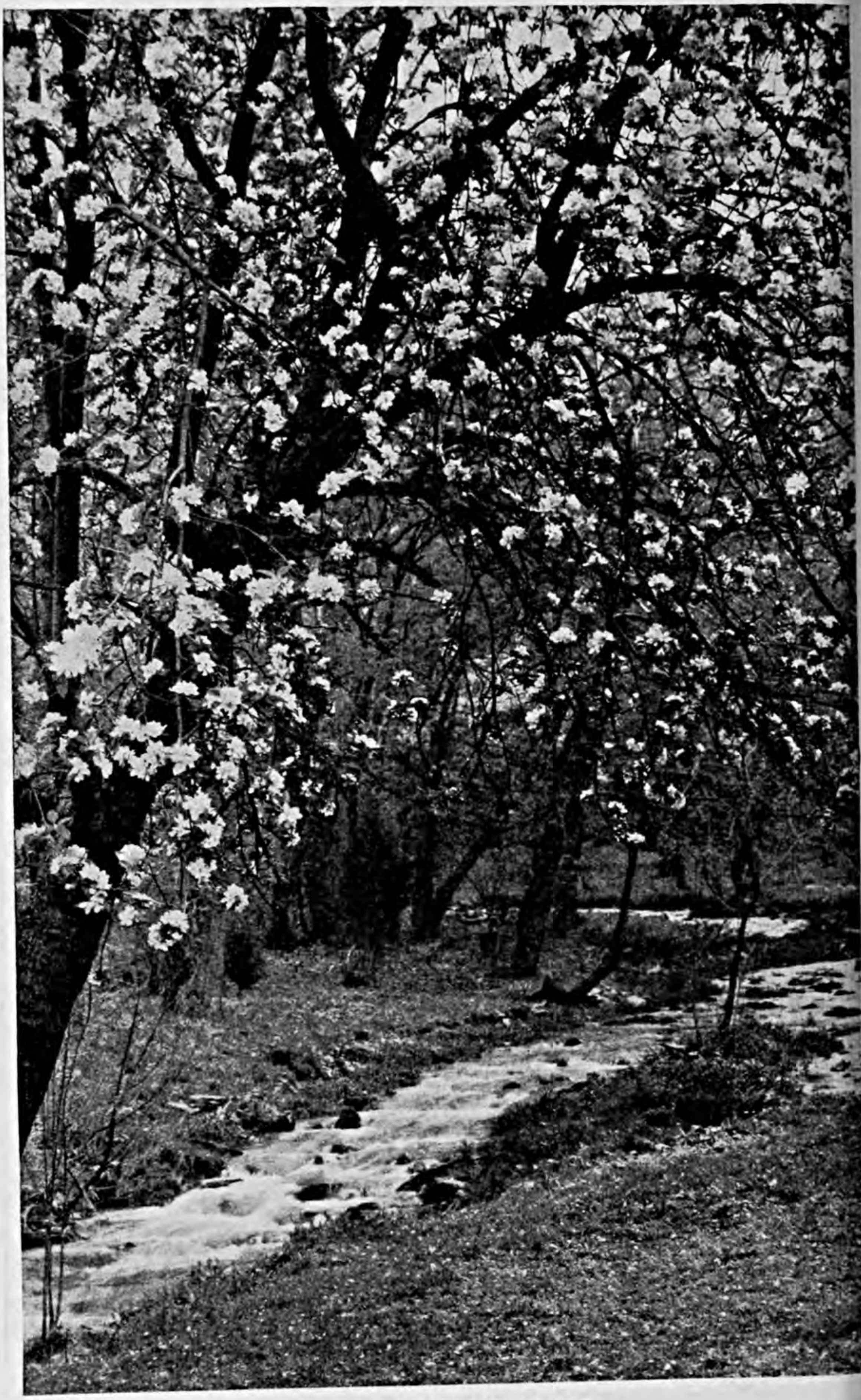

SPRING—ABOVE AND BELOW.

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., APRIL 1937 No. 6

There is much to be gained from--

Sit-down Plowing

Jeff McDermid

LABOR leaders using the imported and effective idea of sit-down occupancy have nothing on the mechanized and modernized American farmer. For everywhere on the far-flung reaches of the belly-filling belt our operators have enjoyed sit-down plowing and be-seated seeding for a number of determined decades.

Of course, there is a shade of difference in the objectives. Sit-downers of industry assume a posterior position on another man's property because they hope to hold down a situation by their own weight and the weight of public necessity so as to pry loose a little more precious privilege.

Farmers on the other hand found out how to be productive and comfortable on their own acreage by the sit-down method. Being planters from time immemorial, they have contrived to plant corn and oats while they peacefully plant the seats of their pants on the time-honored but air-conditioned saddles of sulky plows and snorting tractors.

The "privilege" part of the scheme for them has only been a recent by-product—but its arrival is due to the quicker response of rural minds when freed from the bunions and backaches which kept their fathers yoked with the patient oxen. Instead of celebrating the invention of the steel plowshare as the salvation of agriculture, let's hunt up the firm whose ingenuity first lifted the plodder from the furrow and placed him like a lord on the load!

A few of us yet remain whose experience antedates the pushing period of easeful implementation in farming. We painfully recall enforced absence from the swimming hole and the ball ground, enmeshed by seasonal fate and parental command in the web of "agricultural athletics."

THEY said it was good for our muscles to yank the cultivator and the one-hoss plow, while the spraddling stride assumed in the wake of the shovels and shares was conducive to a better toe-hold on the universe, even better than wrestling. Our calico shirt became loose at the throat, and the sawing reins wore welts and blisters on a scrawny neck fashionably decorated with all the overtones of an Italian sunset. Before the day was over we felt all the effects of the summer spectrum, from ultra-violet rays on one extreme to red-hot tempers at the other.

And no warm welcome awaited the gumbo-footed slave upon seeking his couch by night, fifteen minutes ahead of the chickens. For Mother did all the washing herself over the corrugated back-breaker, and so she made us either lave our lower limbs in the horse-pail or encase them in gunny sacks before slithering between the sheets.

As for the application of plant food in those halcyon days, that, too, is a bitter memory. We either weaved around atop of a mushy and musky wagon-bed of smoking incense laid on the altar of Demeter, forking it out in floppy gobs or wind-casting it from strawy loads; or we dispensed manure and ashes along the expectant garden-rows from a lop-sided wheelbarrow, much in need of knee action and a self-starter.

As a result the meadows took on a spotty, greenish hue from ineffective distribution, and the garden yielded more old horseshoes, rusty nails, and wagon-bolts than it did esculent herbs and vitamins.

Lucky indeed was the lad residing on a sheep or a chicken ranch in those muscling-in, non-stop days of agriculture. Peradventure the bulk of their nitrogen spreading would be done automatically, which was the first evidence of rural common sense in fertilizer application. Its chief objection, however, was the lack of discrimination evinced by those domestic fauna, particularly the geese and ducks, who spent too much of their time squawking and spreading in the immediate door-yard. I am confident that the richest land in the entire corn-belt lies within two rods of the kitchen doors! This fact has been overlooked in Form 57, Series X-J, issued by the S. C. D. A. through what's left of the AAA.

Through the dusty days of flail and horse-power grain separation, the period of threshing was a spell of heat and turmoil. It came to be regarded as hatefully as taking a licking, from whence no doubt came the synonymous use of the term.

ALL of which observation leads to the prompt conclusion that in former times work was the fetish and the sign-manual of the farmer. Success was and had to be measured by tough tasks and long hours. Every form of expression laid all the fruits and blessings of rural life to unremitting work. The art of other days pictured farmers as the benign, resigned, romantic acolytes of toil. There were such popular pictures as the Gleaners, the Angelus, the Song of the Lark, and the Man with the Hoe. The "genre" painters left their saintly church murals in the nineteenth century to depict the glory of husbandry in terms of sweat, rough duds, dull eyes, and blistered knuckles. These impressionists were good pictorial reporters, too, and their canvas caught the fancy of the elect and soon became familiar in warehouse lithographs and sitting-room chromos. Their brushes caught the sunshine and the shadow of the meads and woodlands, but hardly a flicker of their joy and beauty was

reflected in the faces of the soil serfs in the foreground.

Mid-century immigrants to America had no other thought than to grind betimes from dawn to dark, in order to keep pace with the step-up system existing then in a land of liberty which had yet invented no respite for the sons of Cain. No wonder the first mechanical inventions were classed with the likes of the lazy!

NEITHER were the harsh lessons of labor forgotten in church or school. From the Hoosier school-master clear down to the 90's dominated by the traditional mush and morality of McGuffey's axioms and flayed by the gloomy pedantry of revival elders exhorting sinners in the wilderness, congregations and assemblies of young and old had the same dreary doctrine of self-sacrifice at the plow-handle and the grub-hoe beaten firmly into their skulls. It was either work constantly or catch hell, and sometimes it was both!

It strikes me that the religion of those days taught the polar opposite to the economics then prevailing. The deacons insisted that individualism counted for little besides self-castigation, utter humility, and subjection. Yet the economic theory of those times played up the rugged independence of man facing a continental conquest. Thus we had the sacrifice of the church and the selfishness of commerce doled out simultaneously to the settlers of the Midwest. Our poor ancestors were asked to accept both and govern themselves accordingly.

IT is reasonable at this point, in explanation, to emphasize our belief in accomplishment and achievement, and to renounce the doctrine of sloth and inaction. No true American can turn his back on earnest and honest labor, but at the same time he should not offer foolish idolatry to senseless toil which maims the mind and blurs the vision to the wonders of a glorious countryside. Have we clung too long, even in these sit-down plowing days, to an inherent right to leisure and its golden opportunity?

My township once held a few strange souls who rarely had the chance, but sometimes took it, of deep communion with the myriad of unknown facts and mystic forces surrounding their scythes and spades. One of these men was a Scandinavian botanist and naturalist, who sometimes stole a moment from the plow to chase a butterfly or pick a lowland orchid. A neighbor woman took half an hour each day to study bird-life with notebook and references, which culminated finally in her fifties in a useful treatise for the common schools. Still another friend felt the presence of the sunsets and the purple shadows

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Mineral feeding experiment on the Ackert farm. These cattle on pasture were supplied salt alone, no bone meal. Note rough, dry coat.

Feeding Cattle Minerals Through Better Pastures

By N. J. Thomas

Specialist in Soil Fertility, Ontario Agricultural College, Guelph, Ontario.

PRACTICAL cattle men of many years of experience made soil surveys and classified them long before soil scientists ever began a systematic study of the problem. The only difference in the methods used was that soil scientists classified soils on their physical and chemical characteristics, whereas the farmers classified them not only on their ability to produce volume of crop, but on the nutritional value of the crops.

Farms were known for their ability to produce abundant fodder of various kinds, or even if not heavy producers of crop, they would grow and fatten cattle exceptionally well. This fact was so firmly established that farmers were quite willing to pay more per acre either in purchase or rental for such lands of good repute. Possibly this condition is more clearly exemplified in pasture lands than cropped lands, where the influence of soil fertility and crop quality is so discernible in the effects on the cattle within one season. In the experience of the writer, the widest extreme known is where a cattle man will gladly pay an annual rental of $5.00 per acre for pasture, while another area producing more grass he will not take as a gift, knowing it would not fatten cattle.

With the advance of soil science and chemistry, the findings of the

TABLE I.*—FARM NO. 77 FARM NO. 69

	Excellent fattening qualities				Non-fattening qualities			
	Total ash	N %	P %	Ca %	Total ash	N %	P %	Ca %
Red Clover	7.02	2.62	.199	2.310	6.13	2.38	.139	1.716
Sweet Clover	8.63	3.09	.233	2.165	5.30	1.77	.113	1.466
Trefoil	6.93	2.90	.248	2.475	6.51	2.53	.151	1.852
Can. Bluegrass	7.06	1.21	.176	.464	5.15	1.00	.082	.343
Ky. Bluegrass	7.62	.90	.146	.406	6.06	1.07	.099	.480
Timothy	9.59	1.03	.167	.442	5.07	1.04	.106	.340
Red Top	9.14	1.27	.183	.468	8.73	1.01	.103	.329

* Figures on moisture-free basis.

practical farmer have been verified, and part of the reason why has been determined. It is well known now that soil types differ in their inherent physical and chemical characteristics. There is also a relation between the chemical composition of the soil and the nutritional value of the feed produced, with its consequent effect on the health of the animal. For example, there are relatively large areas in this Province where the cattle suffer from phosphorus deficiency due to a very low available phosphorus content in the soil.

During the summer of 1936, a soil survey was made in one of the important, extensive beef-grazing areas of the Province. Samples of pure species of the herbage were also secured and the calcium and phosphorus contents determined in order to find the relationship between soil type and the mineral nutritional value of the herbage. The results indicate that a wide variation exists in the percentage of calcium and phosphorus content of the same species of plants growing on different soil types.

The above table presents the analyses of pure species of herbage obtained from two farms typical of areas where cattle do exceptionally well, and where livestock gains are

In the same experiment cattle on pasture were supplied a mixture of equal parts of bone meal and salt. Note smooth, well-finished, and thrifty appearance.

very small with continual symptoms of mineral deficiency exhibited by a depraved appetite.

Farm No. 77 is located on Brookston silt loam soil type, with a $KHSO_4$-soluble phosphorus content of over 368 lbs. per acre and ammonium acetate replaceable potassium content of 160 lbs. per acre. Farm No. 69 is located on a Berrien sandy loam with a $KHSO_4$-soluble phosphorus content of only 84 lbs. per acre and an ammonium acetate replaceable potassium content of 270 lbs. per acre. The grass grows in abundance on both fields, which have been in pasture for over 30 years, with the dominating herbage approximately the same.

As part of the Provincial Pasture Improvement Program, experiments have been conducted with beef cattle in two very extensive grazing areas. In the Ailsa Craig area, individual gains in weight from May to October will be from 350 to 400 lbs., whereas in the Holyrood area, using cattle of similar age and breeding, in the same period gains of 250 to 300 lbs. each are considered very good. The botanical compositions of the swards are similar, with an average grazing capacity of 20 head per 100 acres for the full season.

As it was known that the soils in the Holyrood area were very low in available phosphorus, it was thought the difference was due to this factor. Subsequent analyses of the soils and herbage from these two areas in 1936 proved this point, as shown in the following table. The samples were taken from natural untreated soils and are typical of the two areas.

To obtain information as to whether the lower gains were due to a lack of phosphorus in the diet, an experiment was set up in the spring of 1935 in which one group of steers on grass received salt alone and a second group received a mixture of equal parts of salt and bone meal. The results of group No. 2 in improved appearance, live weight gains, shipping shrinkage, and dressed per cent were so marked that the work was continued.

Is It Possible?

The question always in the mind of soil fertility students is: Can the minerals be fed to the animal through the soil and plant as well as in the trough? In other words, by improving the fertility of the soil can we improve the cattle? Also, from the livestock man's point, will the continued use of fertilizers with good soil management be ultimately reflected in the health and quality of livestock?

Early in the spring of 1936 a third plot was added to the two of the previous season. This was fertilized with a 2-12-10 mixture at 300 lbs. per acre and stocked with cattle of good uniform quality. The following table presents the results of the gains on grass and financial returns.

It will be observed that the bone meal and salt group made slightly better gains than the salt alone group, and after deducting the full cost of bone meal there was an increase in

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TABLE II*—COMPARISON OF ANALYSES OF UNTREATED NATURAL HERBAGE

Species	Ailsa Craig area Total ash	N %	P %	Ca %	Holyrood area Total ash	N %	P %	Ca %
Trefoil	6.78	1.25	.151	1.692	5.58	2.44	.147	1.409
Can. Bluegrass	10.50	1.13	.127	.363	6.26	1.22	.100	.258
Ky. Bluegrass	8.22	.95	.142	.364	4.36	1.13	.113	.333
Timothy	4.30	2.42	.176	.371	5.35	.98	.129	.292
Red Top	9.17	1.17	.174	.342	6.72	1.20	.132	.372

* Figures on moisture-free basis.

Results With Potash In Eastern Virginia

By Jackson B. Hester and J. M. Blume
Virginia Truck Experiment Station, Norfolk, Virginia

THE horticulturist and agronomist have agreed that almost every field has a different potash-supplying power from that of every other field. They have further agreed that before a true scientific approach to the fertilization programs can be launched some system of evaluating the fertility of the different fields must be available. While long years of research in a particular community have established the fact that a certain fertilizer formula has given consistently the best yield for a particular crop, still it is recognized that this fertilizer is not the best for all the soils. Further, it has been shown that applied potash is less effective on some soils than on others. For example, potash was less than one-half as available on the Bladen sandy loam as it was on the Norfolk and Portsmouth soils. Thus, a knowledge of the available potash, the supplying power, and fixing power of the various soils is valuable.

During the course of the past 4 years a system of evaluating the fertility of vegetable soils in eastern Virginia has been evolved. While this system is by no means perfect, it has served as a working basis for locating fertilizer tests and making recommendations for soil amendments. The present paper deals with the results obtained from the fertilizer studies conducted during the past year on the basis of the soil fertility tests.

A description of the system of evaluating the soil fertility has been given in the Station literature. This system is based on extracting a representative soil sample with a dilute solution of sodium acetate-acetic acid

Fig. 1—A comparison of a potash deficient potato leaf (left) with a normal leaf (right).

mixture (pH 5.0) and testing for the soil constituents extracted.

In predicting crop response on the basis of the soil tests for respective elements many factors must be taken into consideration before a proper correlation with crop yields can be considered. First, in evaluating the fertility of the soil for potash, one is dealing with the chemically available potash. This must be recognized before the true, plant available potash is considered. Plants have different requirements for potash and exert different powers for absorbing the potash from the soil, depending upon the length of season, moisture, etc. The results of a fertility test may have the following relation to plant utilization: If a soil shows a high level of available potash but is too acid for the growth of the crop concerned, then the potash cannot be utilized by the plant. But, if the plant can thrive upon acid soil the potash will be utilized.

A situation that is more complicated may be indicated in the following illustration: Suppose the soil test shows sufficient potash for the crop concerned but also indicates an excess of calcium and a high pH value. Chemically the potash is available, but due to the wide calcium-potassium ratio the plant is unable to take up sufficient potash. Therefore, more than a normal supply of potash is needed to bring the soil solution into balance. Thus, to properly evaluate the fertility of the soil in regard to potash fertilization a knowledge of the soil reaction, supplying power for phosphorus, magnesium, nitrate, ammonia nitrogen, etc., is necessary.

Other Factors

A number of other factors which decrease crop yield may be mentioned, such as other nutritional disorders, climatic conditions, disease, etc. These factors are given for the purpose of illustrating the fact that field plats must be planned with considerable detail, and the data from these plats must be analyzed with the utmost care.

No good color reagent for potash has yet been developed. Consequently, the rapid tests thus far developed must rely upon some turbidity method with the di-sodium cobalti-nitrite reagent. The colloid formed is a sodium potassium cobalti-nitrite and may be estimated by a variety of turbidimetric methods. Since the concentration of potash and other ions in the solution, temperature and light influence the

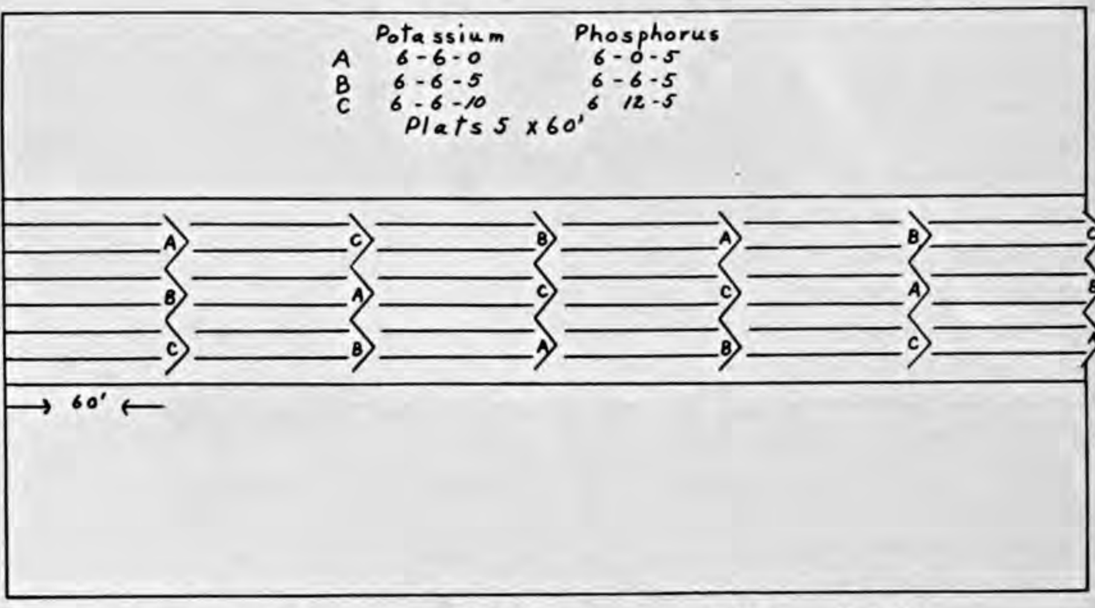

Fig. 2—The arrangement of field plats in commercial grower's field.

Fig. 3—Potato plant from a Moyock fine sandy loam showing an extreme deficiency of potash. The older leaves show the characteristic break down of the tissue between the veins. The younger leaves show a yellow mottling with marginal browning. During certain parts of bright summer days a characteristic purplish coloration was observed on the leaves.

colloid formed, the method is not as well adapted for general use in soil testing as is desirable. A colorimetric method similar to the ones for phosphorus, magnesium, etc., would be far more easily handled. However, the methods now in use are rather reliable and serve as a basis for greenhouse and field work. The test used in this study has been so calibrated that a "good" chemical test signifies more than 100 pounds of readily available potash to the acre; a "fair" chemical test signifies between 40 and 100 pounds of readily available potash to the acre; and a "poor" test below 40 pounds to the acre. While it is realized that the potash requirements for various crops vary widely, the above quantities of readily available potash are sufficient to grow a good, fair, and poor crop respectively of several of the vegetable crops.

Although the final analysis of the value of a soil-testing system must be based upon its success in the field, much valuable information can be accumulated from studies conducted in the greenhouse. Plants vary in their power to absorb potash from the soil. Likewise, soils vary in their power to give up potash to the plant. For example, when the replaceable potash content of a Sassafras sandy loam was below 100 pounds to the acre, sweet corn was unable to obtain enough to make normal growth. A Bladen and a Moyock clay held the potassium even more strongly. There was an apparent equilibrium between the replaceable and non-replaceable potassium but it was of little consequence for a quick-growing vegetable crop.

Relative Absorption

A particularly outstanding point was learned when it was discovered that the dilute sodium acetate extracted less than one-third of the replaceable potash when the amount was less than 100 pounds to the acre, but extracted almost one-half of the replaceable potash when over 200 pounds to the acre were present. This meant that the soil test was a good indicator of the readily available potash, whereas it was less sensitive to the more difficultly available. When the supply is low the plant absorbs little potash, but when the supply is adequate it absorbs more abundantly.

All in all, the pot studies have brought out several very fundamental principles that must apply in the fields under ideal conditions, and to a less extent, under adverse conditions.

In the spring of 1936 an attempt was made to locate plats on soils that showed a good, fair, and poor potash level and a fair phosphorus level. Such crops as beets, cabbage, peas, and potatoes were studied. These tests were conducted with growers, using the same practices with which they handled their crops. Simple fertilizer mixtures, such as 6-6-0 (N-P-K), 6-6-5, and 6-6-10 were used. Each

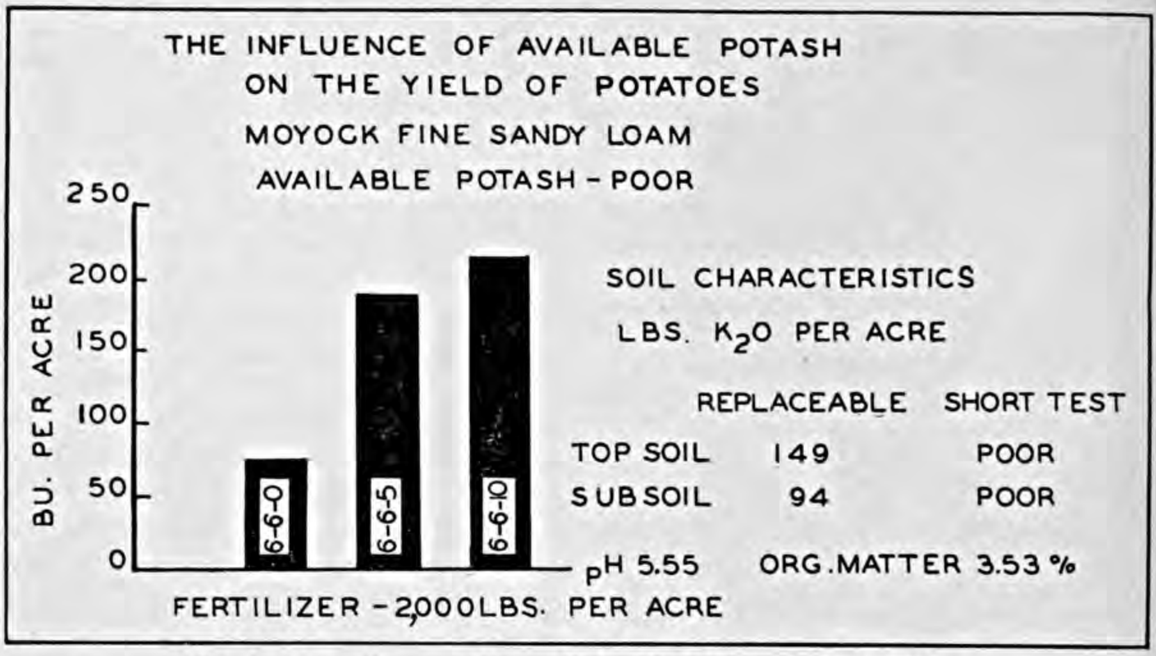

Fig. 4—The soil was well supplied with calcium and magnesium.

plat was replicated six times as shown in figure 2.

It is interesting to observe the results in figure 4. The data in this experiment were from a Moyock sandy loam that showed a poor level in both potash and phosphorus. The soil was well supplied with organic matter, calcium, magnesium, etc., as shown in table 1. The beans from the preceding crop of soybeans had been harvested, but the vines had been turned under. The 6-6-0 plat gave a yield of 74 bushels to the acre. The 6-6-5 plat yielded 194 bushels or 158 per cent increase, and the 6-6-10 plat 216 bushels or 196 per cent increase in yield. It is likely that the phosphorus was a limiting factor on the 6-6-10 plat since its original level was low. It is probable that a 6-12-10 mixture would have yielded higher than any of the mixtures tried. This experiment clearly demonstrates that where the soil level was poor in available potash, medium and high potash fertilizer gave a definite response. The increase due to the 10 per cent potash was significant over the 5 per cent fertilizers.

TABLE 1—SOME SOIL CHARACTERISTICS OF A MOYOCK FINE SANDY LOAM

	pH	Per Cent Organic Matter	Per Cent Phosphorus	Replaceable Lbs. per Acre Ca	Replaceable Lbs. per Acre Mg	Replaceable Lbs. per Acre K	Short Test K	Short Test P
Topsoil	5.55	3.53	0.09	1,660	398	124	poor	poor
Subsoil	5.8	1.04	0.05	880	398	78	poor	poor

TABLE 2—Test with Potatoes on Soil "Fair" in Available Potash, Norfolk Fine Sandy Loam

Fertilizer*	Bushels per Acre	Per Cent Increase
6-6-0	160	
6-6-5	180	12
6-6-10	180	12

*2,000 pounds to the acre.

On a Norfolk fine sandy loam that tested "fair plus" in potash and "good" in phosphorus the response noted in table 2 was evident. Here the replaceable potash was 188 pounds to the acre, about one-third higher than for the former soil, but furnished more than one-third more readily available potash. The soil again

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A Modern Pioneer--
J. W. Hadden

By Ben Hilbun

Agricultural Experiment Station, State College, Mississippi

J. W. HADDEN, after years of seeking, found what he was looking for — financial independence and contentment—on the hills and valleys of a Newton County, Miss., farm. For 5 years Hadden served as agricultural extension agent in Noxubee and Scott Counties, and then filled a 2-year contract with the State of Minas Gereas, Brazil, as cotton specialist, before launching a successful farming career in 1930.

Hadden saw possibilities in ordinary hill land, but didn't cash in the first year, when 78 acres of cotton panned out only 13 bales. He believed that fertilizer would turn the trick, and immediately began a series of tests that verified his judgment. Four years later (1935) he harvested 78 bales of cotton from 63 acres, and the fact that it was long staple cotton made the yield all the more impressive.

He figured that staple cotton would grow most anywhere in the cotton belt if the proper balance of plant food was placed in the soil. Rust, a common disease on hill and sandy bottom land, cut his first crop short. He knew that rust was caused by potash deficiency, and immediately began running tests of varying amounts of potash to get at the quantity that could be economically applied to his land. Starting with 200 lbs. per acre, he ran up the amount during the third and fourth years to 600 lbs. per acre, and even went as high as 800 lbs. per acre.

The 200-lb. application stopped rust. He was sure of that, for he used the farms of his neighbors as checks. His cotton remained green, while his neighbors' cotton rusted out at the height of the fruiting season. He combined the potash with 400 lbs. of superphosphate and 200 lbs. of nitrate of soda to get excellent results.

In 1935, Hadden applied 200 lbs. muriate of potash, 400 lbs. of super-

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Cotton rust can be controlled with potash. Left: Potash starved and badly rusted. Right: Well-fed with potash and normal.

Growing No. 1 Tomatoes For Hoosier Canners

By Roscoe Fraser

Muck Crop Specialist, Purdue University Agricultural Extension Service, Lafayette, Indiana

THE Hoosier tomato canning industry has developed until today Indiana stands out as the leader in packing not only quantity but also quality tomato products. The acreage of tomatoes grown for canning factories in Indiana has increased from 18,472 acres in 1910 to 110,000 acres in 1936. Tomatoes play an important part in a farmer's diversified program. They provide a cash crop and one which has a beneficial influence upon crops which follow in the rotation. Tomatoes require an abundance of plant food to make a good crop, but a large amount of this plant food is left in the green fruits, leaves, stems, and roots after the plants are killed by frost and consequently is returned to the soil.

Fertile Soil Needed

Tomatoes are grown on a wide range of soil types. For the best results the land must be well drained, in a high state of fertility, and in good physical condition. Loams and silt loams best meet the requirements of tomatoes. Light colored, sandy soils usually produce a low percentage of U. S. No. 1 tomatoes unless such soils are high in organic matter and have an abundance of available plant food. On the evidence of 5 years of tomato tagging work by the Purdue University Agricultural Experiment Station in various growers' fields, there seems to be little difference in the percentage of U. S. No. 1's produced on black and clay soils of the same relative fertility.

Green manures together with commercial fertilizer can maintain or increase the crops produced on soils which have previously been poorly farmed. Most crop rotations can be adjusted to get more organic matter incorporated into the soil, even though little barnyard manure is available. (See table for suggested rotations.) Organic matter increases the water-holding capacity of soil as well as improving its tilth and biological conditions.

Green manure crops of deep-rooted legumes like alfalfa and sweet clover add organic matter and nitrogen, and their roots penetrate the subsoils. A good stand of sweet clover plowed under as green manure will add as much as 200 pounds of nitrogen per acre to the soil. About two-thirds of this nitrogen is obtained from the air. Where the hay crop is cut and removed from the soil, there is little or no increase of nitrogen in the soil from the growing legumes. Soybeans are shallow-rooted but if properly inoculated do supply organic matter and nitrogen. Rye may be sown in the fall as an intercrop to be plowed down early the next spring. The application of fertilizer to a green manure crop is desirable from the standpoint of increasing the yield of the green manure.

Plow under green manures before maturity and when still succulent, as the material will decompose more

* Dr. J. H. MacGillivray, formerly on the Purdue Staff, cooperated in preparation of this article.

SUGGESTED 4-YEAR CROP ROTATIONS FOR TOMATOES

For Sweet or Slightly Acid Soils	Corn (Rye-intercrop)	Soybeans	Wheat or oats (Sweet clover-intercrop)	Tomatoes (Rye-intercrop)
	Corn	Wheat (Alfalfa seeding)	Alfalfa	Tomatoes (Rye-intercrop)
For Acid Soils	Corn (Rye-intercrop)	Soybeans	Wheat or oats (Soybeans or Rye[1]-intercrop)	Tomatoes (Rye-intercrop)
	Corn	Wheat (Korean lespedeza seeding)	Korean lespedeza	Tomatoes (Rye-intercrop)

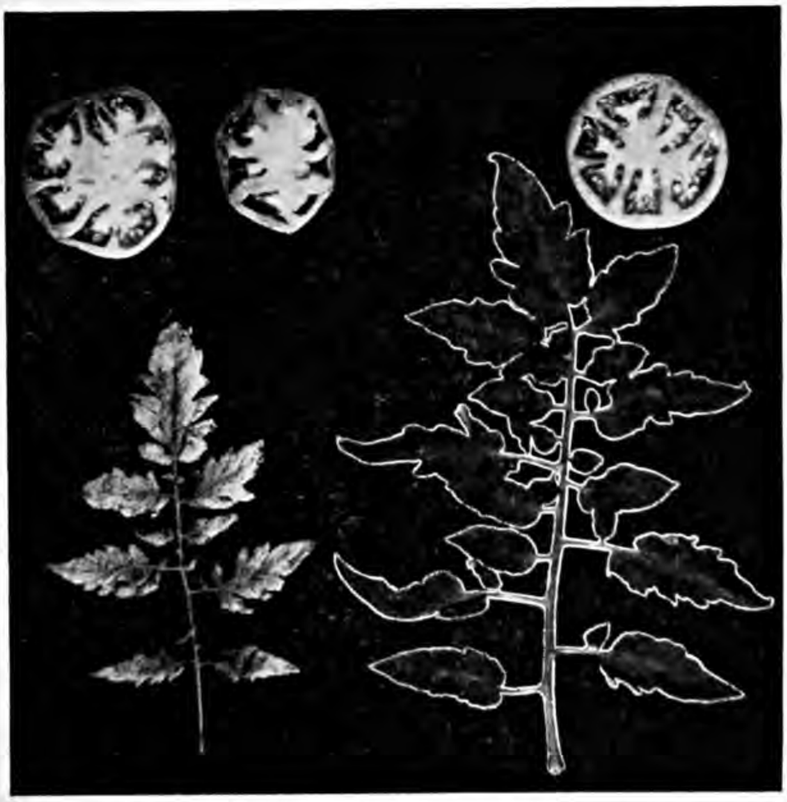
[1] Top-dress rye in early spring with 100-200 pounds per acre of ammonium sulfate, cyanamid, or other nitrogen carrier. Plow under rye 2 weeks before planting tomatoes.

rapidly. When plowing green manure crops, as rye, in the spring, turn under at least 2 weeks before planting time.

Applications of manure are very desirable in tomato production, not only because manure increases the plant-food supply and microbiological activity, but also because it increases the water-holding capacity of the soil and the organic matter which is supplying nitrates throughout the growing season. On dark-colored soils where tomato vines already have a tendency of growing too rank, it is best to reduce the manure applications on tomatoes, and put it on lighter-colored soils for corn and other crops.

Manure applications should be made before the ground is plowed. Where available, 10 tons or more of manure per acre should be used. One ton of average manure supplies plant food equivalent to 100 pounds of 10-5-10 fertilizer. Many profitable tomato crops are the result of generous amounts of plant food supplied by manure. Do not plow under strawy manure just before planting.

For soils high in organic matter, where winter cover crops are not used, and on which there is no danger of erosion, deep (8 inches) fall plowing is best. The fall plowing provides better mechanical condition and greater water-holding capacity. It also helps control disease and insect



Left: Potash starvation—hollow, ribbed, irregularly ripened fruit; leaves yellowed with greenish-tinted veins. Right: A healthy tomato leaf and fruit.

The same care as would be given garden seedbed preparation should be used for tomatoes.

pests. In the spring, shallow working of the soil to kill weeds is recommended.

Simple tests for determining soil acidity and availability of phosphates and potash in soils have been developed recently (Circular No. 204, Purdue University Agricultural Experiment Station) and are now being used by extension workers, county agents, vocational teachers, and canning factory fieldmen. These simple chemical tests indicate when the supplies of available phosphates or potash are so low that crops will be retarded if extra plant foods are not supplied with fertilizers. More dependable fertilizer recommendations can be made following the use of these tests on a soil.

In speaking of acidity, the term pH is being used commonly. This is merely a numerical method of expressing acidity: pH 7 is neutral; 7 to 8 alkaline or sweet; 6 to 7 slightly acid; 5 to 6 medium acid; and 4 to 5 strongly acid. Clover and alfalfa grow best at a pH of 6.5 to 6.8. Many authorities claim that the phosphate and potash in a soil are most efficient for the plant at a pH of 6.2 to 6.5; therefore, it would seem that the most desirable pH for tomato growing would be between 6.2 and 6.5, although profitable crops of tomatoes may be grown on soils as low as 5.5.

Recommended Fertilizers

On practically all soils, applications of 400 to 600 pounds of the proper commercial fertilizer per acre will pay on tomatoes. The analysis of fertilizer to use may be obtained through a knowledge of the type of soil, its past history, Purdue University Agricultural Experiment Station recommendations based upon the state experimental fields, and through the use of recently developed Purdue soil and plant tissue tests.

As general recommendations, clay soils of light color and acid reaction should receive a 2-16-8 or 2-12-6 fertilizer; dark sands and white slash soils, 2-8-16; sandy loams of a light color, 2-8-10 or 3-12-12; dark-colored loams, silt, and clay loams, 0-12-12 or 3-12-12 if the previous crop was not a legume. On a soil that has been heavily manured, a little

Tomatoes should be cultivated often, but very shallow, to destroy weeds without injuring the roots.

less nitrogen and potash may be needed. In the above fertilizer recommendations, many times the actual plant food can be bought cheaper in a one-and-one-half or double-strength fertilizer, for example, a 3-18-9 rather than a 2-12-6.

On soils low in nitrogen, it is often profitable to side-dress or top-dress with 100 or 150 pounds of nitrate of soda or ammonium sulphate, just before the last cultivation. Care should be used in applying either of these materials, so that it does not come in contact with the leaves when they are wet, as it will burn them.

Proper Application

It has been customary in the past to apply fertilizers broadcast with a grain drill, but recent fertilizer experiments have demonstrated that by placing the fertilizer in bands along the side of the plant, the fertilizer is used more effectively. Where the fertilizer is placed in bands, it tends to prevent the fixation of portions of the fertilizer by the soil and consequently a greater proportion is available to the plants. The bands of fertilizer are located so the material is easily accessible to the root system of the young plant.

For the most economical and efficient use, the fertilizer should be applied in bands on each side of the plant, about 3 or 4 inches away from the stalk and at a depth of 4 or 5 inches. Some of the new transplanters will apply the fertilizer in this manner. A two-row corn planter with fertilizer attachment may be used for applying the fertilizer in bands before setting the tomatoes. The corn planter is driven across the field and on the return trip is brought back so that the wheels are about 6 or 8 inches to the side of the wheel marks on the first trip.

Another method of applying fertilizer is by using a one-horse wheat fertilizer drill, stopping up the two outer holes. This places the fertilizer in three bands within a space of 14 inches. The drill should be set as deep as possible, in order to get the fertilizer well down into moist dirt. Many farmers drive the fertilizer drill on the mark made by the marker of the tomato setter and have a spring

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701 Bushels per Acre Broke the Record

By Roy F. Thomas

Houlton, Maine

INTELLIGENT methods in growing white potatoes made it possible in 1936 for Frank R. Shaw, of Presque Isle, Aroostook County, Me., to break the Maine potato-yield record that had stood for 47 years. He harvested 701 bushels per acre, and made the record on 2½ acres of Chippewa potatoes that yielded 1,753 bushels of excellent quality.

Prepared for Success

Born on a farm in Carleton County, New Brunswick, Canada, Mr. Shaw followed the blacksmith trade in Presque Isle for 22 years. During that time he came in contact with hundreds of Aroostook County potato farmers. This gave him an excellent opportunity to meet the best and to learn their practices in growing the crop. Keen observation of good methods and an abundance of common sense provided Frank Shaw with a fund of information about growing potatoes. Thus, in 1932, when he purchased a 120-acre farm in Presque Isle, he was qualified to grow potatoes, and his Aroostook County neighbors all agree that he has done an excellent job of it.

Mr. Shaw plants about 50 acres of potatoes a year, all of which are certified. The principal varieties are Green Mountains, Cobblers, and Chippewas. The short time that he has owned the farm has not given him an opportunity to adjust his rotation to conform with what he considers the proper one for his farm and the number of acres of potatoes he wishes to plant.

The excellent results thus far obtained have been made on fields which have been planted to potatoes for several years. In fact, the Maine potato yield record which he broke was made under practically the same conditions. He does intend to follow a 2-year rotation by planting potatoes on a field 1 year, seeding it down the next spring with an annual legume like crimson clover, and plowing it under that fall to provide humus. The next spring it will be planted to potatoes.

Important Factors

There are a number of factors in growing potatoes which Mr. Shaw regards with a great deal of weight. Some of these are:

1. Deep plowing. He is convinced that, in order to produce a big per-acre yield, one must have a seedbed deep enough and fine enough to invite the development of an extensive root system and allow the making of a big hill on the row so as to provide ample space for the subsequent development of the tubers. This he does by plowing to the depth of from 9 to 11 inches.

2. Liberal amounts of good seed. He uses cut seed averaging 2 ounces in size and drops through his planter 10 barrels (27.5 bushels) on each acre. The best certified seed is none too good for him. All of his seed is treated with corrosive sublimate before cutting, in order to eradicate any dis-

eases which may occur on the surface of the tubers.

3. Fertilizer. "On account of the short growing season in Aroostook County, an abundance of readily available plant food is absolutely essential to start the plants off quickly, to keep them growing and healthy, and to bring a finished crop of good-sized, well-developed potatoes out of the ground at harvest time," he says. As to high-potash potato fertilizers, Mr. Shaw states that he started using them because he found that the best Aroostook County growers were using them. Experience has taught him that he made a wise choice, because they produce for him a high percentage of well-shaped tubers, with few seconds and poorly-shaped ones.

FRANK R. SHAW

To meet the needs of his 1936 crop, he applied under it 1,300 pounds of 8-16-20 fertilizer per acre. This is a per-acre application of 260 pounds of actual potash. Mr. Shaw believes that plenty of potash produces healthier plants that die down more slowly in the fall and better resist lake blight, which is so prevalent in wet years.

4. Cultivation. He cultivates often enough to keep weeds down and is very careful to keep the shoes of the cultivator and wings of the horse hoe away from the feeder rootlets of the young potato plants. Observation has taught him that many fields that were earmarked for a big yield have been permanently injured by upsetting the balance of the young plants by too close cultivation and hoeing. Another point emphasized by Mr. Shaw was that too close cultivation and hoeing drags away some of the fertilizer, thus decreasing the yield.

5. Spraying. A very important requisite in his potato production program is a timely and well-executed spray program. He uses liquid Bordeaux of the 10-10-100 strength. His spray boom is equipped with three nozzles per row so as to provide a thorough coverage of the foliage. Contrary to many growers, Mr. Shaw begins spraying when the plants are 5 to 6 inches high, and sprays often enough to keep the foliage covered. In wet years he continues spraying until well into September. He uses extreme care in preparing the Bordeaux and tests each mixture for the amount of precipitation. At the beginning he uses 200 pounds pressure, and when the plants fill the rows it is increased to 350 pounds. While there was a common late blight infection in Aroostook County last year, his potatoes came through with flying colors.

"All of the foregoing factors are vitally important to a successful potato production program. One is no more important than the other. Each must be performed on a timely and efficient basis," says Mr. Shaw.

Fertilizers For Better Asparagus

By Robert E. Young
Agricultural Experiment Station, Waltham, Massachusetts

ASPARAGUS is a long-time crop, and if it is to pay the grower for his effort, particular attention must be given to selection of the proper fertilizer. Being a perennial, it cannot be changed each year from field to field to receive the benefits of crop rotation and cover crops or other organic matter that have been turned under.

Experimental work with asparagus, in which fertilizer and manure were considered, has not been undertaken at many experiment stations. This is due in part to the difficulty of obtaining comparable results from the replicates. It is practically impossible to obtain a perfect stand, and of course once the experiment is started it cannot be changed. Most of the information which is to follow has been derived from experiments conducted in Massachusetts, particularly those carried on by the Waltham Field Station in recent years. Consideration is also given to the results of other experiments, such as those conducted in Michigan, Maryland, New Jersey, and California.

Before discussing the actual selec-

Harvesting asparagus. The young bed on the left should not be cut for at least 2 years after setting.

tion of fertilizer it might be of value to consider the merits of organic matter for asparagus. As a rule the asparagus that is produced in the eastern part of the United States is grown in light sandy soil. Asparagus seems to make better growth in such soils than when grown on good loam. It would seem from this that organic matter such as a loam soil would contain is harmful rather than helpful to asparagus.

A good plant showing the necessity of being careful in cutting the stalks. With the buds coming so close together many are injured by the knife of a careless cutter.

Use of Organic Matter

The results of experimental work lack unanimity concerning the use of manure or other organic matter. In most experiments where manure has been supplemented with commercial fertilizer, the yields have been far superior to those obtained where fertilizer alone was used. Even on a good loam soil the application of manure greatly increased the yield of that particular plot at Waltham. On a coarse sandy soil the effect of seaweed as an organic material was particularly outstanding in getting the asparagus started and producing high yields early in the life of the plants. From the practical standpoint it is questionable if a grower could afford to use manure on his asparagus bed if he has to compete with general market gardeners in purchasing that manure.

The land for new asparagus beds should be well built up with cover crops or other forms of organic matter before setting the roots. When the tops of the asparagus plants are worked into the soil they supply considerable organic matter, and if every 3 or 4 years a light application of manure or other organic matter could be made this would, no doubt, prolong the life of the bed and increase the production with less damage to the plants in times of drought.

The nitrogen in the fertilizer has been shown by experiments to be important for asparagus, particularly on light sandy soils. The form of nitrogen seems to affect the yield slightly, the organic form of nitrogen producing the largest yields but not a sufficient increase over the nitrate form to pay for the added cost of the organics. The nitrate form has given slight increases over the ammonia form in some experiments. On sandy soils and experiments in sand culture the difference has been distinctly in favor of the nitrate. No doubt the acidity of the soil is an important factor in determining the effect of the ammonia form of nitrogen on yields. In a series of experimental plots that were conducted on a coarse sandy soil which received no lime during the experiment, most of the plants receiving sulphate of ammonia were dead by the sixth year, while the plants receiving nitrate of soda were almost equal to the plants that were kept limed to above pH 6. Where the asparagus was grown on a good loam soil, the sulphate of ammonia plots were slightly better than nitrate of soda.

Calcium cyanamid has been used by many asparagus growers, not only as a source of nitrogen and lime but as a means of controlling the small weeds during the cutting season. Probably the best method in controlling weeds is to use 300 to 350 pounds per acre applied in a band 18 inches wide over the row at the time the first crop of weeds is 2 inches high. A similar application is made at the time the second crop of weeds is 2 inches high. This application will supply all the nitrogen necessary for good growth. A complete fertilizer cannot be used, so superphosphate and potash must be applied to make a balanced fertilizer.

How Much Plant Food?

The amount of nitrogen that can be profitably used depends to some extent on the type of soil, general level of plant growth, and the relationship to the other plant-food elements, particularly potash. The recommendations vary from 60 to 160 pounds of actual nitrogen per acre. If manure or other organic matter is used, or the crop is grown on a good loam soil, the smaller figure is probably nearer correct, whereas if the crop is grown on a sandy soil, poor in organic matter, a larger amount will be necessary for large yields. The proper time of application will be discussed later.

The form of phosphorus used for asparagus has not been the object of very many experiments, probably because superphosphate is the one generally used. The value of phosphorus for asparagus has been questioned by many growers who claim that it causes the tips to spread prematurely. In all the experiments conducted in Massachusetts an ample supply of phosphorus increased the yield, and in recent experiments where a careful check was made there was no difference in the spreading of the tips on the plots receiving no phosphorus and those receiving a generous supply.

Potash Increases Yield

In all the experiments mentioned before, greater response to potash has been obtained than for either nitrogen or phosphorus. These experiments indicate that potash is the most important fertilizer material for asparagus. The results of recent experiments show that the yields of asparagus were increased with each increase up to 360 pounds of actual potash per acre, which would be 720 pounds of 50 per cent muriate of potash. Of course, it is questionable if the larger amounts of potash can be used economically. It has been found that where the larger amounts of potash were used the yields could be further increased by applying a larger amount of nitrogen, thus pointing to a nitrogen-potash relationship. On a coarse sandy soil when potash was omitted from the fertilizer the yields were very low. If only a small amount of money can be spent for fertilizer, it is probable that most of this should go for potash.

The kind of potash to use seems to be of major importance, with experimental data showing the muriate form to be the best and not much difference between the nitrate and sulphate forms. The extra value of the muriate form of potash may be due to the sodium chloride or salt it contains, although salt when applied direct has failed to show such differences in yield as those among the three forms of potash.

There seems to be considerable variation in the results of experiments designed to determine the proper time for applying fertilizer. Considering all the data, it does not seem to make much difference when the fertilizer is

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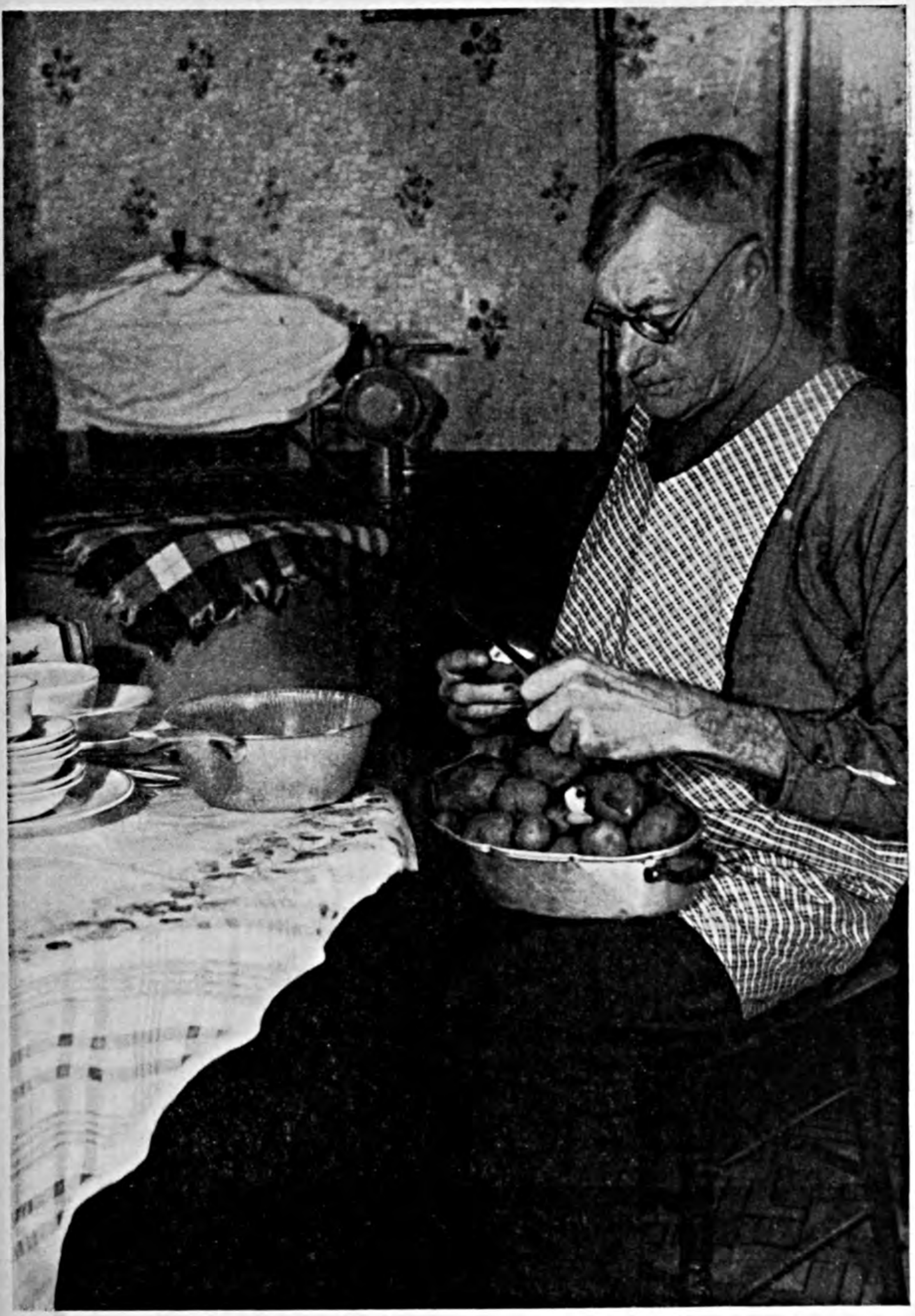
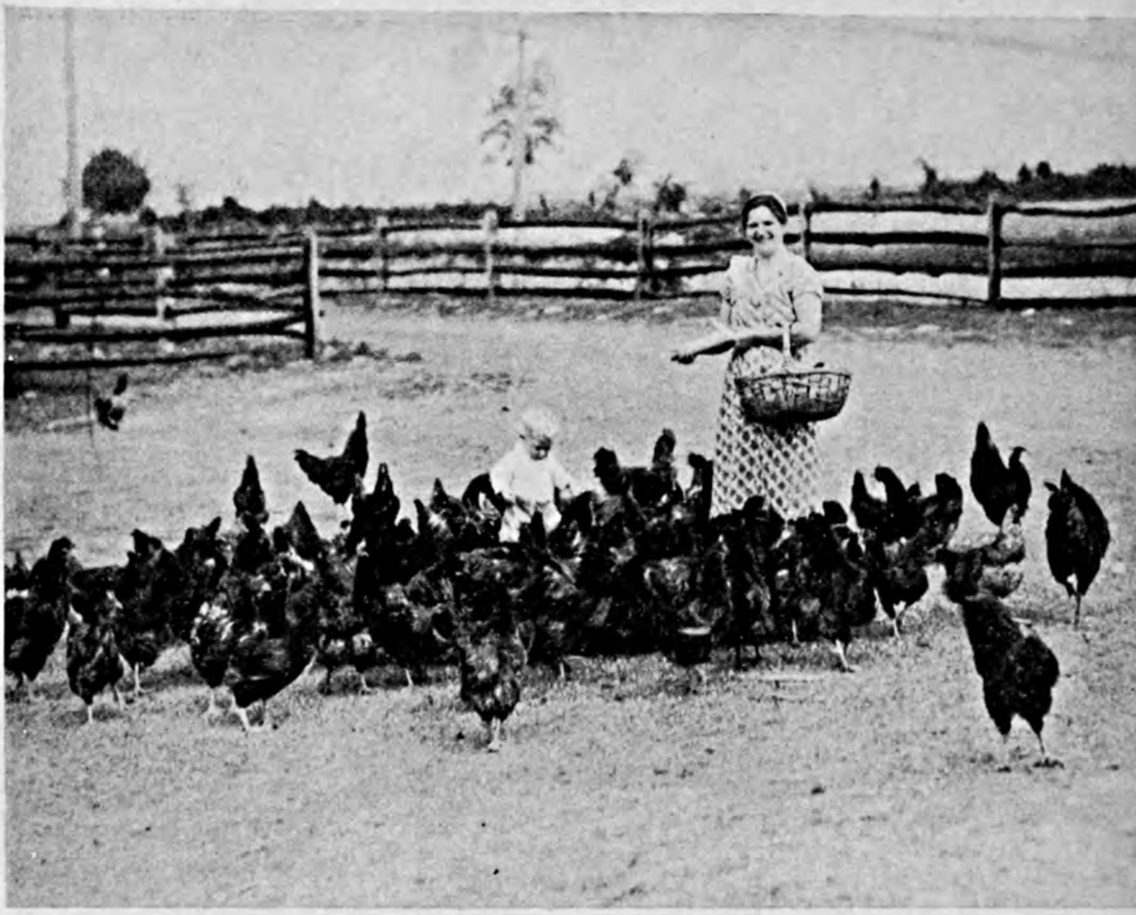
PICTORIAL



GRIM NECESSITY DEVELOPS HIDDEN TALENT.

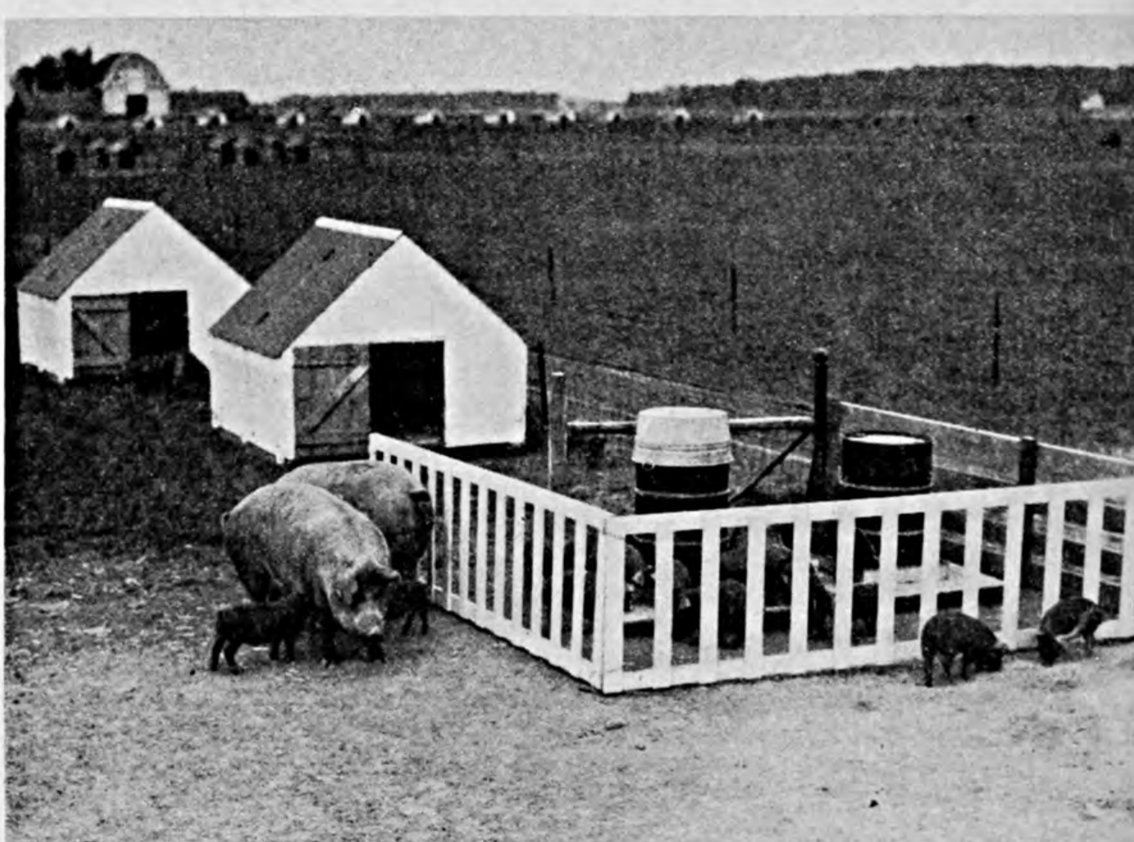
Saturday shopping and community entertainment—diversions from arduous spring work.

Spring comes to the countryside—even farm markets take on a festive appearance.



Poultry is a year-round source of cash income for the farm wife.

Pigs started off in such surroundings will soon make hogs of themselves.



The Editors Talk

Keeping Up With Soils

A new edition of "The Nature and Properties of Soils," by T. L. Lyon and H. O. Buckman, has just appeared. This book can be considered as the latest of a long series beginning with "The Principles of Soil Management," by T. L. Lyon and E. O. Fippin, in 1909. This was followed by "Soils, Their Properties and Management," by T. L. Lyon, E. O. Fippin, and H. O. Buckman, and later by "The Nature and Properties of Soils," by T. L. Lyon and H. O. Buckman. The appearance of the third edition of this book this year thus comes more than a quarter of a century after the first book of the series. It is interesting to observe the changes that have taken place in the subject matter of the books during that time. Subjects which formerly took up whole chapters have now been relegated to footnotes, while other material now occupying major positions, formerly was not mentioned. Methods of mechanical analysis, formerly taking up 11 pages, are now given in a footnote, but a discussion of rapid soil tests is introduced in the last edition.

In the earlier books much attention was given to soil minerals, and the geological concept of soils and their formation. Now comparatively little attention is paid to this, following the divorce of geology and soils. It might be said that the decree was absolute, since the word geology is rare indeed in the latest edition. From the classification standpoint, soils are grouped on the basis of a scheme worked out by Glinka and other Russian workers, and adapted to this country by Dr. Marbut. In place of the geological concept of the soil is the dynamic concept. The soil is considered as a living rather than an inert body.

Stress is now laid on those factors in soil management that can be modified in a practical way by man. For example, soil temperature, while of great practical importance, is primarily of academic interest, since it is difficult to modify it on a field basis. This subject formerly was allotted a full chapter, later was eliminated as a separate subject, but now is given three pages. It is significant that little work is now done on the subject, and the authors refer the reader to an earlier book for a full discussion on it. The soil air formerly was considered of sufficient importance to warrant a chapter. Now it is specifically given one page.

On the other hand, new terms and subjects have been introduced. In addition to the new system on soil classification mentioned above, these include the newer concepts of ionic interchange, carbon-nitrogen ratio, pH in connection with soil acidity and alkalinity, trace elements as fertilizers, artificial farm manure, and rapid tests for determining available nutrients in soils.

This series of books gives an indication of how soil science has changed over the last quarter of a century. The fact that the books reflected this change so well undoubtedly is largely responsible for their continued popularity and prestige in their field.

Safeguards for Our Agriculture

The early reports of county and State agricultural extension workers on the 4-H club work of 1936 indicate that for the first time in the history of the project the enrollment passed the million mark. The membership exceeds that of 1935 by almost 150,000 boys and girls and may reach a total of 1,130,000.

Recognized, without question, as one of the greatest assets for bettering our agriculture, the 4-H clubs are drawing their members from an increasing number of rural homes in the 48 States, Alaska, Hawaii, and Puerto Rico. These members are banded together in small local clubs under the guidance of more than 100,000 trained volunteer local leaders. The only enrollment requirement is an interest in agriculture and homemaking.

The majority of the girls are engaged in one or a number of projects taken from the actual experiences of the farm homemaker. The boys are interested in such projects as may prepare them to be better farmers with a clearer understanding of the problems of rural life. These boys and girls also take an active interest in community affairs, conservation developments, and improved practices in agriculture and homemaking. In developing their projects they follow the most recent recommendations of State and Federal research agencies. In this way they aid in the demonstration and dissemination of the value of practical applications of such knowledge.

It is not to be expected that all of these young people in later life will seek agricultural pursuits, yet through those who will not the industry has further widened the scope of understanding and sympathy with its problems. And the problems of our agriculture are the problems of our civilization.

Progress Requires Fertilizer Usage

The story of farms abandoned when the fertility wore out is an old one. But when the "fertile" frontiers in this country had been pushed to the Pacific Ocean, interest in the fertilizer frontiers began. In other words, fertilizer usage has pretty largely followed the age and intensity of our farming communities, and new indications that eventually this country will know no fertilizer frontiers are coming to light.

H. H. Krusekopf, Professor of Soils, Missouri College of Agriculture, in a recent news release states that the agriculture of Missouri has reached the stage of development where further progress will depend primarily on the adoption of regular soil improvement practices. This means that more fertilizer, limestone, inoculation, terraces, and legumes will be used where they have not been used before, and their use will become a part of the regular farm practice.

"More and more crop production will be done with greater fixed charges and with greater labor requirements," he says. "This trend is clearly indicated with grass. There was a time when seeding only was necessary to secure a stand of grass or clover. Now the majority of land requires special treatment such as liming, fertilization, or inoculation for legumes and even for pasture grasses. The use of fertilizer is a regular practice in many parts of the State. In general, the extensive use of fertilizer is correlated with certain soil conditions."

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

The annual "Preliminary Report of Certain Variety, Fertilizer, and Other Tests Conducted by the Crops and Soils Department of the Louisiana Experiment Station—1936" contains a great deal of useful data as a result of the experimental work of this station. Director C. T. Dowell and his co-workers are to be congratulated for giving out the timely information gathered from the work at the Main and Branch Stations, and also from the cooperative outfield tests carried out in a number of parishes throughout the state. Among the chief findings comprising a large part of this report is the profitable use of fertilizers most adapted for cotton on the various soils. Except for the Red River and Delta soils which require nitrogen fertilizers principally, the high-grade complete fertilizers proved most profitable on the majority of soils in Louisiana. Such analyses as 5-8-4, 5-8-8, 6-8-4, 5-12-8, and 8-8-8 were shown to produce most profitable cotton yields. The rate of application usually recommended is 400-600 pounds per acre. The report emphasizes that much greater gains from increased fertilizer applications may be obtained if boll weevils are controlled. In dry seasons more potash applied to cotton will result in increased profits, especially for soils where cotton rust is prevalent. Under such conditions as are encountered on the prairie type soils west of the Washington Ridge, the use of 600 pounds of a 6-8-8 per acre is recommended. Results of a winter cover crop experiment on bench land at Baton Rouge indicated that it is unnecessary to plow under cover crops each year to maintain high cotton yields; increased cotton yields are reported for 2 or 3 years following turning under leguminous crops. The net profit realized from turning under various winter crops appears to be determined largely by the amount of green matter turned under. Other pertinent information given in this report includes the performance of soybean, oat, corn, and sugar-cane varieties, and seed treatment to control diseases.

"Influence of Rotation and Manure on the Nitrogen, Phosphorus, and Carbon of the Soil," Agr. Exp. Sta., Logan, Utah, Bul. 274, Oct. 1936, J. E. Greaves and C. T. Hirst.

Soils

V. E. Spencer, of the Soils Department, Nevada Agricultural Experiment Station, is stressing the great need for the inauguration of a suitable State-wide study of Nevada's soils in Bulletin 144, entitled "Nevada Soils: An Outline of Proposed Investigations." Of much concern to the farmers in this state is the fact that soil improvement measures are inevitable in order to restore the crop-producing power already lost from the soil and reflected by reduced yields. The author tells us that the progressive farmers are already deeply interested in the problems that have begun to show up in the crops produced on some of Nevada's soils, once believed "such fertile land that its richness is inexhaustible." Not only are crop yields declining, but the quality of crops produced on soils which are nutritionally deficient is also commanding an early and whole-hearted attention.

The initial step in the author's outline of proposed investigations looking toward the betterment of agriculture is a useful soil survey to serve as a guide to other investigations which are in part based upon it. The next logical step is the establishment of field experiments at strategic locations to furnish a foundation of information necessary in practical soil improvement. The laboratory and greenhouse investigations in connection with both soil survey and field experiments are indispensable tools to furnish information valuable in assisting the field work. The value of soil testing in the extension work is explained as another urgent measure in the soils investigation program.

Since there is growing interest in soil fertility and an increasing tendency toward the use of commercial fertilizer in Nevada, Professor Spencer is firm in his belief that an adequate state fertilizer law requiring that materials sold as fertilizers shall come up to a definite standard is necessary. This law should provide for laboratory fertilizer control work where proper analyses of materials sold as fertilizers can be determined.

The Agricultural Adjustment Administration, U. S. D. A., has recently issued a number of Regional Informational Series Leaflets outlining the 1937 Conservation Program for several agricultural regions. These publications will aid those particularly interested in the provisions for participating in the program. In the East Central Region, the leaflets are termed, "Better Balanced Farming . . .," ECR Leaflet 101 for Delaware, Kentucky, Maryland, North Carolina, Tennessee, Virginia, and West Virginia (a separate leaflet for each state). The Northeast Region Conservation Program is contained in NER Leaflet 102, . . . "Ways to Conserve Soil and Qualify for Payments . . ." The States represented by the leaflets received are New Hampshire, New Jersey, and Vermont. The North Central Region Program is given in NCR Leaflet 103. Only one publication for this region has been received—"Agricultural Conservation — 1937 — for Nebraska and South Dakota." Programs for other regions and states are likely to be released in the near future. In general, farmers in the different sections of the country who plan to participate in the Agricultural Conservation Program will need the information contained in these leaflets, as they give facts about the most important provisions of the program, their application to individual farms, and a list of approved soil-building practices and rates of payment.

"The Nitrate Nitrogen in the Soil as Influenced by the Crop and the Soil Treatments," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 250, Feb. 1937, W. A. Albrecht.

"Lysimeter Experiments—IV, Records for Tanks 17 to 20 During the Years 1922 to 1933, and for Tanks 13 to 15 During the Years 1913 to 1928," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Memoir 194, Sept. 1936, T. L. Lyon and J. A. Bizzell.

"Soil Productivity Balance," Agr. Ext. Serv., Columbus, Ohio.

"Land Decadence and How to Halt It," Agr. Ext. Serv., Columbus, Ohio.

"Selenium Occurrence in Certain Soils in the United States with a Discussion of Related Topics—Second Report," U. S. D. A., Washington, D. C., Tech. Bul. 530, Dec. 1936, Horace G. Byers.

"Neutralization Curves of the Colloids of Soils Representative of the Great Soil Groups," U. S. D. A., Washington, D. C., Tech. Bul. 542, Nov. 1936, M. S. Anderson and Horace G. Byers.

"Soil Conservation Reconnaissance Survey of the Southern Great Plains Wind-erosion Area," U. S. D. A., Washington, D. C., Tech. Bul. 556, Jan. 1937, Arthur H. Joel.

Crops

According to Georgia Experiment Station Circular 112, "Bunch Grapes in North Georgia," by J. E. Bailey, grapes are so well adapted to hillside and mountainous sections of northern Georgia that they should be more generally planted for home use and possibly for commercial production. Among the important considerations explained in this interesting and useful circular are the varieties best suited to this section, setting of the plants, pruning, propagation, and cultivating and fertilizing. Results of 5 years experimentation at the Mountain Station located in the heart of the Blue Ridge Mountains have shown that a gently sloping hillside, well-drained and fertile, with a porous subsoil, is desirable for grape growing in north Georgia. Choice of varieties depends upon location and whether grown for home use or market. Bunch grapes are easily propagated from cuttings made during the dormant season. Two-year rooted vines are most desirable for setting. Spacing of grape vines depends upon the amount of space available and fertility of the soil, as well as the system of training to be employed.

A commercial fertilizer high in superphosphate and potash gives best results. An 8-4-6 (PNK) applied at the rate of 600 to 800 pounds per acre gives good results on sloping lands. Frequent shallow cultivation should be given to control weeds.

Grapes are borne on new wood and for this reason it is necessary to prune each year. Training vines on a two-wire trellis is recommended for general practice.

"Partners in Agricultural Progress, Report of the Agricultural Experiment Station from July 1, 1934 to June 30, 1936," Agr. Exp. Sta., Berkeley, Calif., C. B. Hutchison, Director.

"Some Reasons Why Roses Fail," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 499, Jan. 1937, William B. Shippy.

"Sea Island Cotton," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 500, Mar. 1937, W. E. Stokes.

"Sixteenth Annual Report, 1935-1936, of the Georgia Coastal Plain Experiment Station," Agr. Exp. Sta., Tifton, Ga., Bul. 26, Sept. 1936, S. H. Starr, Director.

"Nineteenth Annual Report of the Department of Agriculture—July 1, 1935, to June 30, 1936," St. Dept. of Agr., Springfield, Ill., Walter W. McLaughlin, Director.

"Thirty-sixth Annual Iowa Year Book of Agriculture," Iowa St. Dept. of Agr., Des Moines, Iowa, Ray Murray, Secretary.

"Sweet Potato Production in Louisiana," Agr. Exp., Baton Rouge, La., Bul. 281, Dec. 1936, Julian C. Miller and W. D. Kimbrough.

"Report of Progress for Year Ending June 30, 1936," Agr. Exp. Sta., Orono, Me., Bul. 384, June 1936.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 19, No. 3, Feb. 1937.

"Sweet Potato Project," Agr. Ext. Serv., State College, Miss.

"Forty-ninth Annual Report, 1936," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Carl E. Ladd, Director.

"The Potato Situation and the Status of Potato Research in New York," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 352, June 1936, H. C. Thompson, M. P. Rasmussen, E. V. Hardenburg, F. M. Blodgett, Donald Reddick, G. F. MacLeod, J. R. Livermore, and Ora Smith.

"Varieties of Vegetables for 1937," Cornell Univ. Ext. Serv., Ithaca, N. Y., Bul. 370, Feb. 1937, Paul Work and A. E. Griffiths.

"The Panhandle Bulletin," Panhandle A. & M. Col., Goodwell, Okla., No. 62, Mar. 1937.

"Forty-ninth Annual Report of the Pennsylvania Agricultural Experiment Station for the Fiscal Year Ended June 30, 1936," Agr. Exp. Sta., State College, Pa., Bul. 336, July 1936.

"Tree Fruit Varieties in North Texas.," Agr. Exp. Sta., College Station, Tex., Bul. 535, Nov. 1936, L. E. Brooks.

"How Science Aids Utah Agriculture—Biennial Report of the Director, 1934-35 and 1935-36," Agr. Exp. Sta., Logan, Utah, Lowry Nelson, Director.

"Forty-sixth Annual Report for the Fiscal Year Ended June 30, 1936," Agr. Exp. Sta., Pullman, Wash., Bul. 342, Dec. 1936, Edw. C. Johnson, Director.

"Home-grown Red Clover Seed Best," Agr. Ext. Serv., Madison, Wis., Cir. 289, Jan. 1937, O. S. Aamodt, E. J. Delwiche, and A. L. Stone.

"Report of Extension Project 22, 1936," Agr. Ext. Serv., Madison, Wis., Dec. 15, 1936, F. V. Burcalow.

"The Houma Potato: A New Variety," U. S. D. A., Washington, D. C., Cir. 420, Dec. 1936, C. F. Clark, F. J. Stevenson, and J. C. Miller.

"List of Publications of the U. S. D. A. from January 1931 to December 1935, Inclusive," U. S. D. A., Washington, D. C., Misc. Pub. 252, Mabel G. Hunt.

Economics

Of special interest to those interested in the economic aspects of the fertilizer industry are the various state tonnage reports which are published about this time of the year. The Bureau of Agricultural Economics, U. S. Department of Agriculture, cooperating with the Alabama Department of Agriculture and Industries, has issued a very complete report of the fertilizers used in Alabama. According to this report, a total of 468,800 tons of fertilizer was sold in Alabama in 1936. From the tonnage standpoint, the most important grade sold in that state last year was 3-8-5 which represented 111,262 tons of the total. The next most important grade was 6-8-4 with 91,193 tons, and third was 4-8-4 with 80,182 tons. These three grades made up about 80 per cent of the total of mixed goods sales. The tabulations were made on the basis of analyses and by counties. The average analysis of mixed goods has increased from 16.5 per cent to 17.2 per cent since 1929.

The Indiana Department of Agriculture also published a very complete report on fertilizer sold in that state. According to the tag sales reports from Indiana, 254,118 tons of fertilizer were sold in 1936, and the report published by the Indiana Department of Agriculture covers 238,390 tons. Of this total, 103,725 tons were sold in the spring, and 134,665 tons in the fall. The most important single analysis in Indiana was 2-12-6, which constituted 107,658 tons of the total. The report covered 118 different analyses of mixed goods.

According to the report of the State of Maryland Inspection and Regulatory Service at College Park, Md., there ware 92 firms registered in Maryland, 857 registered brands, and 93 different analyses. Of the 93 different analyses registered, 61 were complete fertilizers, and 6 were superphosphate and potash mixtures. Total sales in Maryland in 1936 were 164,817 tons. The tonnage of plant food included in mixed fertilizers was as follows: 3,944 tons nitrogen, 12,999 tons phosphoric acid, and 9,096 tons potash. Fifteen brands made up the largest part of the total tonnage, 139,508, with 2-9-5 the most important single analysis.

The Department of Agronomy of the Ohio State University reported that there were 337,146 tons of fertilizer sold in Ohio in 1936, of which 138,370 tons were sold in the spring, and 198,776 tons sold in the fall. This compares to sales of 306,509 tons in 1935, and to 338,662 in 1929. The most important single analysis sold in 1936 was 2-12-6, which constituted 123,111 tons of the total. This report also gives the data by counties. Fertilizer sales in Ohio are fairly well distributed throughout the state.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 20 *and* 21, *Jan. and Feb.* 1937.

"An Economic Study of Milk Production Costs in Herds of Producer-Distributors in Maine," Agr. Exp. Sta., Orono, Me., Bul. 385, *Aug.* 1936, *George F. Dow.*

"Official Inspections 161*—Commercial Fertilizers,* 1936*," Agr. Exp. Sta., Orono, Me., Oct.* 1936, *Elmer R. Tobey.*

"Commercial Fertilizers, Commercial Feeds, and Agricultural Liming Materials," St. Insp. Serv., Univ. of Md., College Park, Md., Control Series No. 161, *Jan.* 1937.

"Inspection of Agricultural Lime Products," Agr. Exp. Sta., Amherst, Mass., Control Series, Bul. 87, *Dec.* 1936, *H. D. Haskins.*

"Acquiring Farm Ownership by Payments in Kind—A Plan to Permit Tenants to Buy Farms Through Annual Product Payments," Agr. Exp. Sta., Columbia, Mo., Bul. 378, *Jan.* 1937, *O R. Johnson.*

"Types of Farming in Montana—Part I. Physical Environment and Economic Factors Affecting Montana Agriculture," Agr. Exp. Sta., Bozeman, Mont., Bul. 328, *Oct.* 1936, *Neil W. Johnson and M. H. Saunderson.*

"Inspection of Fertilizers," Agr. Exp. Sta., Kingston, R. I., Annual Fert. Cir., Sept. 1936, *W. L. Adams and T. Wright, Jr.*

"Drainage and Irrigation, Soil, Economic, and Social Conditions, Delta Area, Utah," Agr. Exp. Sta., Logan, Utah, Bul. 273, *Oct.* 1936, *W. Preston Thomas and George T. Blanch.*

"A Graphic Presentation of Changes in the Agriculture of Washington from 1930 to 1935," Agr. Exp. Sta., Pullman, Wash., Bul. 341, Dec. 1936, Carl P. Heisig.

"Cooperation Principles and Practices," Agr. Ext. Serv., Madison, Wis., Sp. Cir., Nov. 1936, Chris L. Christensen, Asher Hobson, Henry H. Bakken, R. K. Froker, and Marvin A. Schaars.

"Producers' Goals and Consumer Goals," U. S. D. A., Washington, D. C., G-65, Mar. 1937.

"The Nature and Properties of Soils"

The third edition of "The Nature and Properties of Soils" (The Macmillan Company, New York, $3.50) has been prepared by the indefatigable T. Lyttleton Lyon and Harry O. Buckman of Cornell University. To those who have studied soils the title and authors need no introduction. The general style, arrangement, and scope of the book are similar to the preceding edition. The authors have been conscientious in their revision, however, and the text has been largely rewritten. Keeping pace with the progress of soil science, appropriate newer developments have been introduced into this edition.

The first half of the book is devoted to the physical and chemical properties of soils, while the latter half gives consideration to the fertility relationships of soils. The book opens with a general introduction to the concept that the soil is a dynamic body with definite characteristics, rather than just dirt. Following this are chapters devoted to the consideration of the soil as a medium for supplying plants with the nutrients needed for growth; soil colloids and ionic interchange; the microbiological population of the soil; soil organic matter; soil moisture and its control; origin and modes of formation of soils; classification of soils; peat and muck soils; soil acidity and alkalinity; liming; soil nitrogen in its various relationships; a brief discussion on fertilizers and their use; farm and green manures; and methods of maintaining the fertility of soils.

The sequence of chapters in a book, of greater importance in a textbook than in a reference book, is frequently a trying problem, the solution usually representing a compromise not wholly satisfying. The present edition marks some notable improvements in the matter of chapter sequence over earlier editions, in the opinion of this reviewer. Placing the chapter devoted to fertility maintenance at the end rather than near the beginning of the book certainly appears more logical. While some may say that this chapter, representing the motivating spirit of the book, should be introduced earlier, the problems involved are so complex that all the information contained in this or any other book is little enough for solving them. It would seem that the chapters on soil moisture could well precede the consideration of ionic absorption and exchange, and since farm and green manures are so closely related to the soil organic matter, these chapters could well be closer together in the book.

Recent Developments

Out of the great mass of literature on soil science, the authors appear in the main to have culled wisely and digested carefully, with emphasis given to more recent developments. A fuller discussion of soil classification according to the pedological system worked out for this country by the late Dr. Marbut is given. The material on colloids and ionic exchange has been expanded in this edition to include modern concepts. This would seem to be warranted by the great importance of these phenomena in practically all soil relationships. The significance of trace elements in fertilizers and soils and the use of rapid tests in the determination of the fertilizer needs of the soil are briefly discussed. The authors wisely point out the possible futility or even danger of placing such tests "in the hands of amateurs" (p. 358). However, it seems to this reviewer that a little more emphasis could have been given to the proven value of these tests when placed in the hands "of experienced and technically trained men who understand the scientific principles underlying the common field procedures" and the correlation with soil characteristics and plant responses that have already been effected. In considering fertilizer placement, full advantage does not appear to have been taken of the results of work in this field within the last several years.

"The Nature and Properties of Soils" will serve as an excellent reference book to those having to deal with soils, and who in agriculture does not, some time or other? The concise and lucid handling of the various subjects, combined with a full subject index and the restoration of the author index, enhances its value for this purpose. However, the book is primarily a textbook, the latest of a series by the same authors which has been the standard for the teaching of soils in this country for many years. The authors have rendered an inestimable service to soil science in standardizing on a high plane the fundamental training in the subject, so that the confusion commonly attendant on the development of a new science, such as that of soils, has been largely lacking here. The third edition is fully up to the standard of the previous editions and there is every reason to believe that it will enjoy the same well-merited success.

"Production of Field Crops"

The well-known book on agronomy, "Production of Field Crops," by T. B. Hutcheson and T. K. Wolfe, has been revised, with the addition of a new co-author, M. S. Kipps, all of the Virginia Agricultural Experiment Station (McGraw-Hill Book Company, Inc., New York, $3.50). This new edition follows the same general form as before, with some rearrangement of chapter and subject sequence, condensation of numerous subjects, inclusion of new material, and the addition of references at the end of each chapter.

The book is divided into nine sections entitled General, Cereal or Grain Crops, Legumes for Seed, Forage Crops, Root Crops, Fiber Crops, Tubers, Sugar Plants, and Stimulants, respectively. The first chapter is a general historical introduction to plant culture, which is followed by chapters devoted to a discussion of the economics of crop productions; the adaptation of crops to various factors; the classification of field crops from the botanical and agronomic viewpoints; germination and growth of seeds and plants; plant breeding and hybridization; the value and use of good seed; a very brief consideration of the use of commercial fertilizers; barnyard manure; lime; seedbed preparation; seeding practices; tillage; harvesting grain crops; haymaking; silage; pasture and meadow management; weeds; and crop rotation. The rest of the book is devoted to the individual crops, giving in each case the botanical classification, production data, historical facts, varieties, uses, specific cultural practices, insect pests and diseases and their control. These chapters include cereals, corn, wheat, oats, barley, rye, buckwheat, rice, peanuts, soybeans, cowpeas, field peas, field beans, pasture and hay grasses, clovers, alfalfa, sorghums, millets, vetches, rape and sunflowers, sweet potatoes, carrots, mangels, turnips, cotton, flax, hemp, potatoes, sugar beets, sugar cane, and tobacco.

The expansion of the chapter on germination and growth of seeds and plants to include brief descriptions of cell structure in the root and leaf will be very helpful to those of us who have become a little rusty in our botany. A new section on vernalization, or iarovization, briefly explains these terms, newcomers to crop literature within the last several years. When discussing plant breeding and hyoridization, a section on the Jones method of breeding corn has been added.

The rearrangement of the subject matter in the second edition of "Production of Field Crops" represents a distinct improvement, especially from the viewpoint of a textbook. The first edition served as a handy reference book, and this edition should prove even more useful owing to the inclusion of new material and the lists of references following each chapter.

Fertilize Corn Properly For Early Spring Growth

THAT quick growth of stalks so necessary for the formation of early ears of sweet corn depends to a great extent upon proper fertilization. C. H. Nissley, extension professor of vegetable gardening at the New Jersey College of Agriculture, Rutgers University, says that placing fertilizer so that the roots of the plants have ready access to it early in the spring is important in fertilizing this crop.

"The analysis of commercial fertilizer used by most New Jersey sweet corn growers ranges from a 6-6-5 formula to a 5-8-7 or a 4-12-6," Mr. Nissley reports. "Where a rye or other green manure crop is plowed under, a fertilizer containing a larger amount of nitrogen is advisable, and where stable manure has been applied, fertilizer containing a greater amount of phosphorus is recommended. The most popular fertilizer, however, is the 5-8-6 or 5-8-7 commercial mixture.

"At least half of the fertilizer should go deep into the ground in the row. It is best applied with a potato planter or with a fertilizer distributor which places the fertilizer in bands 3 to 4 inches in the ground and 2 inches away from the seed. This method locates the fertilizer in fairly moist soil and where it will be more readily available for plant use should dry weather follow seeding. From 600 to 800 pounds of fertilizer per acre are usually applied in the row.

"After the corn has attained a height of about 12 to 15 inches, apply 600 to 800 pounds of the same fertilizer to each acre as a side-dressing and cultivate it into the ground along the row. About the time the sweet corn comes into tassel some growers find it advisable to apply a nitrogen fertilizer at the rate of 150 to 300 pounds to the acre. The application of the nitrogen fertilizer at this time under normal growing conditions will produce a green-colored husk and increase the length of the streamer on the ear.

"Do not cultivate sweet corn deeply after the corn has attained a size of at least 18 to 24 inches. Deep cultivation will tear off many of the feeding roots which are so important to the early spring crop."

Fertilizers For Better Asparagus

(*From page* 22)

applied as long as the application is not delayed beyond the time of the last cutting.

The result of one experiment conducted in Massachusetts indicated that it was slightly better to apply the phosphorus early in the spring before the cutting season. It is probable that this early application permits the phosphorus to be more thoroughly worked into the soil by the cultivations made during the cutting season. Where mixed fertilizers are to be applied it is questionable how many growers would care to divide this application, thus making double the work. If fertilizer materials are to be used it is probably best to apply the superphosphate and potash before the asparagus bed is prepared in the spring, thus affording ample opportunity to work these materials well into the soil. The application of nitrogen fertilizer can then be divided as the grower desires. All of the fertilizer should be applied to the bed by the end of the cutting season.

RECOMMENDATIONS

Sandy Soil

Where good growth is obtained use one of the following:

1. Apply 1,500 to 2,000 pounds of an 8-10-12 or similar analysis fertilizer

Careful packing is as important as careful growing, in marketing asparagus with a profit.

per acre, apportioning the quantity if desired, applying two-thirds of the fertilizer before the cutting season. If no such analysis as 8-10-12, 4-5-6, or 5-8-10 fertilizer is available, use 5-8-7 and apply 200 pounds of muriate of potash or nitrate of potash in addition.

2. Apply 1,200 pounds superphosphate and 400 to 500 pounds of muriate of potash per acre before preparation of the bed in the spring. Top-dress with 125 to 160 pounds of actual nitrogen per acre, using either 600 to 800 pounds of cyanamid or 800 to 1,000 pounds of nitrate of soda. If cyanamid is used, apply in two equal parts, the first at the time the first weed crop is 2 inches high. The fertilizer should be used over the row only, a band 18 inches wide being sufficient. This application will control most weeds for about 2 weeks. The second application should be made at the time the next crop of weeds reaches 1 to 2 inches in height. If nitrate of soda is used to supply the nitrogen, one-half should be applied before and the remainder at the conclusion of the cutting season.

Loam Soils

Where asparagus is grown on good loam soil, the fertilizer may be reduced one-quarter and the nitrogen portion as much as one-third.

Poor Sandy Soils

Where soil and other factors affecting growth are limiting the production of asparagus to a light crop, it would not be economical to make such heavy applications of fertilizer although ample quantities should be supplied to restore production to normal.

Young Asparagus Beds

Apply three-quarters as much as recommended under No. 1 for the first 2 years, then regular amounts thereafter.

Results With Potash in Eastern Virginia

(*From page* 12)

was well supplied with calcium, magnesium, etc. This time a 6-6-0 mixture yielded 160 bushels to the acre while the 6-6-5 mixture yielded 180 bushels or 12 per cent increase in yield. The 6-6-10 mixture also yielded 180 bushels to the acre or no increase in yield over the 6-6-5 mixture. The rainfall was slightly below normal and the yield possibly a little below average. Since a 6-6-5 mixture gave only a 12 per cent increase in yield over the 6-6-0 it is not likely that a 6-6-10 mixture could have been profitable under even the most ideal conditions.

The response to potash in the fertilizer was very low on the soil well supplied with potassium. There was no response to phosphorus in the fertilizer used on this soil. The profitable application of fertilizer for this soil would have been an average application of nitrogen and potash, without phosphorus, for the conditions under which the crop was grown.

The results with peas are of limited value due to a dry season. For a field that showed a fair level of potash, no response to this element in the fertilizer was noted, whereas nominal response was noted on a field that had a low level of potash. Whether a "fair" amount of potash in a soil indicates a sufficient quantity for the production of peas is a question yet to be answered. It is certain, however, that a crop will respond to potash where the supply in the soil is low. These results are given in table 3.

Again the number of tests on soils low in potash was limited. Beets are

TABLE 3—Test with Peas on Soil "Fair" in Available Potash, Norfolk Fine Sandy Loam

Fertilizer*	Pounds per Acre
6-6-0	5,346
6-6-5	5,135
6-6-10	5,188

*1,000 pounds to the acre. Top-dressed with 200 pounds of calnitro.

considered a crop that requires a large amount of potash. On a soil that showed a fair level of potash the 6-6-5 mixture gave a 15 per cent increase in yield over the 6-6-0 plat, table 4, and 22 per cent increase for the 6-6-10 plat. Here again the yield was below the average due to limited rainfall. Several factors of importance were noted in the beet crop. The beets receiving the potash made a more rapid start and matured several days earlier. Since weather conditions were not conducive to rapid growth it is likely that the difference should have been more pronounced had the season been normal. But a low response to potash was about all that could be expected where the potash content of the soil was fairly high. Two hundred twenty-six pounds to the acre of replaceable potash were present in this soil.

TABLE 4—Test with Beets on Soil "Fair" in Available Potash, Moyock Fine Sandy Loam

Fertilizer*	Pounds per Acre	Per Cent Increase
6-6-0	6,583	..
6-6-5	7,584	15
6-6-10	8,033	22

*2,000 pounds to the acre.

The results with sweet potatoes might be called outstanding. One of the growers, who produces rather large crops of sweet potatoes after leafy vegetables, has experienced difficulty in getting a good yield of high quality potatoes. It was thought that since he used 6-6-5 and 9-5-4 fertilizer mixtures with additional nitrogen on his leafy vegetable crop, he was likely to already have too much phosphorus and nitrogen in his soil for sweet potatoes. It was decided to try an experiment using 3-3-15, 0-0-15, and 0-0-30 mixtures as compared with no fertilizer treatment. This test was laid out and the above fertilizers were applied at the rate of 1,000 pounds to the acre. All of the crop made rank growth of vines, too rank in fact. The yields of U. S. No. 1 potatoes, figure 3, were 242 bushels to the acre for the no-fertilizer plats, 228 bushels for the 3-3-15 plats, 230 for the 0-0-15 plats, and 327 for the 0-0-30 plats. In other words, 300 pounds of muriate of potash gave no response, but 600 pounds gave 85 bushels to the acre increase.

Balanced Nutrient Supply

It is probable that a larger supply of potash would have given even a larger increase in yield on this field. The explanation of this large increase in yield for the 600 over the 300-pound application perhaps lies in the fact that the nutrient supply was brought into balance only when the potash was built up to a definite point. The soil test showed a "high" ammonia and nitrate content, "fair plus" test for phosphorus, "low fair" test for potash, and a "good" test for calcium. In other words, the nutrient supply of the soil was completely out of balance for the production of sweet potatoes. This has often been found to be the case with a variety of crops. It has been found quite frequently that more than an average application of the nutrient concerned was necessary to produce the maximum crop yield.

It has been shown that when the proper coincidence of chemical factors occurs in the soil and climatic conditions are favorable, abundant crop production is a result. Without a knowledge of the available nutrients present, optimum nutrient conditions in the soil occur only as a matter of

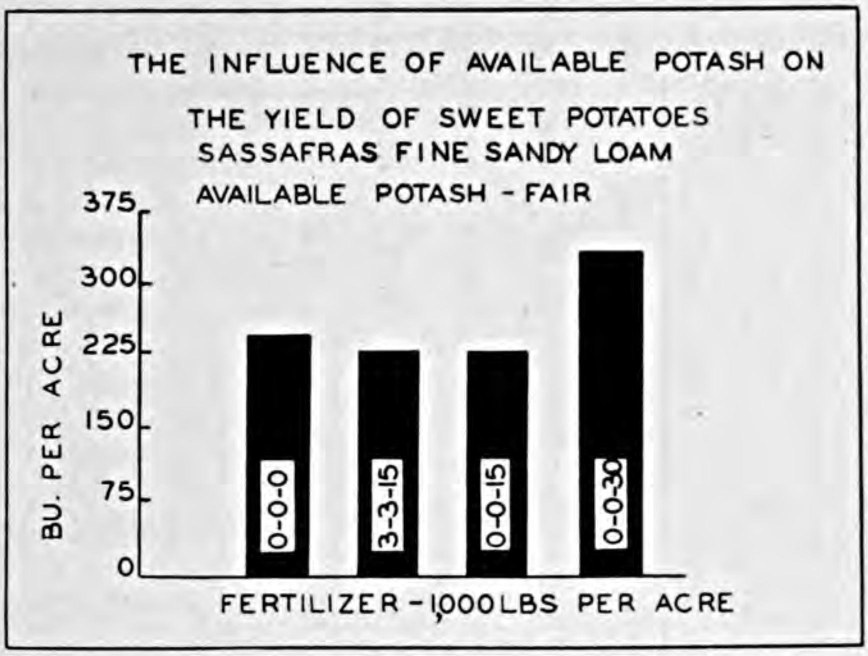


Fig. 5—The soil carried an excess of calcium, nitrogen, and phosphorus for sweet potatoes.

chance. If the soil test is made, a limiting factor in crop production may be eliminated.

It is realized that all of the conditions in the soil which may influence the soil test have not been learned. It has been shown that much work needs to be done on various soil types and with the various crops. It has further been shown that the potash requirements of the various crops need considerable study. However, it is believed that a working basis for the various crops has been started that warrants further study.

Feeding Cattle Minerals Through Better Pastures

(From page 8)

the returns per acre. The 2-12-10 fertilized plot grazed six head equally as well as the other two plots carried four head for the season and with increased individual gains above the other groups. As there is usually a

TABLE III—COMPARISON OF THE EFFECTS OF:
1. A pasture well-fertilized with a 2-12-10 analysis and salt.
2. Bone meal and salt in the trough.
3. Salt alone.

Conducted on the Farm of E. Ackert, Holyrood, Ontario, 1936.
(In co-operation with the Departments of Chemistry and Animal Husbandry, Ontario Agricultural College, Guelph).

	Plot 1*	Plot 2**	Plot 3
Size of plot	12 acres	12 acres	12 acres
No. of cattle grazed	6	4	4
No. per 100 acres	50	32	32
Average wt. May 10, 1936	945 lbs.	975 lbs.	925 lbs.
Average wt. Oct. 21, 1936	1,263 "	1,270 "	1,215 "
Average gain per head	318 "	295 "	290 "
Total value May 10, 1936 @ 4c	$226.80	$156.00	$148.00
Total value Oct. 20, 1936 @ 6c	$454.68	$304.80	$291.60
Gross increase	$227.88	$148.80	$143.60
Cost of treatment	$ 30.00	$ 2.00	$ .....
Net gain	$197.88	$146.80	$143.60
Returns per acre	$ 16.57	$ 12.40	$ 11.13

*Plot 1—Charged with ½ cost of 300 lbs. of 2-12-10 fertilizer applied broadcast in the early spring.
**Plot 2—Charged with 66 lbs. of bone meal.

TABLE IV—SHIPPING AND SLAUGHTER SUMMARY OF MINERAL FEEDING AND FERTILIZER EXPERIMENT OF BEEF CATTLE ON PASTURE 1936

Plot No.	Treatment	Av. wt. May 10	Av. wt. Oct. 20	Av. gain on grass lbs.	Av. gain on grass pct.	Av. wt. Oct. 20 (Buying)	Av. wt. Oct. 22 (Killing)	Av. shipping shrinkage lbs.	Av. shipping shrinkage pct.	Av. warm dressed weight lbs.	Av. warm dressed weight pct.	Ave. cold dressed weight lbs.	Ave. cold dressed weight pct.
(1)	300 lbs. 2-12-10 + salt	945	1,263	318	33.65	1,263	1,215	48	3.78	696	55.10	684	54.11
6 head.													
(2)	66 lbs. bonemeal + salt	975	1,270	295	32.82	1,270	1,207	63	4.96	694	54.64	682	53.74
4 head.													
(3)	Salt alone	925	1,215	290	31.35	1,215	1,160	55	4.52	656	53.99	643.5	52.96
4 head.													
Plot 3 less animal No. 35 (Extra good breeding)		...	1,237	...	....	1,237	1,173	64	5.17	654	52.87	641	51.85

residual effect of the fertilizer on pastures, it was thought only fair to charge one-half of the cost of treatment to the cattle. After deducting this amount, the increased financial gain for the 2-12-10 per acre was $5.44 above the salt plot and $4.17 above the bone meal.

As in the previous season, the cattle receiving the bone meal supplement and those on the 2-12-10 fertilized pasture had a decidedly more thrifty appearance than the salt group.

To complete the picture of this work and determine if the various treatments had any effect on the quality of the cattle, arrangements were made to slaughter them at a local abattoir. The cattle were shipped in two trucks a distance of 85 miles, yarded for two days and fed hay and water. Individual weights were taken just before shipping and again just before slaughtering. Warm-dressed and cold-dressed weights were also recorded. The following table presents the average shipping and slaughter results.

Practical Advantages

The addition of the mineral supplement decreased the shipping shrinkage and increased the dressing per cent over the salt group, which indicates that the natural pasture is not supplying all required by the animal. The group on the fertilized pasture (2-12-10) was decidedly better in shipping and dressing percentage than the other two groups. While no attempt was made to grade the cattle on the hoof, the slaughter tests would indicate that the latter group should sell for a higher price than the salt alone group. It also proves the point of the practical farmer or cattle buyer, that cattle from good soil will make better gains and are worth more per pound than cattle raised on soils low in fertility. The results are also a direct answer, as far as one season can determine, to the value of fertilizers in producing more fodder with an increased nutritional value.

The soil on which this experiment was conducted is a Napanee clay loam, slightly acid in reaction, of good natural drainage, very low in available phosphorus but reasonably high in replaceable potassium. The fields have been in pasture for nearly 20 years and the sward consists chiefly of Canada and Kentucky bluegrasses, timothy, with a small per cent of red top and trefoil.

Samples of the herbage were taken on June 25 from the fertilized and unfertilized area, separated into species, and analyzed for total nitrogen, phosphorus, and calcium, with the following results:

TABLE V.*—COMPOSITION OF PASTURE HERBAGE

	Fertilized Area				Check area			
	Ash %	N %	P %	Ca %	Ash %	N %	P %	Ca %
Alsike	6.99	2.49	.185	1.346	....	....	....	....
Trefoil	6.23	2.56	.181	1.314	5.58	2.44	.147	1.409
Can. blue	8.14	1.19	.153	.336	6.26	1.22	.100	.238
Ky. blue	5.53	1.14	.153	.315	4.36	1.13	.113	.333
Timothy	5.38	.95	.157	.260	5.35	.98	.129	.292
Red Top	7.34	1.06	.171	.310	6.72	1.20	.132	.372

* Figures on moisture-free basis.

These investigations clearly show that a rational fertilization of forage crops can have a beneficial effect, not only directly on the crop yields, but indirectly on the livestock being fed the forage. There is a very definite indication that by improving the fertility of the soil we can improve the cattle.

Growing No. 1 Tomatoes For Hoosier Canners

(*From page* 17)

marker in the middle of the drill, which serves as a mark for the planter, thus the soil is fertilized just ahead of the tomato setter. The plants are then set in the center of the 14-inch fertilizer strip. A corn cultivator with fertilizer attachment is a very satisfactory implement to use after the plants are set and have straightened up.

If machinery is not available for any of the above methods of application, the fertilizer should be placed deep under the rows and thoroughly mixed with the soil before setting the plants. Sometimes a single shovel plow is used to make a furrow, and then a one-horse corn planter with fertilizer attachment is used, drilling the fertilizer back and forth in this furrow until the desired amount has been distributed.

There are two main satisfactory sources of tomato plants—those from southern states and local plants grown in the open or under canvas or glass. Each have their special advantages. Where a grower can raise his own plants, this is usually the cheapest; and it is always good insurance to raise some for transplants.

Varieties: Various improved strains of Baltimore are most satisfactorily used in the state. Stone may be used for the extreme southern portion of the state because of its greater foliage protection for the fruits. Some of the wilt-resistant varieties are Marglobe, and a more recent similar introduction is the Pritchard.

Seed: Good certified seed always should be used. It should have a guaranteed germination and have been produced from good parent stock.

Plant Beds: In growing tomato

plants in cold frames or hotbeds, watering should be done in the morning so that foliage will be dry by night and prevent spread of diseases. The temperature of the beds should not go below 50 or 55° F. at night and ventilation given during the day when the temperature rises above 75-80° F. The plants should be sprayed every week with 2-6-50 Bordeaux or dusted with a 20-80 copper lime dust. Arsenate of lead should be added where insects are eating the plants.

A number of weeds, including ground cherry, nightshade, and horse nettle, carry diseases which also attack tomatoes. For this reason, these, as well as other weeds, must be kept under control, especially around plant beds.

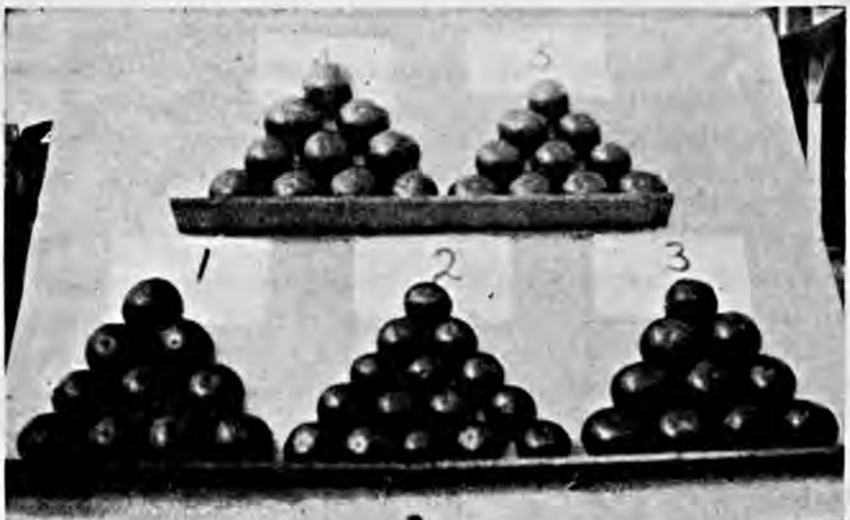
No one should use tobacco while working around plant beds or while transplanting, because the disease of tobacco mosaic also attacks tomatoes. Those who use tobacco should wash their hands with soap before handling plants.

Transplanting retards growth, more or less, depending on the amount of root injury. Plants should be moved with as little shock as possible. Water beds 12 hours before lifting. Do not pull plants, but lift them with a spade or fork with close tines. Leave as much soil on roots as feasible. Roots dipped in a mud paste made from clay and water are better able to withstand the shock of transplanting. Plant setting should be done on cloudy days, or if the weather is extremely hot and clear, only in afternoons, preferably late afternoon.

A good plant to set in the field should not be badly wilted, diseased, or woody, and should have a stem the size of a lead pencil, 6 to 8 inches high with a blossom cluster just forming. Longer plants should be set deep, even in a trench, allowing only a small portion of stem above the surface of soil, as all portions under soil will produce roots.

Plants are usually set 4 feet by 4 feet on very fertile soil, and 3½ by 4 feet on medium soil. Some successful growers have been planting their tomatoes 3½ by 3½ feet. Tomato plants are set both by machine and by hand, and either method may be used successfully by skilled men. Counting a team of horses on the transplanter as one man, there is little difference in the cost of setting an acre. In both methods it is essential that the roots of the tomato plants are firmly pressed into contact with the moist soil.

The plants should be set in the field as soon as the frost danger is past — during the last two weeks in May and the first week in June, depending somewhat upon location in the state. Data from New York State show that



Nos. 1-2-3 tomatoes were taken from plots which received high-potash fertilizer. Nos. 4-5 were fertilized with a 2-12-6. Note the larger fruit and better color produced by the extra potash.

growers planting before June 5 averaged 10 tons per acre; from June 5 to 10, seven tons per acre; and those setting later than June 10 averaged only 4.1 tons per acre. Figures collected in Indiana in 1920 also showed the advantage of early plantings in total yields.

Tomatoes should be cultivated often, but very shallow, to destroy weeds without injuring the roots. The root system of the tomato begins very close to the surface of the soil and may extend down some 2 to 3 feet, however, most of the roots are in the top 8 inches of soil. Corn cultivators equipped with sweeps or duck-foot shovels may be used, as they are very efficient weed-killers and destroy very few feeding roots. Many farmers are using homemade, one-horse, sled-type drags, made by driving 60-penny spikes through planks at 4-inch intervals. The spikes extend 2 inches into the soil. The drag is guided by two handles extending in the rear.

Discontinue the use of any cultivator whenever there is danger of injuring the vines. The destruction of foliage or leaf area reduces the food-manufacturing capacity of the plant and causes lower yields. Good foliage is of great value in warm weather, since it keeps the fruit cooler and thereby enables the plant to produce a greater percentage of No. 1 tomatoes.

In an average tomato season more than 65 per cent of the tomato fruits will become U. S. No. 1's and bring the farmer the "top price," if picked at the right time. At picking time it is essential that the farmer consider ways he may handle his help so that tomatoes will be picked to return him full value. If a normal tomato is picked too green or too ripe, it becomes a No. 2 or cull. A potential No. 1 tomato picked as a cull is a loss, with the additional cost of hauling to the factory. A No. 1 picked as a No. 2 is merely obtaining the cost of production. A No. 1 picked so it will grade a No. 1 means a profit for the grower and a happy contractor. In an effort to help the farmer to pick tomatoes as U. S. No. 1's, there has been published a leaflet on Profits in Tomato Picking which gives the essentials of better picking.

A large tonnage of tomatoes is purchased each year on the basis of Federal state grades. These grades are administered through the U. S. Department of Agriculture and Purdue University Agricultural Experiment Station, and are determined by specially trained inspectors. This is a sound basis on which to buy or sell tomatoes. Some canners purchase their tomatoes on a flat rate basis at a specified price per ton with the privilege of inspection. Indiana canners have had an enviable reputation for the quality of their canned tomatoes and tomato products, and this cannot be maintained without the delivery of red, ripe tomatoes at the factory.

Eight Essentials of Quality Tomato Picking

1. The crop must be grown with good farm practices, but it must also be carefully and skillfully picked.
2. Color-blind people are usually not successful tomato pickers unless they have knowledge of their condition and pick for brightness rather than redness.
3. Frequency of picking must be governed by weather conditions, but tomatoes are usually picked too frequently.
4. On the average, 68 per cent will become U. S. No. 1's and remain as U. S. No. 1's for an average of 6.5 days.
5. Bruised or cracked tomatoes from careless picking, overfilling the baskets, or improper loading of the tomatoes in trucks or wagons result in a loss of tonnage and quality to grower and canner.
6. Tomatoes which are wet from rain

or dew appear redder than when dry. The picking of wet tomatoes should be avoided, but when necessary, special care should be used.

7. More rotten tomatoes result from careless picking than from weather conditions.

8. Most tomato pickers must be supervised and paid on a quality and thoroughness basis.

A Modern Pioneer—J. W. Hadden

(*From page* 13)

phosphate, and 200 lbs. of nitrate of soda per acre to 282 acres, from which he picked 245 bales of staple cotton. And the staple cotton grown on hill land compared favorably with staple produced in the Delta.

Believing that oats would show a corresponding increase if fertilized, Hadden tried 200 lbs. muriate of potash and 100 lbs. of nitrate of soda on 12 acres, using the rest of the planting as a check. "The fertilized plot," he said, "almost doubled the per acre yield of the unfertilized plot."

To add further variety to his farming venture, Hadden decided to try out the commercial possibilities of popcorn, something no one in that vicinity had ever attempted. Starting on a small scale and finding the venture profitable, he has increased his plantings to 75 acres per year.

The best mixture of fertilizer, he finds, is 100 lbs. muriate of potash, 200 lbs. superphosphate, and 100 lbs. of nitrate of soda. His yields average about 20 bushels per acre.

When he began experimenting with popcorn, he found the popping expansion to be 21. In 1936 he had samples tested by the Kansas Experiment Station and Iowa State College, Ames, and got a reading of 32, which is the highest popping expansion known. He thinks, in view of the first and last test, which represent different fertilizer practices, that the fertilizer and the long growing season are responsible for the high popping expansion.

Hadden, a new kind of pioneer, is demonstrating a modern philosophy of farming, not on new but on old, worn-out land. He is proving the contention of the poet Sidney Lanier that "there is more in the man than there is in the land."

Sit-down Plowing

(*From page* 5)

of the meadows, and took his refuge in poetry and water-colors. Another lady put this same spirit of the open fields into embroidery and rugs, after the milk things were scrubbed!

Had these persons enjoyed the surplus leisure engendered by mechanical improvements, their avocations would have more fully served the task of bread-winning. One always returns stronger to a routine job after riding hobbies in leisure moments. But as things used to be, leisure came only with decrepit age and fading eyesight.

And in those unlovely times of toil any rural community grew suspicious and resentful of any person who was "quare," and who varied from its

Calvinistic standards. Yet I am happy to say that among the rolling hills of my state there stands a granite monument overtopping a splendid vista, dedicated by the emancipated sons of farming to the culture of a bucolic scholar. The grandsires of the lads who erected the stone thought the "darned old hermit" was loose in the steering gear. So we see, after all, that our ethics and our economics today square with each other better than of yore. That is, he who contributes to the common weal in any productive form is welcome to the brotherhood of agriculture, even though he does not anticipate hell-fire and brimstone every time he fails to speed the plow!

And while we are at it, let's tackle the case of those cooperative leaders who may not be as early afield or as late a-choring as somebody else, and who thereby get muttered about. Perhaps some of them kill more quack schemers abroad than they kill quack grass at home, and if so, maybe they have served the cause quite as nobly as the fellows who get the benefits of cooperation without leaving their milking to the "missus."

AT any rate, it's time enough to howl them down to earth when their families start fussing. Meanwhile, add them to the list of emancipated leaders who have found time in a mechanical age to make religion and economics run parallel. (Memo and insert) We exempt from this encomium all the petty-fogging "politikers" who abuse the name of cooperative enterprise. Do your own sorting by states!

Now that the hard-pressed ruralite has learned to sit down a trifle during working hours, thanks to artful inventors, he has still another hurdle to jump. As an individual and a cooperator in many enterprises, his present stunt is to discover how it feels to be a *consumer*.

Ever since I attended my first rock-ribbed cooperative "ruckshun" down at old Turnverein hall in the Townley days, the speakers and resoluters have kept blinders on the consuming side and stuck spurs in the flanks of production.

THEY chased the ghastly and wraithful middleman from melon patch to market place and prayed fervently for nothing nicer than his hide for a lap robe. In him they saw a selfish barrier to more consumer demands, which of course meant room for greater farm production. Always eagerly trying to get closer to the dear consumer (for trading reasons, not for love), producers forgot that all they required to find him was an ordinary looking-glass!

Price alone has been the goal sought by too many producers. The meat and milk makers want high prices for raw stuff on the hoof and in the can, washing their mitts of much responsibility after it leaves the farm. The somewhat resentful consumer wants low food prices, his wish often being echoed by his industrial employer.

Yet either extreme is bad medicine for both ends of the grub line. The American farmer knows his onions but he hasn't had to peel any to drag down the tears during recent flip-flops in food prices. As one cooperative shouter stated at a recent hullabaloo, "unbalanced production plus too many working hours brings on bumper storages, bankruptcy, and droopy prices; while if the farmer gets his sights too high on the price target Mister Consumer either shifts to a substitute, if there is any, or goes on relief or a strike, if there isn't."

The more the farmer grunts to lift himself up to some "guaranteed" price scheme, the tougher the consumer gets. But when things succeed in yanking down consumer quotations at food stores over any long period, then we get the red-hot climax to the poker party.

Then, fellow observers, you note how quickly both factions in the price squabble realize at least three non-sinkable facts, which I may recite to you briefly: First, that the farmer consumes a third of what the city food inhaler sells or makes; second, that Mrs. Consumer can find no surer way to set a miserable table than to crack down on the income of the rancher, the dairyman, and the gardener; and third, that regularity and uniformity of quality in food products really mean more to a growing family than prices. I hustle to add that as long as some poor, underprivileged kids must hunt crusts and take any kind of musty shelf goods and stringy boiling bones, then price *will* play too big a share in the situation. But normally, for the ordinary exchange between farmers and vitual buyers the wrong emphasis has been put on what the farmer gets and what the housewife pays.

THE distributive margin too has worried many honest folk into fits and foment, but like the w. k. drought and flood, it still maintains itself as part of the economic scenery, and mayhap always will. It seems that the more we request some college shark to tinker with another man's margin allowances, the less we get done about it. But just as we measure rainfall and draw isobars (without doing any remodeling of the climate withal) so we should keep a hawk-eye on those in-between food margins, for scientific and museum purposes at least. In a way, although shameful to admit it, the writing of blistering treatises on food margins helps to keep farmers in good mental trim for the bout that lies ahead.

But this thought is more important to the topic. If meanwhile the producer learns that he is an all-fired, double-A rated consumer of varieties galore, and that they need him as bad as he needs them; and if the misguided consumer acknowledges finally that he also is a bang-up producer seeking country customers, then maybe the "twain shall meet."

Yea, verily, when that cometh to pass perhaps East will be West, farming will be easy, and Europe and organized labor will be at peace!

YET I warn you now that if this happy millennium cannot arrive before we liberalize our constitution a trifle, we shall see the erection of tariff walls and the taxing of competitive foods between neighboring agricultural states. Right now the solons solemnly dozing their way into destinies and writing an occasional bit of statecraft have put a few grazing states into a pretty kettle of fish. Two of these ambitious state assemblies to my knowledge have tried to enact laws to forbid the importation of farm products in fresh state across their boundaries without labels and a small tax. Another freak proposal is intended to make every drop of milk shipped from one state into the metropolis adjoining it subject to the sole inspection and classification of the state of origin. That is a step toward naming the price limit I suppose. We have witnessed a senseless class struggle between a northern dairy state and a section of the South over butter substitute legislation, with boycotts and retaliations threatened on both sides.

So I feel that if our relatively relaxed and stimulating physical situation in farm life, due to unfettered labor, cannot point the way to a spot where we can do some real "sitting down" then we have missed the whole show. I mean a nook where we can sit down with the rest of the nation and get this studied out. Plans have been offered in high places for its solution, but theories won't turn the trick. Unless the ones who make the rumpus agree to arbitrate, then we might as well all go way back and sit down forever!

FAMILY TROUBLES

Ethel (Aged six, combing hair): "Mama, what makes my hair crack when I comb it?"

Mama: "Why, dear, you have electricity in your hair."

Ethel: "Aren't we a funny family? I've got electricity in my hair and Grandma has gas on her stomach."

An Irishman got a job at a railway station. When the first train came in, however, he forgot the name of the station; so he called out: "Here ye are for where ye are going. All in there for here, come out."

YOUR CHOICE

Marie: "Yes, we had a lovely time; Jack's car passed everything on the highway."

Agnes: "Well, we had a good time, too; everything passed us!"

Proud Mother: "Yes, he's a year old now and he's been walking since he was eight months old."

Bored Visitor: "Really? He must be awfully tired."

Chloe: "Da's a purty shirt you boy friend's got on. Wonder how many yards o' dat goods hit took to make it?"

Caroline: "He done tole me he got two shirts like dat outen one yard las' night."

Husband: "I don't like to invite that fellow to dinner. He used to kiss you before we were married."

Wife: "Well, so did you."

Husband: "Yes, but I've gotten over it and chances are he hasn't."

START YOUNG

"Little boy, why aren't you in school?"

"Hell, lady, I ain't but three years old!"

"What kind of dress did Betty wear to the party last night?"

"I don't know, but I think it was checked."

"Boy, that must have been some party."

Ikey: "Will you please explain to me the difference between shillings and pence?"

Abie: "You can walk down the street without shillings."

Girl: "Did Jack give the bride away at the wedding?"

Boy Friend: "No, he let the groom find out for himself."

CAN YOU?

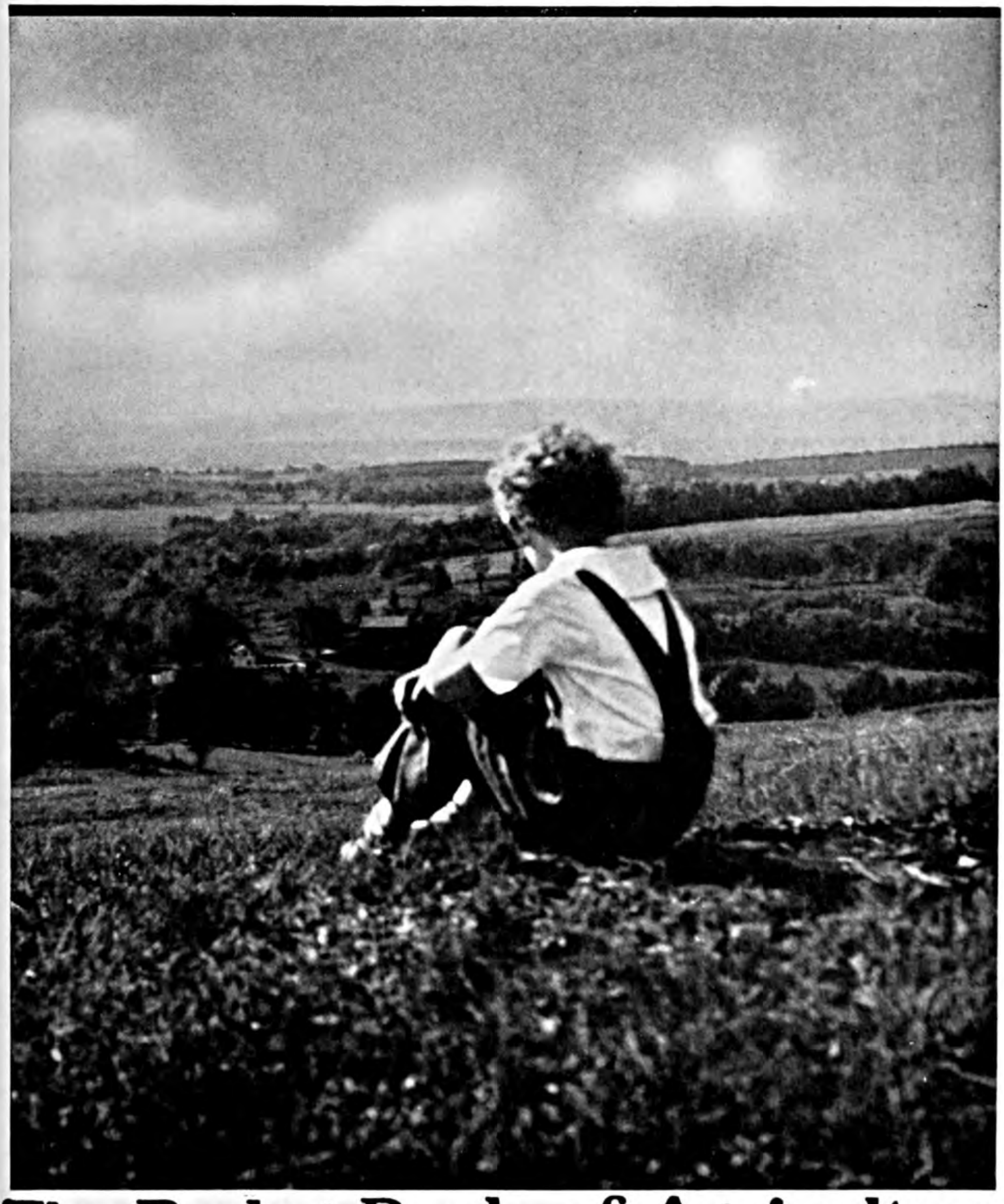
A girl can sing,
A girl can dance,
A girl can play crokay;
  But she can't strike a match
  On the seat of her pants,
'Cause she just ain't built that way.

Printed in U.S.A

Better Crops WITH PLANT FOOD

May 1937

10 Cents



The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

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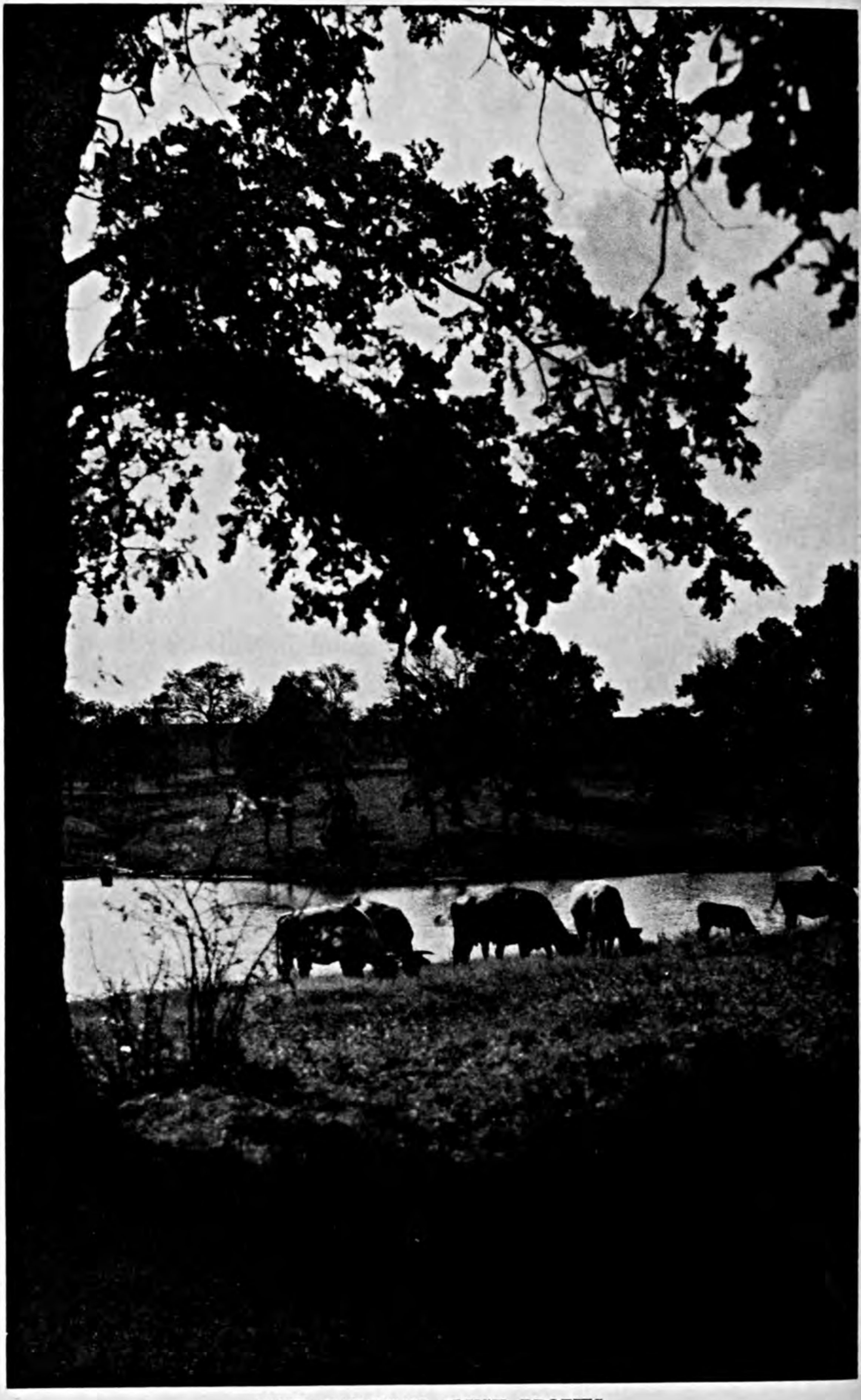

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VOL. XXI WASHINGTON, D. C., MAY 1937 No. 7

Insist on the present and —

Nix on Nostalgia

Jeff McDermid

AFTER the mud from the spring thaw recedes I once more meander countryward in my internal-explosion perambulator. One of my frequent by-paths takes my snorting six over the cement causeway known of old as the toll-gate plank road. It leads into the town where I was fetched up, but which has many other nobler distinctions and reflected glories to stimulate the pride of its placid citizens.

For instance, it once had a pioneer fortress and a stockade to facilitate safer trade relations for the clever ones who dealt with the Indians; and at one time in the nineties this burg had a saloon for every 100 souls; and moreover, a man was hanged by a mob two blocks from the Methodist meeting house. It also boasts most of the modern service clubs and other luxuries, and it is the stopping point for a dashing stream-lined train.

As I drive slowly down the main street, hardly a familiar face mugs at me from the sidewalks. The buildings are pretty much the same as they were when I departed 30 years ago, although the food store signs have been changed since the eggs and cheese.

There at the head of the principal avenue still stands the court house of dun-colored brick, surmounted by a squatty dome, o'ertopped by a wooden effigy supposed to represent justice with her sword and scales. In childish times I lived in a canary-yellow cottage trimmed with red oxide barn paint, about three blocks from this awesome seat of judicial majesty.

Once there was a storm that blew Justice down on the flag-stone walk, and they labored as long and hard to get her back on her perch as our juries did to dispense equality in divorce cases and contested wills. She stands a bit askew like some of the decisions in these (and other courts), but for all I see she is just as stiff and blind as ever.

NOT long ago I parked opposite the court house for awhile, to visit with the county agent—an official unknown to our rugged days of ignorant competition. I found him ensconced in the still dingy basement, right in the northeast corner where my father used to preside over the Grand Army of the Republic, when the musty lodge-rooms could be packed on short notice with the real and fancied heroes of Manassas and Gettysburg, then so robust and jocular.

They tell me that not a single member of the post is able to navigate the streets alone anymore, so the county board decided to keep the basement still dedicated to patriotic service at small wages, and turned it over to the agricultural committee.

THE rooms looked strangely small and cramped to me, because as a youngster the lodge-rooms, alive with hearty repartee and martial music, and decorated with banners, crossed swords, and "honorable discharges" in gilt frames, seemed a veritable hall of national splendor. Perhaps it was fancy, and it seems incredible when the county agent's spray dope and chemical reagents are considered, but I seemed to get a whiff of fried cakes and coffee, left as a lingering vestige of the delectable suppers served by the ladies of the Relief Corps during the days of recruiting for the Spanish-American War.

Recollections of 1898 follow me outside again (after I have found out the local soil-depleting base and intentions to plant from my obliging county agent). Upstairs in the mottled lobby with wide plank flooring and a polished walnut staircase, several litigants are waiting as of yore to tackle the county judge or the sheriff on line-fence and stray-animal matters of grave import to provincial peace.

They sit in a silent circle around the spot where the august mortal remains of Judge Gaylord once rested during that same recruiting week when prodigious dinners for the belligerent Sons of Veterans nerved them to enlist for "Cuba libre." The chanting of the Episcopal ritual in the lobby blended on that spring day so long ago with the muffled pledges below stairs by the boys who shouted, "Remember the Maine, to hell with Spain!"

I EXPECTED to see the doughty old Civil War judge jump from his ornate casket and swing his tasseled sword in the fashion of the Sixties, so pregnant was the hour with swashbuckling and "sacred honor." It must have been a great sacrifice for him, just to get a few bunches of wilted flowers, a halting sermon, and a short ride to Golden Lake Cemetery—on such a sunny morning. And the blank volleys fired across his grave and echoing against scrub-oak hills, must have made him impatient to join Colonel Teddy and General Shafter in the mobilization for the Cuban invasion.

And as I pause on the roughened stone steps flanked with wrought-iron railings, I see again a husky throng of veterans seated there in rows, while a jerky gent in a brown derby hat and a baggy suit fumbles underneath a black cloth getting the proper focus for a wet-plate negative of the post members during a lull in some jolly camp-fire reunion. My glance roves across the street through the budding elms to an open doorway of a yellow brick hall, from whence in all the trappings of blue and gold braid, with

Springfield rifles at attention, came each Memorial Day the "squads right" columns of Judge Gaylord's Guards, who discarded that honorary title for a more official one as the troops departed for Havana.

Stepping on the reluctant starter, I throw the motor into gear and ramble down the shady street, passing right along the "line of march," where I watched countless circus parades and torch-light processions, saw my first horseless carriage, glimpsed Buffalo Bill and Annie Oakley (world's greatest lady wing-shot), and cheered the Negro minstrels and the town boys who went to Cuba.

In the fifth block from the court house I pass the grade school where sundry patient teachers did the best they could for me—under the circumstances. Oh, I suppose it's no use, the sky is too blue, the air too bracing, and strong "ectoplasms" of boyhood impressions seize me on this accustomed spot. Shall I again give way to an impulse, instead of adhering to a solemn duty? Why not forget soil improvement and farm enlightenment a couple of hours, like I did my grammar, and just play hooky?

It was on this elementary campus that my earliest pleasures and discomforts mingled. The latter were fewer, to be sure, and soonest forgotten. They include minor ailments of the soul and the stomach common to grade-school pupils everywhere, such as the wistful heartache caused by an indifferent miss in pig-tails, and hurrying home frantically with a green-apple bellyache.

HERE I learned how to play marbles, fly kites, and turn handsprings, or received sly, elder-boy lectures on the origin of species before I ever heard of Darwin or biology. It was here that we underlings watched the approach of a certain gaunt, stern-visaged, high-school teacher with dread, only to become of later years in mathematics classes her devoted and admiring slaves. For on the wall of her classroom, neatly framed in a water-color border of pansies, was the motto which led us past her forbidding exterior to a warmth ineffectually concealed, "There is so much bad in the best of us and so much good in the worst of us that it allows none of us to speak ill of the rest of us."

Our graduation exercises in that turreted old building occurred 30 years ago this summer. But I presume so many new ties have been made and so many things of greater consequence have happened to my callow comrades of that humid June-time, that any crude suggestion on my part for a reunion on the anniversary would be as welcome as a donation day in Edinburgh. Most of us are too engrossed in family matters and in finding funds to educate our own children to pause

(*Turn to page* 45)

On Apple Orchards Use "Congenial" Fertilizers

By Dr. Fred W. HofMann
Agricultural Experiment Station, Blacksburg, Virginia

RESULTS from experiments carried on over a number of years at the Virginia Agricultural Experiment Station indicate that it will pay apple growers to recognize certain beneficial interactional effects that are likely to occur in orchard soils and in certain fertilizer mixtures among different materials. In many instances the value of the respective materials has become immensely enhanced. Evidence is clear and convincing that the mixing of these materials facilitates greater efficiency by increasing their availability as nutrient solvents. Some materials containing valuable nutrient elements may remain inert and relatively of little value until they come in contact with others. It is only too obvious that both physical and chemical changes are likely to occur when the different fertilizer materials are brought together.

It has been found that the availability of phosphorus and of potassium may be significantly influenced in the presence of different nitrogenous fertilizers. Phosphorus in the soil is made more soluble with applications of either sodium nitrate, calcium nitrate, calcium cyanamid, or potassium nitrate. This also occurs when these nitrogenous materials are mixed with acid phosphate. Ammonium sulphate has the opposite effect and the phosphorus will remain fixed unless the acidity of the soil is decreased. However, ammonium sulphate increases the solubility of potassium.

Recently more attention has been directed to the influence of acid phosphate and of either potassium sulphate or potassium chloride upon some of the nitrogenous fertilizers. At various times during the past 8 years results have been reported from experiments conducted at the Virginia Experiment Station by the writer, indicating beneficial in-

Fig. 1—Apple trees the spring following an application of nitrogen only. Compare with trees in Fig. 2 which received the same amount of nitrogen and also phosphorus and potash.

fluences of these fertilizers upon ammonium sulphate and more particularly in recent years upon calcium cyanamid. A very live interest in these results is evident from the numerous inquiries that come to the writer not only from fruit growers in Virginia but from elsewhere. Because of this widespread interest the writer feels justified in presenting herewith some of these results, along with a somewhat popular discussion of what most likely takes place chemically when the materials mentioned are applied along with calcium cyanamid to fruit soils.

In 1932 near Blacksburg an apple orchard of crowded, starved, and stunted trees was selected for these fertilizer experiments. These trees were far from anything in the way of what would be expected in a well-maintained orchard. Because of their low scale of vigor and fruiting, the chances were considered more likely that the trees would show the more striking responses from the treatments. The apple trees, composed mostly of Grimes Golden, Stayman, and York Imperial, were about 25 feet apart and 20 years old when the experiment was commenced. As this was entirely an experimental lay-out that was designed primarily for the purpose of working out certain principles, the reader is cautioned to consider the rates of application in that light and very much in excess of what would be recommended in usual practice. Such experiments are justifiable as certain extreme situations are valuable in bringing out results in the more marked degrees.

On the other hand, it was also the object of this experiment to reveal what may happen when applications of calcium cyanamid are made under some conditions other than are ordinarily recommended. Applications in the different treatments per tree, one set in fall and a replicate in spring, were as follows: 1. Calcium cyanamid alone 10 pounds. 2. Calcium cyanamid 10 pounds, acid phosphate (20%) 13 pounds. 3. Calcium cyanamid 10 pounds, sulphate of potash 4.2 pounds. 4. Calcium cyanamid 10 pounds, acid phosphate (20%) 13 pounds, sulphate of potash 4.2 pounds.

Need Potash and Phosphorus

As compared to the responses made when calcium cyanamid was applied alone, those trees that received in addition either or both acid phosphate and potassium sulphate showed the better growth and yield gains. Such responses commenced the season following the application. Over a 3-year period, as compared to calcium cyanamid used alone, the results were three times better for calcium cyanamid with potassium sulphate, three and a half times for calcium cyanamid with acid phosphate, and four times higher with these three fertilizers applied together. The most marked effect was

Fig. 2—Apple trees the spring following an application of a complete fertilizer. Note the abundance of strong, vigorous, blossom clusters and the character of the new wood.

noticed in the luxuriant growth of the native ground cover under the trees, especially in those plats receiving the three fertilizers.

Many fruit growers and investigators who have visited and inspected these experimental plats have been interested in ascertaining the changes that take place when the other fertilizers are added with calcium cyanamid. Several years ago the writer referred to the ammoniation of either phosphorus or potassium that took place with the release of ammonia from calcium cyanamid. Among the products in the decomposition of this nitrogenous fertilizer are ammonia and also urea, which subsequently gives off additional ammonia.

The ammonia given off that goes into combined form is the product more quickly used by the trees and plant growth but in a free state is lethal in larger amounts. Any condition that will promote ammoniation of this free ammonia with phosphatic or potassic fertilizers will increase the value of the fertilizers not only in checking the lethal properties of the ammonia but in making all these materials more convertible into plant food.

Supporting Evidence

Recently some more investigations have been conducted showing this principle of ammoniation. Chemical aspects of ammoniation of superphosphate were presented in May 1935, as a result of experiments conducted by Messrs. John O. Hardesty and William H. Ross, Fertilizer Investigations, Bureau of Chemistry and Soils, Washington, D. C. In later investigations in this same bureau, Messrs. Frank O. Lunstrom and Colin W. Whittaker show in January 1937 the effect of ammoniation on urea component of superphosphatic mixtures.

Attention is directed to the more recent use of ammonia in the preparation of fertilizer mixtures. The ammonia is added in aqueous or anhydrous form or as ammonia solution of urea or other nitrogenous material. The addition of ammonia to a superphosphate is accompanied by a rise in the temperature of the mass, due mainly to the heat developed in the reactions between these materials. The heat, as it progressively develops during the ammoniation of superphosphate in mixtures with urea, tends toward an accelerated decomposition of the urea and a more complete ammoniation.

Beneficial Interactions

Among the products formed in ammoniation of the phosphatic fertilizers are urea phosphate, urea-monoammonium phosphate, and urea-dicalcium phosphate. All of these materials are conducive to higher growth and yield responses in the apple trees. The apple trees will also be benefited by the enhanced growth of any ground cover or cover crops supplied with such materials. When ammoniation also includes potassic materials, these responses are the more marked. In view of the superior results that have been secured, fruit growers should find it to their advantage to be aware of some of the beneficial interactions that may take place in adding phosphatic and potassic fertilizers to their nitrogenous materials. This is particularly so in mixtures with calcium cyanamid. It has been found that applications of such mixtures can be made over a much more extended season, even through the bud swell of the apple trees up to the green-tip stage.

When apple trees are booked for the on-year more attention than ever should be given to a liberal supply of soil nutrients. The more liberally fed trees will, of course, be better provided to take care of the current season's needs for the development of the fruit crop and also for the development of fruit buds. Most important of all, they will be better equipped against unfavorable weather conditions in summer as well as winter. In a consideration of practical measures in the application of fertilizers to apple trees, inquiries come up as to the amounts and rates of application that should be used. This depends upon the fertility of the soil, the age of the trees, and certain seasonal or emergency needs.

Fig. 3—With proper attention to the management of the orchard soil, volunteer growth can be utilized to great advantage in supplying relatively large amounts of organic matter. Orchard soils can be built up to an excellent organic content especially when the cover crops are given liberal amounts of a 10-6-4 fertilizer combination.

Fertilizer Recommendations

If the orchard soil is not strong enough to maintain a good crop of grass or sod it should receive 600 to 800 pounds of an 8-6-6, 6-8-6, or 10-6-4 fertilizer. If the soil is capable of producing a lush growth of grass or sod the fertilizer applications may be more confined nearer the area under the spread of the tree and to fertilizers with the higher nitrogen content. Bearing trees 30 to 40 inches in circumference will be benefited with a 5-pound application of a 20 per cent nitrogenous fertilizer, especially when they are booked for the on-year.

As a general proposition it should be well for apple growers to bear in mind the special needs for special situations. Of late much importance has been attached to investigations based on analyses which show how much of the essential elements are removed by the apple trees. Thomas of Pennsylvania reports analysis of apple trees grown on vegetatively propagated roots of the same clone in Hagerstown clay loam soil, half under clean cultivation and half under sod. According to this investigator's analyses, fertilized apple trees, including the leaves, contained nitrogen, phosphoric acid, and potash in the ratio of approximately 6:1:4; whereas the ratios of these three elements in the fertilizers applied had been approximately 3:8:4. These analyses are of great interest, particularly as revealing the proportion of these elements as they go into the making of apple-tree growth.

The more consequential effect of the pull of nutrient salts by the harvested fruit is generally after the 17th year in the average Virginia orchard plantings of about 35x35 feet. The computations made at this station by the writer show that for every 100 pounds of harvested fruit .059 pounds nitrogen, .027 pounds phosphoric acid, and .16 pounds of potash are removed. This requires the equivalent of .369 pounds of sodium nitrate, or .295 pounds of ammonium sulphate, or .269 pounds of calcium cyanamid for the nitrogen; .169 pounds of acid phosphate for the phosphoric acid; and .32 pounds of potassium sulphate or potassium chloride for the potash for every 2 bushels of apples. *Thus one bushel of apples requires the equivalent of 2.96 ounces of sodium nitrate, or 2.37 ounces of ammonium sulphate, or 2.16 ounces of calcium cyanamid for nitrogen; 1.32 ounces of 16 per cent acid phosphate for phosphoric acid; and 2.56 ounces of potassium sulphate or potassium chloride for potassium.* For these fertilizers this is approximately in the ratio of 2 of the nitrogenous to 1 of the phosphatic to 2 of the potassic, or on the basis of the actual elements 2 of nitrogen to 1 of phosphoric acid to 6 of potash.

By adding somewhat above the actual removal in the fruit, a depletion that might become harmful to optimum growth and fruit production of the tree can be guarded against. Upon the basis of these removals the grower is enabled to make applications more correctly and more economically. Since experimental evidence shows the more direct responses of apple trees to complete fertilizers as the space to which they are confined becomes more root-crowded, it is reasonable to replenish nitrogen, phosphorus, and potash at some time, at least at the rate that it is removed by the harvested fruit. It appears best to make adequate nitrogenous applications to the apple tree from the very beginning. The larger part of the phosphatic and potassic applications may be withheld until about the 17th year, after which their removals will commence to be progressively more consequential; but other than as a matter of insuring a

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Fig. 4—In the background the organic content of the soil was so depleted over a 20-year period of continual cultivation that it was difficult to establish even a sparce growth of rye. The area in the foreground has been maintained in ground cover growth. Such growth between trees would add materially to the organic matter of the soil. An occasional "cracking" or tearing up to prevent fire and mouse hazard and application of a complete fertilizer insures a greater supply of food and moisture to the apple trees at the critical periods of the tree's needs.

Potato Improvement In Wisconsin

By E. A. Jorgensen
County Agricultural Agent, Wautoma, Wisconsin

HERE is a letter which might have been written by a prosperous Waushara County, Wisconsin, potato grower in the gay 90's to his relatives back East:

"Potato is King in Waushara County. Pine and oak trees are giving way to potatoes and the great, level, dark sandy soil on the Oasis prairie is rapidly being plowed for potatoes. Waushara County is first and last a potato county. The village of Plainfield will ship 2,000 cars of potatoes this year. Potato growers are rapidly paying for their farms, building fine homes, and are foremost in providing good schools for their children. They grew over 20,000 acres of potatoes this year with yields running from 200 to 300 bushels per acre. No fertilizer was needed. Potato spraying has never been heard of outside of putting on some bug poison. There are no potato grades and yet Waushara County potatoes are of high quality. All a dealer needs to say is, 'These potatoes are from Waushara County,' and then demand a fancy price."

Analyzing the Problem

You say this sounds like a fairy tale—well, it is not a fairy tale—it all happened 40 years ago. Those were the days when farmers were working with a soil that nature had taken thousands of years to build for what everybody thought was the growing of potatoes. Yes, there is romance connected with the lowly potato, dating from the days of Sir Francis Drake way down to the Warren Potato Control Act of 1935.

Today we in Waushara County are involved in a county-wide potato improvement program. Why? Because:

1. Our yields are too low for profitable production—only a scant third of what they were in the 90's. As the average yield goes down, so does the quality.

2. Our acreage has gone down steadily until today it is less than half what it was in former years.

3. The dealers say that our potatoes are below grade, therefore we hate potato inspections.

4. Consumers who have money to pay satisfactory prices for potatoes are asking for Idaho Russets and Colorado McCures. They say our potatoes are below grade and will not buy them unless they are forced to because of a great shortage, and then they are apt to pay upwards of a dollar more per hundredweight for Idaho's and Colorado's.

5. Our soil is filled with a dozen kinds of scab diseases—even seed potato treatments seem to be futile.

Can we devise a potato improvement program that will reinstate this desired cash crop? Can we regain these now lost desirable markets? Here's a challenge to the efforts, imagination, and vision of the sons and grandsons of our past potato kings.

Is it our marketing system that is

to blame? Some farmers have voiced this opinion but older men tell us that the distribution system of today is much improved over the 90's.

Is it the lack of spraying? It can't be this because sprayers were never heard of in the early days when the yields were three times those of today.

Is it our cultural practices that need improvement? Do we need better machinery? "No," even our "hay-wired" machines would have been welcomed by our grandfathers.

Is it the weather? Most of you will say "yes." We all realize that the drought of recent years has been one of the main causes of our low yields and poor quality. Yet Wilbur Larson, potato grower at Wild Rose, in Waushara County, who obtained some new seed through the County Agricultural Agent last spring, reported a yield of 275 bushels per acre. The weather wasn't any different on his farm than on a neighbor's who purchased the same seed and only obtained a yield of 89 bushels per acre.

A Successful Program

What made the difference? A visit to Mr. Larson's farm during the potato-growing season might have given the answer to the kind of program that we need. Over 10 years ago Mr. Larson was having trouble with his potatoes. At that time he engaged Professor A. R. Albert, Director of the Hancock Branch Experiment Station, to test his soil and to advise him as to its need. Since then he has been seeding deep-rooted, drought-resistant, soil-building crops like alfalfa and sweet clover and he has been stimulating their growth and their soil-building powers through the application of lime, phosphate, and potash—enough lime to nearly neutralize his soil and a 1 to 2 mixture of 45 per cent phosphate and muriate of potash applied at the rate of 200 pounds per acre before each new legume seeding. A 4- to 6-year rotation gives his potato soil a rest and thereby reduces the virulence of potato disease organisms.

Mr. Larson has, by helping nature with applications of lime, phosphate, and potash and the regular seeding of soil-building crops, done in 10 years what it might have taken nature unassisted perhaps 400 or more years to do.

High Quality, Good Yield

Frank Trickey, veteran potato grower on the Oasis prairie, has been solving many of his potato-growing problems in practically the same manner as Mr. Larson—by improving his soil. He tells me that the quality of his potatoes depends upon the yield. He maintains that a good yield of 200 bushels to the acre has always given him a high quality production whereas low yields go hand in hand with poor quality. He says that as the land gets run out and the yields go down, so does the quality of potatoes.

Each year more and more Waushara County farmers are practicing practically the same principles of soil improvement which Mr. Larson and Mr. Trickey found so successful. Potato growers are rapidly becoming convinced that most of their potato-growing problems will disappear if they can restore their soil to its original tilth, fertility, and high humus content.

The County Agent's Office, in cooperation with the Soils Department, College of Agriculture, has during the past 8 years analyzed for lime, phosphate, and potash 5,127 samples of soil from about one-half of the farms in the county. Potato growers are taking advantage of the CWA, WERA, and WPA liming programs and the present Agricultural Conservation Program in this huge and expensive soil-building venture. During the last 3 years Waushara County farmers limed over 30,000 acres through the application of 114,167 yards of marl and 9,654 yards of paper mill sludge,

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Variation in size and number of stalks of seedlings from one mother plant.

Asparagus in Ontario

By O. J. Robb
Horticultural Experiment Station, Vineland, Ontario, Canada

SUCCESS with asparagus depends on many factors, some of which are not fully appreciated by the commercial grower. Other than lack of moisture, which has affected many fields during the recent dry seasons in Ontario, probably the most serious factor limiting asparagus yields is the lack of uniformity of the plants themselves. This is evident to anyone who may take the time and trouble to record a few individual plant yields. Observation of the mature top growth during the late summer may disclose considerable difference as to number of stalks, size and height of growth, as well as the difference in sex of the plants. It is this last character which prevents the production of pure or uniform strains of asparagus.

It is not practical to propagate by division of the crown, and our nearest approach to a pure strain is the repeated selection of desirable parent plants followed by progeny tests until a nearly uniform strain can be found. This is being attempted at the Horticultural Experiment Station by the selection of high-yielding male and female parent plants followed by a progeny yield test to determine the best cross from the standpoint of producing uniform high-yielding plants.

The commercial grower is advised to select the plants at planting time. At present there is no certain means of identifying young plants as to their desirability, except that the large plants usually do better than the very small ones. It is not possible to determine the sex of 1-year-old plants, and consequently advantage cannot be taken of the increased yield of male over female plants. Selection of plants will pay, but selection of seed from high-yielding plants which have been pollinated by the best male plants should ensure the maximum number of good plants in the seedling row. For commercial growers, the selection of seed-baring plants is not impossible.

Great variation in yield of individual plants was observed at the Station on three separate tests of plants picked at random from plots of Mary Washington which had been set with carefully selected plants at planting time. Each of these test records covered three seasons. In addition to the variation in yield which ranged from 4 to 40 marketable sprouts in one season, other factors were noted as follows: plants with low yields remained in the low class over the three periods, and the high-yielding plants maintained their relative position; few plants produced sprouts at every cutting date.

One of the most significant observations was the positive correlation between the high early yields and the high total yields. The early yields were in effect linked with the total yields. This correlation simplifies the selection of high-producing plants, as individual records for a short period at the beginning of the season will indicate the best plants.

The factor of earliness becomes more important in northern sections where the cutting season is apt to extend into and shorten a normal growth season. We can do little towards extending the growth at the end of the season, as the lower temperatures together with the shorter days of late September and early October effectively limit further development. It is at the beginning of the growth period that the season may be lengthened.

Early Season Growth

The type of soil as well as the location has some influence on the early season growth. A light sandy soil will warm up more rapidly than a low-lying heavy type. Plants in the more southern areas start into growth earlier and therefore the cutting season can be terminated earlier, thus allowing for a longer growing season.

Plants like this one break records.

The question of manure and fertilizer applications is very important. Much in the way of manuring can be done previous to setting the plants, and at the time of planting the partly filled furrow is a good place to apply a complete fertilizer such as a 4-8-10 analysis. Subsequent applications are usually broadcast on the surface. Nitrogen is readily absorbed at any time, and favorable results have followed its use before and during the early cutting season. Cyanamid, containing lime as well as nitrogen, is frequently used

Kainit was used in a weed-control experiment on the Martindale Farms, St. Catherines, Ontario. Compare the untreated field on the left with the one on the right which was treated with 2,000 lbs. of kainit per acre.

during the cutting season, mainly to control weeds.

Asparagus plants can withstand large concentrations of sodium chloride (common salt) and sometimes it is applied as a weed-killer. Kainit, which contains a low per cent of potash, may also be used to control weeds.

General recommendations of the Advisory Fertilizer Board of Ontario are to apply liberal quantities of manure and 1,500 lbs. of a 4-8-10 fertilizer at the end of the cutting season, or the manure may be applied in the fall. During the cutting season up to 500 lbs. of non-granular cyanamid may be applied to control weeds.

Depth of Planting

The depth at which the young crowns are planted has a greater influence on the early season growth than most factors. It is the normal habit of the asparagus plant to gradually extend its crown and stem (rhizome) outward and upward until the buds are formed almost at the soil surface and spread over a considerable space. The underground stem elongates and branches out more rapidly as it comes nearer the surface, thus a plant set deeply not only is slow in starting growth each season but it is also late in reaching its maximum yield. Soil conditions vary greatly, but the general recommendation to set the young plants not over 8 inches and 6 inches in depth may be more desirable in good, rich, sandy soil. The only occasions where deeper planting would be useful is on very deep, sandy soil and where blanched sprouts are desired. On the heavier soils, such as clay loams, not over 6 inches deep, and even less if the conditions warrant it, is best. With shallow-set plants it is necessary to take special care in cultivation, as the buds are easily destroyed. Very old crowns are right at the surface, and the soil is almost completely occupied by the storage roots. Decrease in yield of old asparagus plants may be due to severe injury to the buds from cultivation or freezing injury during hard winters when the soil is exposed to extreme temperatures or to over-crowding and the consequent production of small unmarketable shoots.

The distance of planting has some bearing on the early yields of asparagus plots. Wide spacing is not desir-

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From Pine Forests To Sweet Potatoes

By Ben Hilbun
Agricultural Experiment Station, State College, Mississippi

AT Laurel, Mississippi, the steady din of machinery which sounded the end of the lumber industry's heyday has been hushed. Now the almost noiseless operation of other machinery in one of the old sawmills hums the saga of a new industry that promises a lot for the rural sections, towns, and cities of the South.

It is a transformation from pine trees to sweet potatoes or from lumber to starch. The expansive forests of yellow pine have been almost exhausted, and scientists prospecting for a new vein of pay dirt think they have found it in the lowly sweet potato which grows abundantly in the warm, loam soils of the Coastal Plains area.

U. S. D. A. chemists formulated the process of extracting high-grade starch from sweet potatoes in an effort to establish a stable market for this farm product. For years farmers had been requesting the Department of Agriculture to find a market for their surplus yields, and this plant, made possible in 1934 by the Government's allocation of $150,000 for its construction, is the answer.

Removed Discoloration

Sweet potato starch is not a new product. It has been produced in Japan for a number of years, but discoloration limited its use. Chemists sought to remove this objection of industrial concerns that require a fine grade, white, cereal starch for various purposes.

The first starch plant erected in the United States was built at Thibodaux, Louisiana, in 1928. Irish potato starch machinery was used, and the "off color" in the finished product caused the project to fail.

Chemists by 1934 had apparently solved the problem of removing from sweet potato starch the coloring which had made it objectionable to manufacturers, and Department officials proposed to Government officials an experimental plant at Laurel. The money for the renovation of the building and the installation of machinery was provided.

Producing Starch

The plant handles the ordinary field-run potatoes in keeping with the objective of research workers to find a method of converting the non-marketable potatoes into profitable products. Everything from three-fourths inch up, including cut, bruised, and cracked potatoes, are accepted just as they come from the field.

When received, the potatoes are weighed and unloaded into bins, from which they are fed into a flume which conveys them into a washer. The washing is continued under power sprays until the last particle of dirt has been removed.

An upright elevator lifts them to the second floor, where they are automatically fed into rapidly-revolving grinders. To separate coloring matter which might contaminate the starch, a chemical solution is added.

The mixture is then fed onto screens for separation of the starch and pulp. The pulp passes through an hydraulic press which squeezes the water out, and is afterwards conveyed to a dryer from which it emerges as the finished byproduct.

Starch milk forced from the pulp is fed onto tables or troughs. Being heavier than water, the starch settles on the tables, while the water, small particles of pulp, and other foreign matter drain off. The starch is removed and finished for market.

Possibilities of the industry are emphasized by the approximately 300,000,000 pounds of root starches that are imported annually. They consist chiefly of white or Irish potato, and Cassava or tapioca starches that originate mainly in the East Indies. The Cassava gets its name from the root from which it is produced.

High-grade root starches, because of their peculiar properties, are required in various manufacturing processes. For example, white potato starch is imported and used to a great extent in warp-sizing and finishing fine cotton textiles. Cassava, also an import, is used in the manufacture of adhesives for stamps, white envelopes, furniture veneering, and for food purposes.

Tests have shown rather conclusively that sweet potato starch produced at Laurel meets the requirements of several industries that have heretofore relied wholly on imported products. About 1,000,000 pounds of starch have been made in the Laurel plant in its 3 years of operation, and most of it has been used in the textile industry for warp-sizing and finishing cotton goods. The results, according to the operators, have shown less shedding, less loom stoppage, and better feeling cloth, all of which contribute to lower production costs.

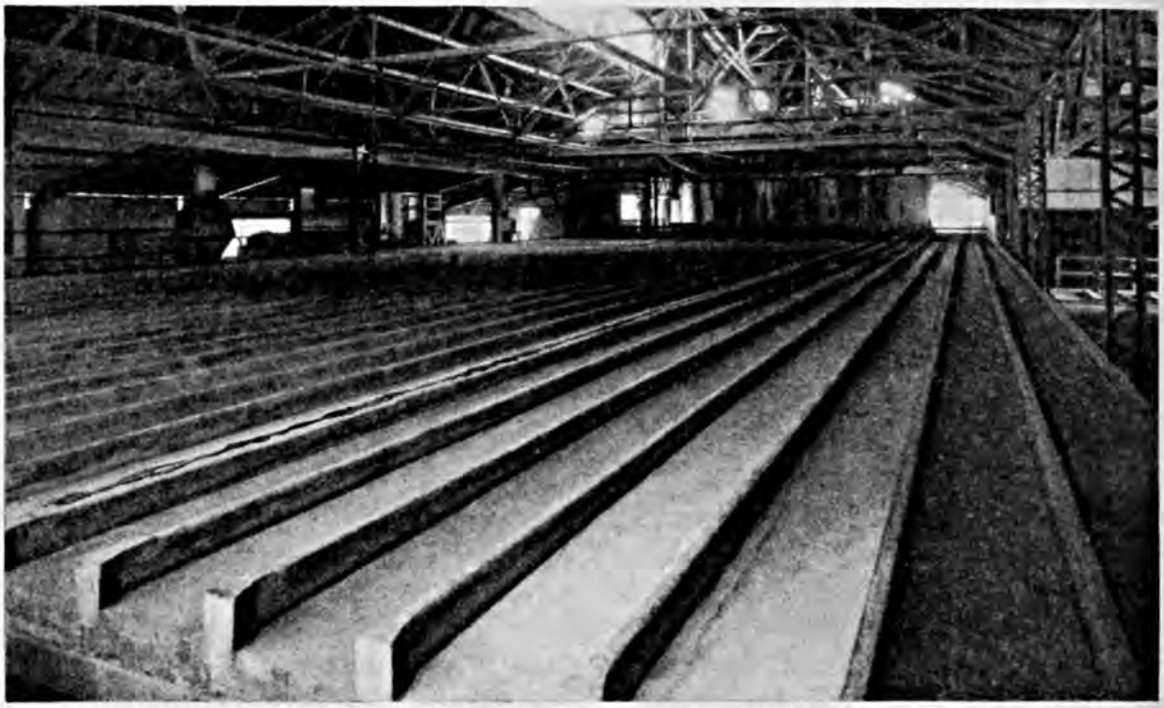
Variety of Uses

Factory scale tests have been made in sizing and finishing paper and as an adhesive in the manufacture of paper bags, laminated wood, and wood veneer. It has also been used with good results in baking, confectionery, and commercial laundry work. It has no superior as a home laundry starch.

The Laurel plant, which has been deeded to the Mississippi Experiment Station, is leased to a cooperative or-

The Laurel Starch Plant, showing unloading and elevating potatoes to the storage bins.

ganization of farmers, 51 per cent of whom are being rehabilitated. It has a capacity of 200,000 bushels of potatoes for a 100-day season, and if run at full capacity for this period of time the output of starch would be 2,000,000 pounds.



Starch tables or troughs onto which the fluid starch milk empties.

In 1934, the first season it operated, the plant made 140,000 pounds of starch at a cost of 13 cents per pound, raw material included. The 250,000 pounds made in 1935 were turned out at 10 cents a pound, while the 420,000 manufactured in 1936 cost, roughly, 3 cents a pound. To operate the plant requires 52 men working in three 8-hour shifts.

Large Demand

It is estimated by officials of the Bureau of Chemistry and Soils of the U. S. D. A., who direct the chemical and technological work of the plant, that it would require 150 plants the size of the Laurel plant to manufacture as much root starch as is imported. To do this would require an expenditure of about $75,000 for each plant.

The weight of sweet potatoes makes it unprofitable to transport them long distances for the manufacture of starch. The raw product supplied the Laurel plant is grown close enough to be trucked or shipped in from relatively short distances. Therefore, if the sweet potato starch industry, now in its infancy as a commercial enterprise, develops to maximum possibilities, additional plants must be built in convenient locations in the sweet potato belt.

Farmers can count on at least 20 cents per bushel for either culls or the entire crop. Twenty cents a bushel is not a high price for marketable potatoes, but it is not so bad considering the fact that little, medium, and big potatoes are acceptable. Also, they can be plowed up, loaded directly into the wagon or truck, and unloaded at the plant. No preparation is necessary.

Many members of the cooperative association that has the Laurel plant leased, supplement the cotton crop with sweet potatoes. One farmer, J. H. Bush, averaged $71.68 per acre for his crop in 1935 as compared to $32.74 an acre for cotton grown on similar land. Another, Carl Moss, got \$26 for his harvest on three-fourths acre. Still another, S. F. Vaughn, netted \$40.03 per acre on 10 acres after deducting fertilizer, plant, harvesting, and hauling costs.

A systematic survey of 103 commercial growers made in the Laurel area in 1934 revealed an average total yield of 200 bushels per acre. In 1936, an extremely dry growing season, 250 growers who had contracts with the starch factory averaged 151 bushels per acre, yields on individual farms averaged from 49 to 492 bushels per acre. Fertilizer applications on these farms ranged from 100 to 1,100 pounds per acre, and averaged 480 pounds per acre.

Most Productive Strains

Sweet potato production in the United States averages around 75,000,000 bushels annually. Most of this amount goes for food and feed, and only the small part now being manufactured at Laurel turned to the production of starch. It is known that sweet potatoes are grown on more than half the farms of the South, with production centering in North Carolina, Mississippi, Alabama, Georgia, Louisiana, and Tennessee.

Extensive variety tests have been carried on by the horticulturist of the Laurel plant, the object in view being to increase the production of starch per acre by finding the variety that has the highest starch content. A total of 64 varieties have been tested during the last 2½ years. In addition to standard southern varieties, these tests included varieties and strains representing importations, selections, and seedlings introduced by the Department of Agriculture.

Previous experimentation has dealt largely with the adaptability, storage qualities, yielding ability, palatability, cultural practices, and fertilization. Nothing had been done toward ascertaining the amount of starch they contained or the influence upon starch content of soil type, fertilizers, or cultural practices, until the manufacture of starch was initiated at Laurel.

Although this work, like other phases of the commercial aspects of the plant, is new, 10 southern varieties of sweet potatoes have been found superior in plot tests run at Laurel in 1936.

Here are the results of the 1936 tests:

Variety	Yield Bushels	Starch Content Per Cent
Miss. Blue Stem Triumph	308	24
Wennop (from Australia)	303	27
Pierson	293	26
U. S. 95984	279	21
Miss. Green Stem Triumph	275	25
U. S. 85985	275	21
Norton	267	28
Nancy Hall	252	22
Porto Rico	244	21
Southern Queen	212	23

Production of starch at Laurel has introduced a byproduct that is high in carbohydrates. From a bushel of potatoes the finished products are about 12 pounds of starch and about 6 pounds of dried potato pulp which is a good feed for cattle and sheep.

Feeding experiments at Mississippi State College show that potato pulp, when mixed with cottonseed meal which is high in protein, makes a feed that is about 95 per cent as valuable as crushed corn and beet pulp for milk and fat production.

While Japan makes about 40,000,000 pounds of sweet potato starch a year, the natural color, which the Japanese have made but little effort to remove, limits its use for industrial purposes. In fact, before testing starch from the Laurel plant, industries had little faith in its ever having a chance to replace most of the 250,000,000 pounds of cereal starch imported annually.

Chemists have shown that sweet po-

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Apply Boron to Prevent Darkening of Turnips

By Ralph W. Donaldson
Extension Agronomist, Massachusetts State College, Amherst, Massachusetts

DARK center or brown heart of turnips has been a serious problem for some years to growers marketing this crop. Crops exhibiting apparently normal growth and yield reveal no external evidences of this trouble, the presence of which is only detected by cutting open the turnip. Absent in some crops, but present in others, the number of turnips affected may vary from nothing to 100 per cent dark centers. The lack of any definite external symptom for detecting sound from affected roots, renders marketing of any but comparatively clean crops unsatisfactory.

Effects of Disease

Cross sectioning an affected turnip reveals a mottled discoloration of cell tissue having an appearance of darkened water-core areas. In less severe cases, such areas more frequently occur near the root and then in the top half of the turnip. Depending upon the severity, a cross section may show only a small portion discolored, or involve the entire area of parenchyma tissue inside the turnip. In more advanced stages the turnip becomes punky. Objectionable to the housewife, dark center turnips cut less crisply when fresh, seem more woody on cooking, and may be off flavor. Tradesmen discriminate against handling lots containing even a small percentage showing dark centers.

Known as brown heart in Canada and first reported in their literature in 1910 and by Maine experiment Station in 1914, occurrence of this disorder is now recognized at least in eastern sections of Canada, New England, and British Columbia. It was the serious losses due to its prevalence in turnips sold in New England markets in 1928 that prompted Canadian efforts for its control.

Already a problem at that time with some growers in Massachusetts, it was known by them as "dark center." Since then it has been found to occur on most soils of the State, ranging from the heavier glacial till soils of the Berkshires to the water-laid sandy soils of Cape Cod.

In Massachusetts, dark center is common only in the rutabaga varieties or smooth-leaved type; observation indicating that some strains may be more susceptible than others. For instance, dark center has rarely occurred in one section of the State where Macomber, a locally produced strain of white-fleshed rutabaga, is grown. When grown in a test trial with a yellow-fleshed strain this past season, Macomber produced a 100 per cent clean crop, while the yellow-fleshed variety showed every turnip to be dark center. Apparently also the rough-leaved or true turnip varieties are least susceptible to dark center.

Evidence of dark center trouble may not appear until the roots are well grown, often developing rapidly between early and late stages of harvesting a crop. Moreover, growers report more trouble during certain seasons than others. In fact, presence or absence of dark center has varied considerably, apparently due to the particular plot of ground, the season, time of harvest and, the strain of seed used.

Field trials of ordinary amendments such as lime, manure, and fertilizers begun in Massachusetts in 1928 failed to give control. Neither was moisture control relationship under laboratory conditions a complete answer to the problem as determined by G. B. Snyder of this station.

Early Discoveries

From these earlier trials, the only points of significance were: that clean turnips resulted in spots (1) where seaweed was used in abundance from pitting, (2) where raw subsoil was brought to the surface from a previous year's ditching, and (3) from leachings of large manure piles.

A definite clue that boron deficiency was the cause of dark centers was first obtained from trials with raw elements, carried out by Dr. D. J. MacLeod of the Dominion Experiment Station, Fredericton, New Brunswick, Canada, in 1933. Boron gave clean centers. Following this discovery, other Canadian stations using sodium tetraborate (borax) applied in dry form directly in the hill, found satisfactory control usually from a 10-pound rate per acre. Dr. J. A. Chucka, Maine, reported gratifying control of dark center from borax during the seasons 1934 and 1935, with indications of some control from seaweed.

During 1936, 10 growers in five counties in the State cooperated with trials of borax treatments on 100 acres of turnips. In these trials sodium tetraborate ($Na_2B_4O_7 \cdot 10H_2O$ 99.5%, powdered borax) was applied, in some cases sprayed after germination along the rows, and in other cases drilled before seeding along the row with a Planet Junior. Amounts of borax used varied according to the farm, ranging from a low rate of 7 to 10 pounds, a medium of 15 pounds, and a higher rate of 30 pounds, both drilled or sprayed at these rates.

© Eastern States Farmers Exchange.

Rutabaga roots showing normal condition on left, "dark center" showing in ones top and right.

Results of these tests all showed definite benefit from borax applied. Practically perfect control of dark center was obtained, and no injury at seedling stage was observed in those cases where 15 or 30-pound rates were applied when sprayed or drilled. In most cases, the low 7 to 10-pound rate was insufficient, affording only partial control. Mention of several trials is given.

Both 15 and 30-pound rates of borax were sprayed on an entire 11-acre field on Brookvale Farm, Windsor, on heavy soil thoroughly manured and fertilized with 500 pounds of 4-16-20 per acre. A 4-row traction sprayer was used applying the borax in solution just after emergence of the plants. In former years this field had usually produced good yields, but unsatisfactory quality due to dark centers resulted in only two carloads out of 15 marketed in 1935. This year the borax treated rutabagas were not only free of dark centers, but also possessed a quality texture noted both by the owner and the market man. No difference between the 15 or 30-pound rates could be noted, but untreated check rows ran one-third dark centers—a portion unsatisfactory for market purposes.

A 10-pound rate of borax applied as a delayed spray in another trial in Plymouth County after the roots and tops were well formed was used. At harvest, untreated rows showed 100 per cent of the turnips (rutabagas) badly affected with dark center. In this case, sprayed rows showed reduction to 40 per cent of roots affected, and in these the degree of injury was noticeably less. While this delayed application helped, evidently it was either applied too late in growth stages of the turnip or insufficient amount of the borax was used to give full control.

Results obtained from drilling borax are cited for two Cape Cod growers. In the one case, excellent results followed the use of at least a full 10-pound rate drilled along the row. Eighteen acres treated in this way gave entirely clean turnips on land which commonly gives trouble, and in the previous year dark center was so bad as to occasion several thousand dollars' loss on the crop. Other control tests on this farm, were carried out, in which borax was drilled in 6 varying rates from 10 to 26 pounds per acre. All treatments gave uniformly good results of clean turnips with no symptoms of injury on seedling growth observed even from the heaviest amount. Untreated rows showed dark centers in more than 75 per cent of these turnips. However, this grower says he will use a 15-pound rate for drilling another year to be certain.

Apply Proper Amount

The largest turnip grower on the Cape (25 acres) drilled borax for a 10-pound rate, but feels certain that less actually was delivered. About 15 acres were thus treated with a few rows left as checks, but with no buffer rows. At harvest time, inspection showed some evidence of dark centers on all the area, but affected tubers were not severe cases. Actual counts revealed no significant improvement of treated over check rows. However, one field especially bad last year received a double rate of borax this year, and here alone of his entire crop did we not find a single evidence of dark center. Unfortunately no check rows were left on this particular field.

Another field, however, which produced relatively clean turnips last year, received no borax this season, and here we found the worst trouble, about 75 per cent affection, and the most advanced stages of dark center. In discussing results with the owner the evidence suggested that—borax had been positive control applied in

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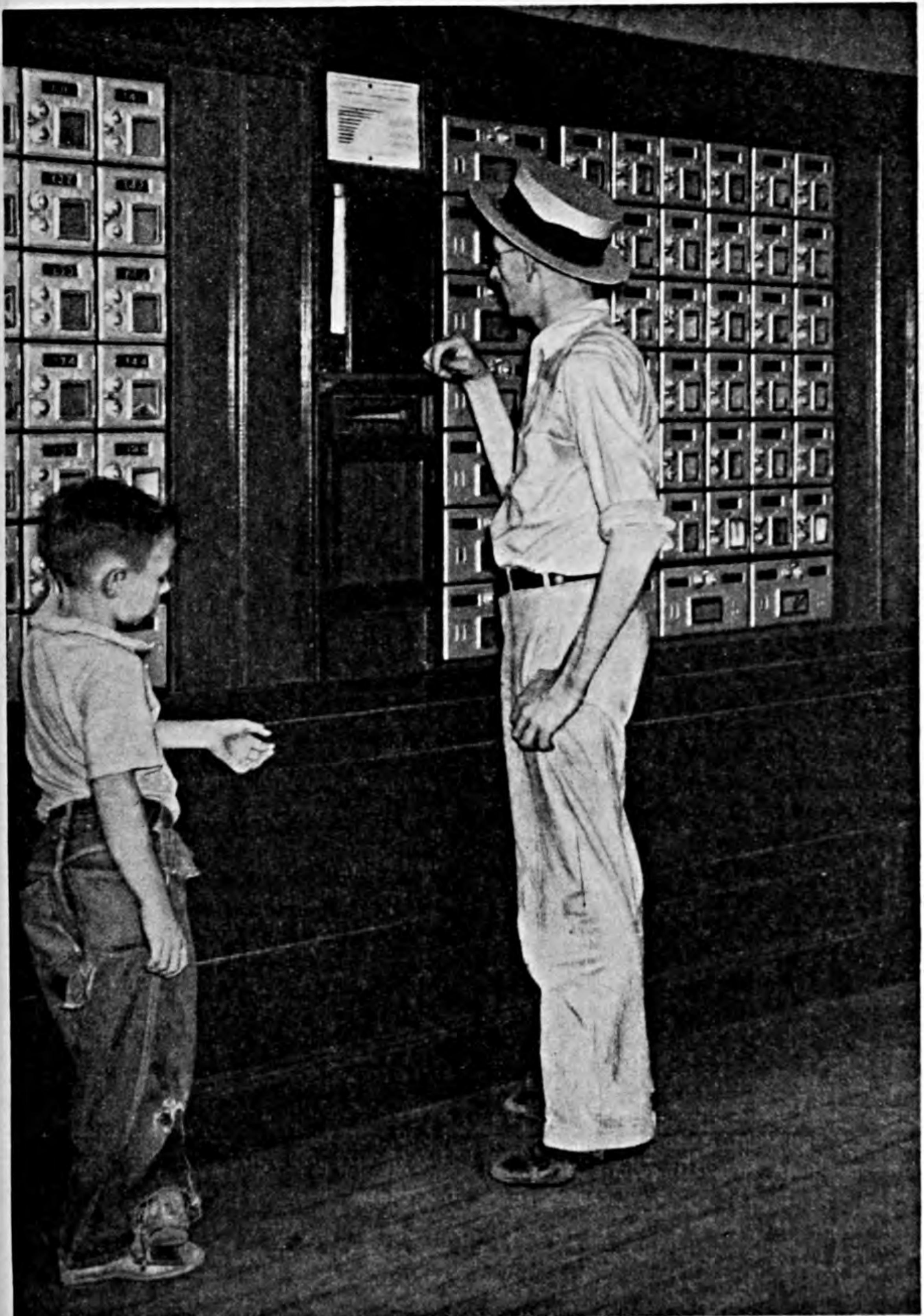
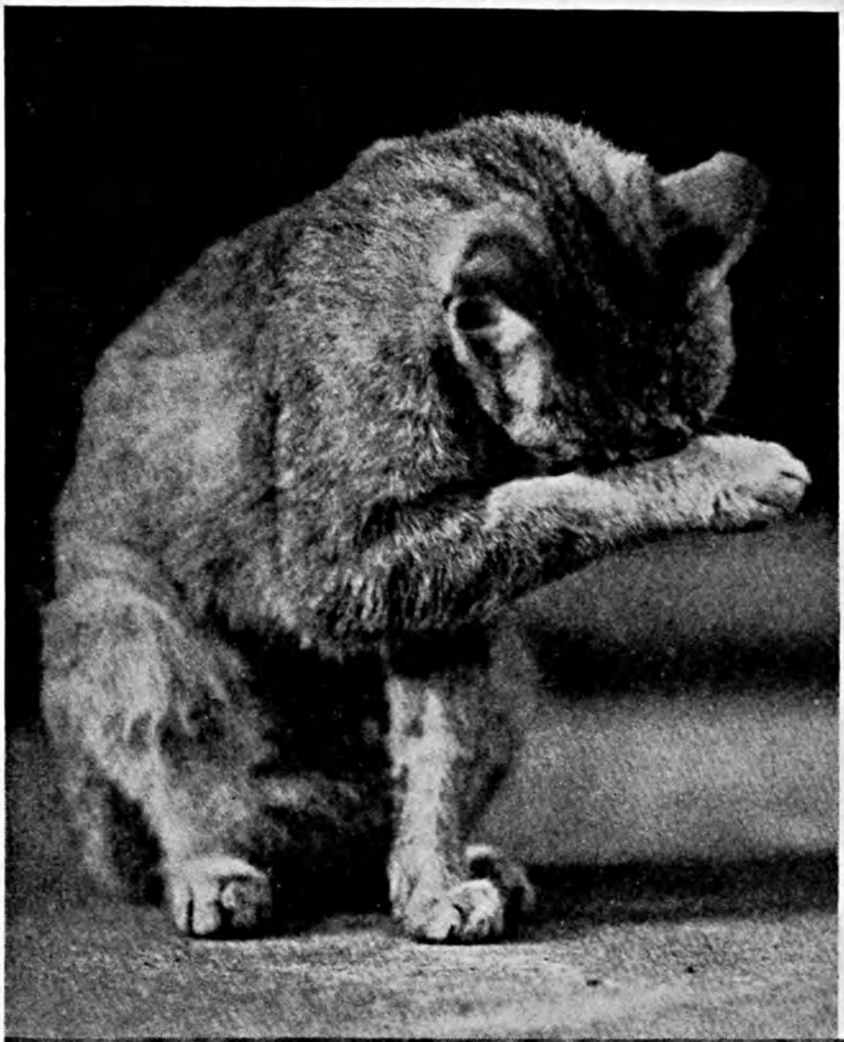
PICTORIAL

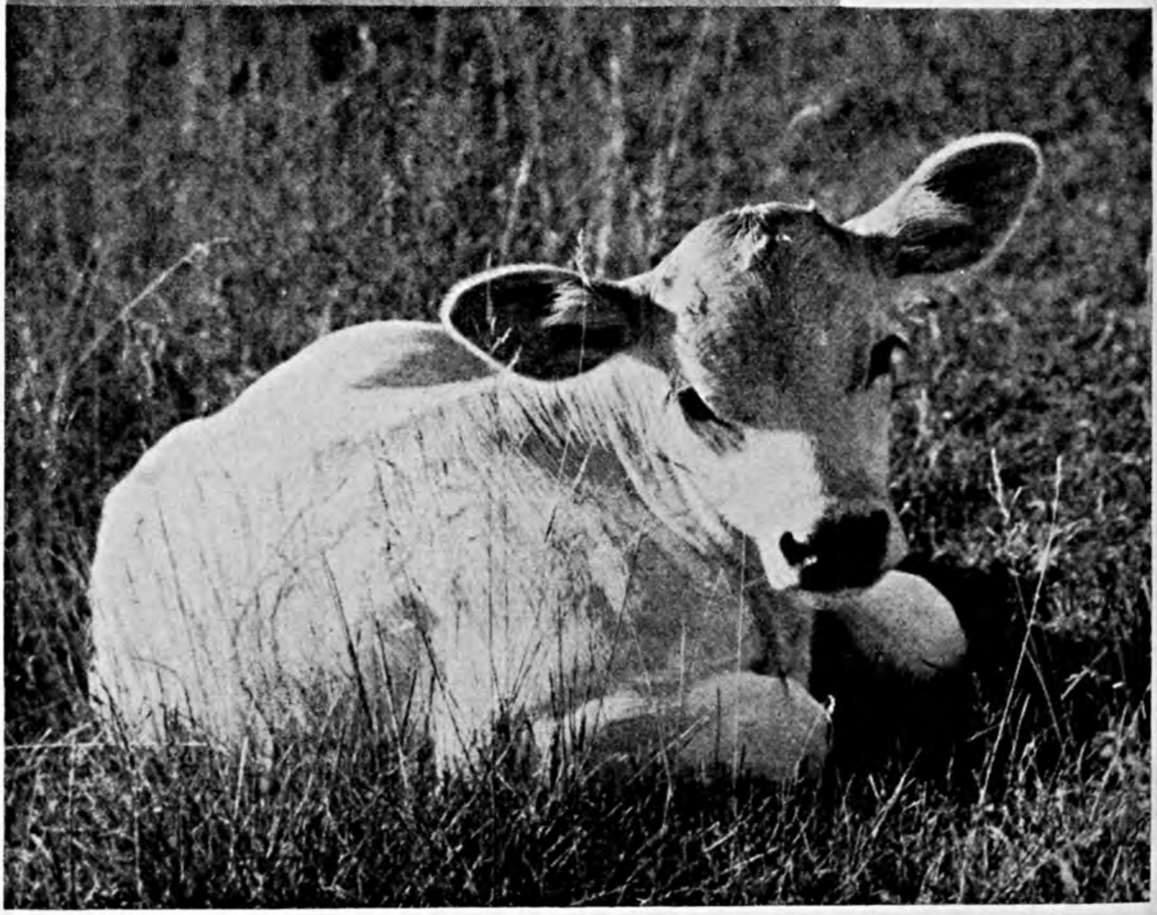


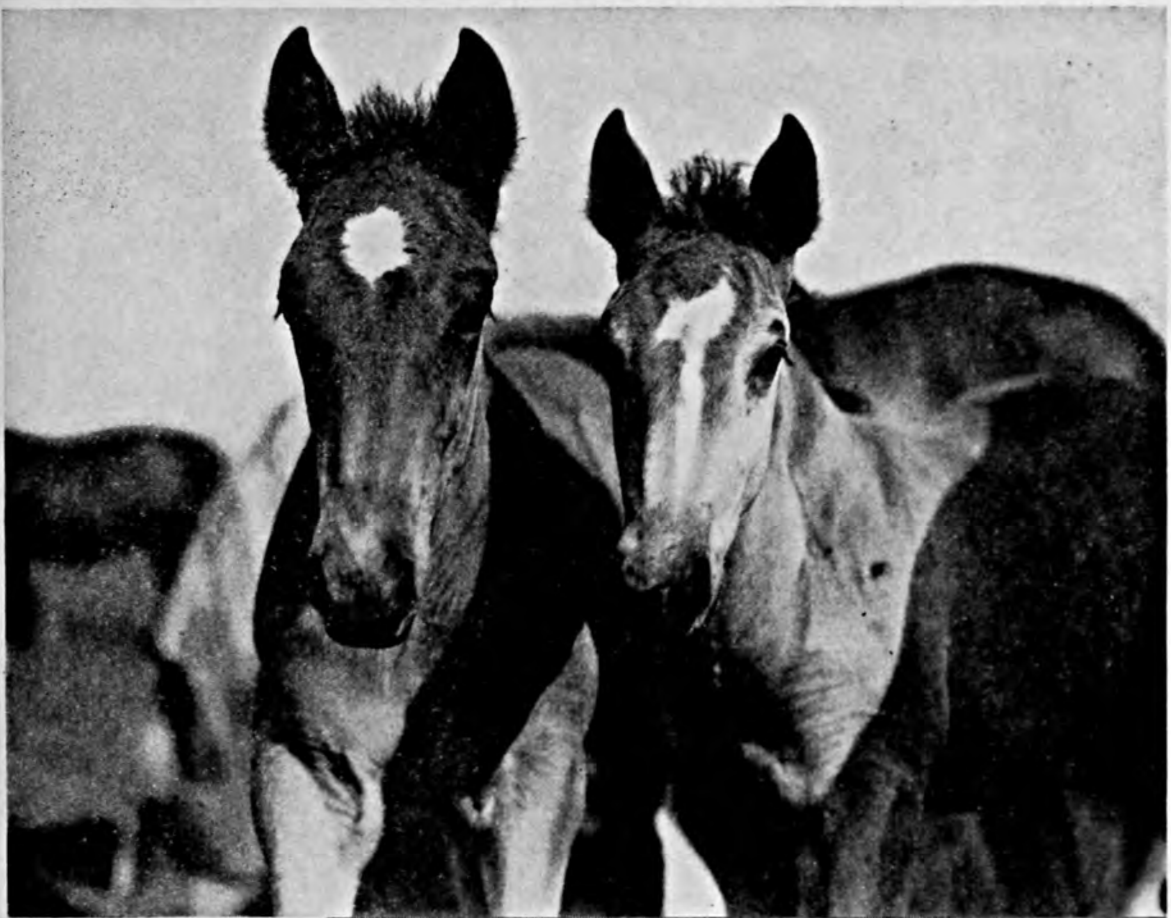
LOOKING FOR THE DELAYED SEED CATALOG.

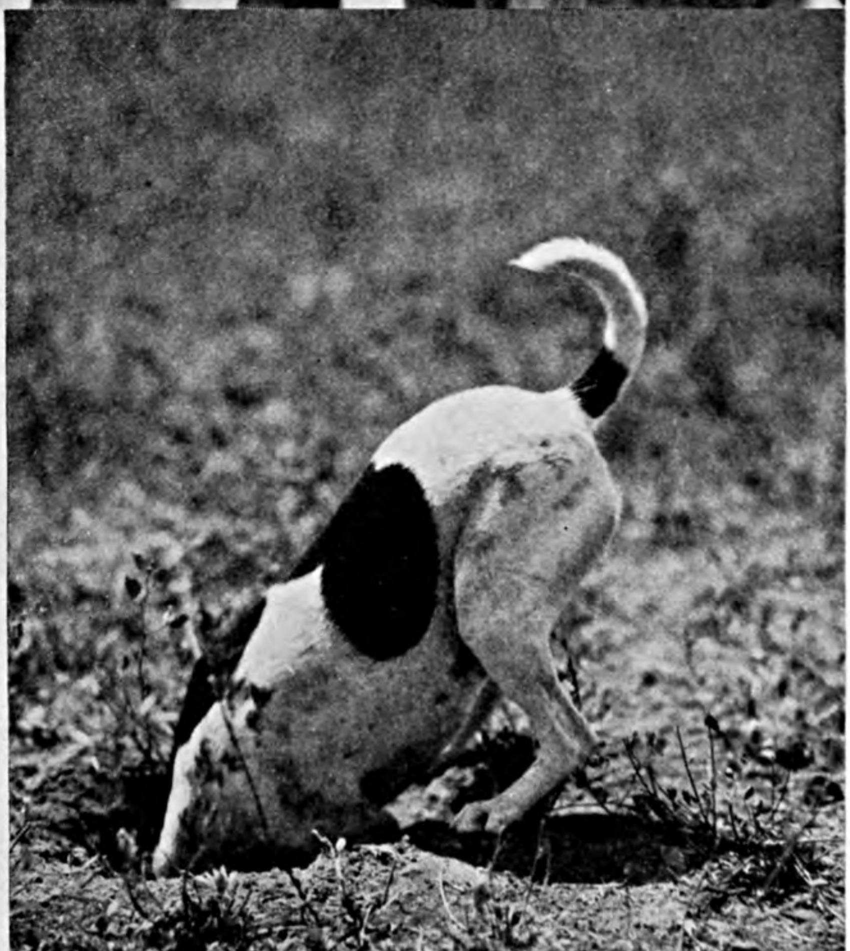


Left: A good rat exterminator cleans up after a campaign.

Below: Contented calves make contented cows, or vice versa.

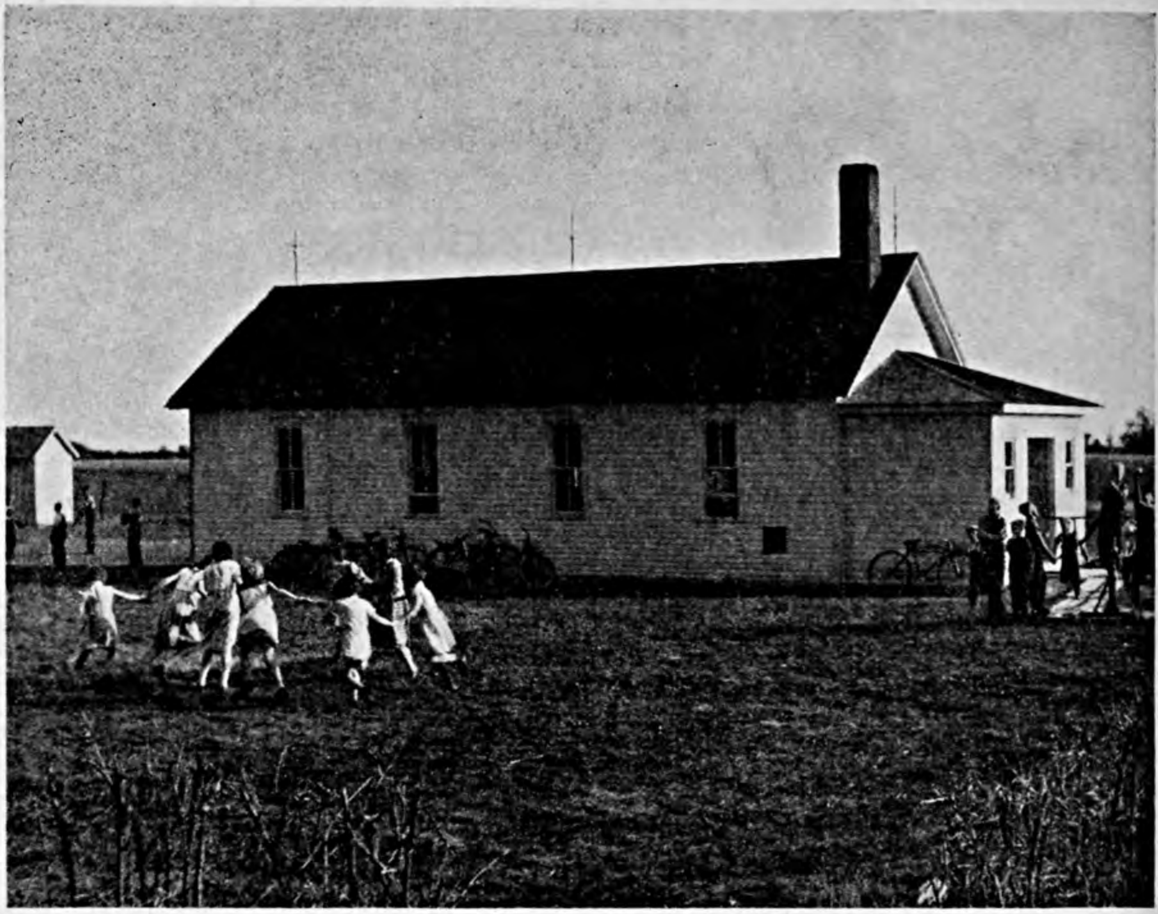




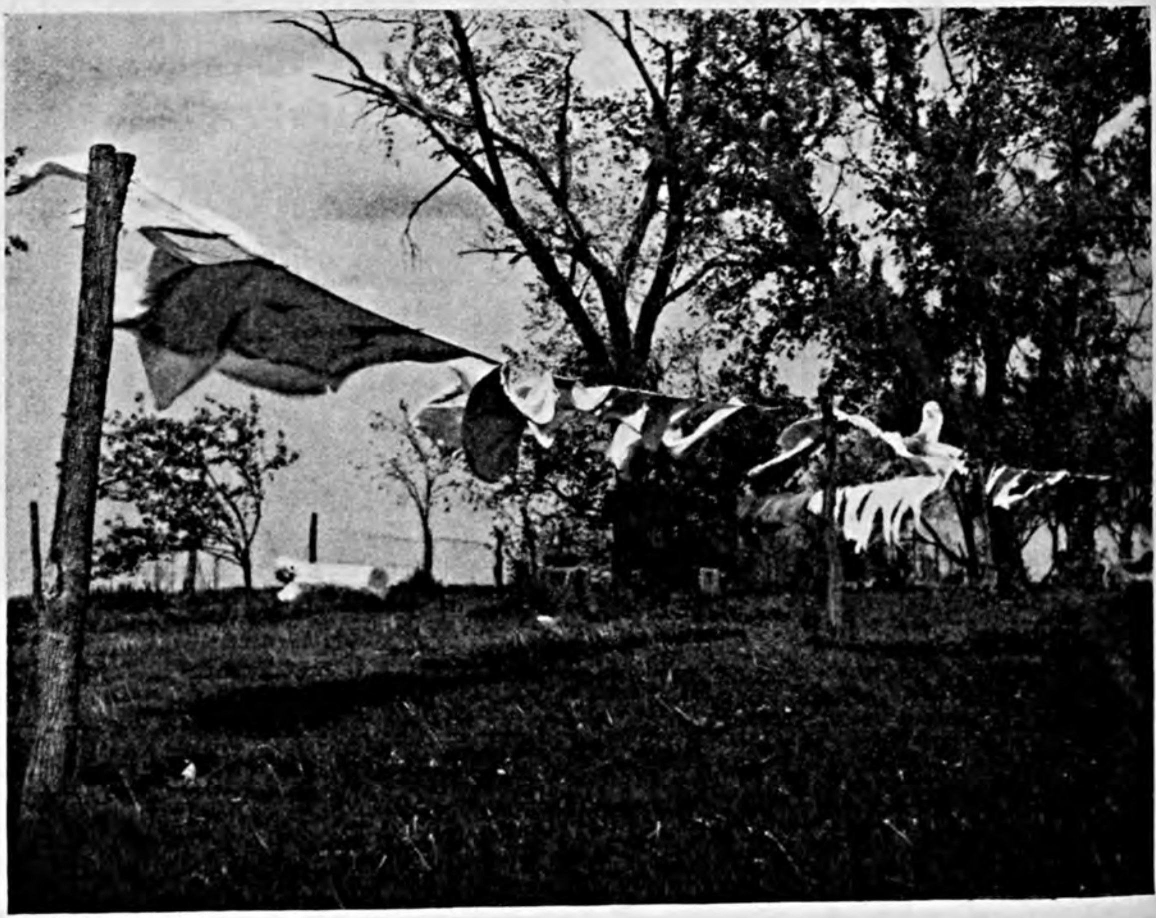


Above: A friendship which will mean good team work later on.

Right: Her name is "angel," but she's heading the wrong way.



DANCING MAY.



The Editors Talk

Returning Plant Food

Not all of the plant food lost from the farm can be laid to produce and livestock sold, leaching, and erosion. A large, but unestimated, share disappears with the crop of summer visitors which will soon descend upon farmers. The relatives, near and distant, and the urban friends and acquaintances who find summer week-ends a most opportune time to run out into the country and see "Bill and Mary" are a strain, not only on the country's natural hospitality, but upon its natural fertility. Somehow or other the guests always arrive in time for dinner and return home with cars well filled with fresh garden truck which "just doesn't cost Bill anything to raise" and is "so highly appreciated" in town.

A recent news item, given suitable publicity, might do much to correct this evil. Presents of fertilizers instead of food delicacies to country cousins are being urged by the Latvian Minister of Agriculture as a means of increasing the country's foodstuffs supply, according to a report from Consul William L. Peck, Riga, made public by the U. S. Commerce Department.

The Minister has made a number of such appeals to urban dwellers having relatives in farming districts or who contemplate spending vacations on farms to take or send small bags of fertilizers instead of the gifts usually found in vacation or week-end luggage. "This year," the Minister states in his appeal, "must be a bumper crop year," and he suggests that those who wish to eat well on vacations, or who care to bring back fresh vegetables, will be well repaid for carrying out the idea.

The Union of Farm Cooperatives is making small bags of fertilizers readily available to all who wish to participate in the unique plan, the report states.

Feeding Humans Minerals Through Better Foods

Animal nutrition research has long been under way and has been of vital interest to livestock men. More recently this research has taken a turn to include soil and crop specialists in the possibility that minerals can be fed to cattle more economically and efficiently through the growing plant than in any other way. The article, "Feeding Cattle Minerals Through Better Pastures," by N. J. Thomas in our April issue, reported recent work in this direction.

Another great field of research interest is now being stimulated by published references to the work of Dr. Charles Northen, who turned from doctoring the sick to doctoring sick soils, confident that therein lies the most economical and efficient means of treating many human nutritional ailments.

It has been said that 99 per cent of the American people are deficient in some of the minerals which guarantee full nourishment. It is Dr. Northen's belief that soils must contain ample amounts of these minerals in order to insure a resultant balanced mineral content in plants and animals, and that for any mineral necessary to human metabolism and health to be efficiently appropriated by humans, it must be present in food form. Therefore, health building must start with soil building.

Of the relationship between vitamins and minerals, he has asserted that while vitamins control the body's appropriation of minerals, in the absence of minerals they have no function to perform. He points out that two food products may look alike and taste alike and still vary widely in their mineral content, owing to the variance in the mineral content of the soils from which they were grown. He has been credited with doubling and redoubling the mineral content of fruits and vegetables; improving the quality of milk; causing hens to lay eggs richer in the vital elements; and by scientific feeding, raising the food value of potatoes, grapes, oranges, and other crops.

It is difficult for the mind to register the possible changes which might develop from further research along this line. For instance, would our entire system of grading and pricing food products be involved? What would occur in our practices of soil fertility building and maintenance? Would our race take on noticeable increases in vigor and span of life? Time alone will tell.

Consult Your County Agent

So common has the advice to "consult your county agent" become in agricultural circles that it must often reach outside circles and occasion a bit of wonder at the power of the county agent. No more fitting explanation can be found than that given in a tribute to the county agent by C. B. Smith of the Extension Service.

Within 25 years, Mr. Smith says, the county agent has risen from an almost unknown factor in rural affairs to a place of commanding importance. Looked upon at the outset as a theorist and impractical, county agents—both men and women—have come to be the trusted counselor and guide to more than 4,000,000 farm people. County agents have risen to this position, not because they have something to sell or a theory to teach, but because they help farmers increase their incomes and get more out of life.

County agents have grown strong because they carry honest, unbiased, and, as far as they know, accurate information to the people they serve. They have grown strong because, in carrying on their work, they help rural people to see larger, think more deeply, and act in the light of facts which farm people themselves help gather and help interpret.

The man who looked askance at county agents 25 years ago seldom undertakes any large matter affecting either his farming or his home today without consulting his county agent. County agents have become an influence in rural life on a par with the great inventor, the great teacher, or the press. They are comparable to the great statesman. The county agricultural agent or the home demonstration agent is recognized as one who knows what to do about local problems or can find out and then do something about them.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

The changing conception of the proper fertilization of cotton is exemplified in Bulletin 196 of the Georgia Experiment Station by R. P. Bledsoe, S. V. Stacy, and J. J. Skinner entitled, "Cotton Fertilizers for Georgia Soils." As a result of 8 years' experimentation on 5 typical cotton soils, the conclusion is reached that under average conditions the fertilization should supply 32 lbs. of nitrogen, 32 lbs. of phosphoric acid, and 32 lbs. of potash, or a 1:1:1 ratio.

The authors point out that the recommended amount of plant food may be supplied in 500 to 600 pounds of a 6-6-6 fertilizer per acre or 400 lbs. of 4-8-8 with a nitrogen side-dressing to supply 15 to 20 pounds of nitrogen per acre or by the application of 400 lbs. of 4-8-4 and a nitrogen-potash top-dresser supplying 16 pounds per acre each of these plant foods. These data are supported by the results of fertilizer demonstrations conducted for two years by the experiment station on 49 farms of the state. In these demonstrations the fertilization was brought up to approximately a 1:1:1 ratio by adding nitrogen and potash to the farmers' ordinary fertilizer practice. The yields produced by the 1:1:1 ratio were compared with those produced by the farmers' fertilizers. The yield of seed cotton was increased on an average of 192 lbs. per acre from the extra nitrogen and potash, producing a profit of $5.38. The authors point out that these recommendations are made for average Georgia conditions and should be modified to meet special conditions. For example, it was found that the Limestone Valley bottom soils respond profitably to 64 lbs. of available phosphoric acid per acre. On many of the sandy loam soils of the state more potash will be found profitable. This is also true where the soil has been limed. For extreme conditions where the cotton plant has indicated the need for more potash in the form of cotton rust, a top-dressing of 100 to 200 pounds of muriate of potash will pay. Where non wilt-resistant cotton varieties are grown on wilt-infested land, a broadcast application of 150 to 200 lbs. per acre of muriate of potash over the land before planting is advisable. The authors say that it will probably pay to use more than 600 lbs. of a 6-6-6 fertilizer in some cases. On good soils and where good farming methods are used, the amount of fertilizer used might well be raised to 700 or 800 lbs. per acre.

A section of the bulletin discusses the advantages of using high-grade fertilizer. The proper placement of fertilizer in order to obtain best results is also discussed. The best placement appears to be in a band along the row 2 inches or 3 inches away from the seed, a little below the level of the seed. Machines have been developed which do this, combined with seeding. Unfortunately, they are seldom used for cotton partly owing to their rather high cost.

"Georgia farmers are interested in

cotton fertilizers, for they are a large item in the cost of cotton production," and the authors believe that any possible economy in the purchase of fertilizer or any change that would give a higher return on the fertilizer investment would greatly benefit Georgia farmers. The facts presented in this publication appear highly practical and no doubt Georgia farmers can definitely increase the efficiency of cotton fertilizers and thereby increase profits when proper use of these data is made.

Two sources of practical information that will prove of much timely value to farmers in Michigan and North Carolina are Michigan Extension Bulletin 159, "Fertilizer Recommendations for 1937," by the Soils Department, and North Carolina Extension (Agronomy Information) Circular 103, "Suitable Fertilizer Mixtures for Different Crops . . .", by W. H. Rankin. Very similar releases are issued by these state services each year to aid farmers in determining their fertilizer requirements. As in the past, the Michigan bulletin lists in simple chart-form the fertilizer analyses and rates per acre recommended for the different crops to be grown on sand, sandy loam, loam, silt loam, clay loam, and muck soils. Among the mixed fertilizer analyses recommended for use in Michigan are: 2-14-4; 2-12-6; 4-16-8; 4-10-6; 3-12-12; 3-12-15; 2-8-16; 0-10-20; and 0-8-24. These recommendations are based on the results secured from the experimental fields in all parts of the state. The North Carolina Circular gives fertilizer recommendations for different crops according to the state provinces and soils. The suitable fertilizer mixtures for such crops as cotton, corn, tobacco, etc., include 4-8-4, 2-10-4, 5-7-5, 3-8-6, 5-7-7, and 4-8-8. This circular describes briefly the functions of the chief plant nutrients contained in fertilizers, which should enable growers to understand more clearly the purpose of and reason for using the various plant foods. Although eight or more mineral elements are required for normal crop growth, according to the authors most soils contain sufficient amounts of these in available forms with the exception possibly of nitrogen, phosphoric acid, and potash, and in some instances, magnesium, calcium, sulphur, manganese, and chlorine, although most of these minor nutrients are supplied in the regular fertilizers.

"Report of Studies on the Control of Cotton Wilt and 'Rust' or Potash Hunger," Agr. Exp. Sta., Fayetteville, Ark., Data Sheet, Feb. 17, 1937.

"A Study of Ammonia and Nitrate Nitrogen for Cotton. Part III, Influence of the Nitrogen Concentration in the Nutrient Medium. Part IV, Influence of Boron Concentration," Agr. Exp. Sta., Experiment, Ga., Bul. 197, Jan. 1937, K. T. Holley and T. G. Dulin.

"Phosphate Investigations in Montana—1936. Section I, Tests with Alfalfa and Other Farm Crops. Section II, Phosphorus Responses on Potatoes," Agr. Exp. Sta., Bozeman, Mont., Bul. 334, Feb. 1937, Jesse Green.

"Investigations on the Mechanical Application of Fertilizers for Cotton in North Carolina with some Results for Other Crops Obtained in Other States," Agr. Exp. Sta., State College Station, Raleigh, N. C. Cir. 104, Feb. 1937, Emerson R. Collins.

"Relative Value of Different Brands of Sodium Nitrate in Cotton Production," Agr. Exp. Sta., Clemson, S. C., Cir. 56, Feb. 1937, H. P. Cooper, E. E. Hall, W. B. Rogers, R. W. Wallace, and R. L. Smith.

Soils

Pennsylvania Agricultural Extension Circular 171, entitled "Soil Management in the Orchard," by J. L. Mecartney, contains much useful information that should materially help fruit growers with their orchard programs. Among the important topics comprising a large part of this instructive circular is the method of fertilization recommended for the different tree fruits grown in Pennsylvania. Every program of orchard soil management must consider organic matter as well as the fertilization of the trees since it produces a more spongy soil which rapidly absorbs rainfall and increases the rate at which soil nutrients are made available to the plant. The value of using quickly available nitrogen to produce more vigorous tree growth and the proper time and method of fertilizing the orchard are explained. Legumes for use as a cover crop or sod in the orchard are favored over non-legumes because of their relatively high content of nitrogen. The legumes in common use in Pennsylvania orchards are alfalfa, sweet clover, soybeans, red clover, and alsike. Since applications of lime, phosphate, and potash for the orchard are mostly effective on the sod or cover crop, complete fertilizers carrying nitrogen in quickly available form may be used in the cultivated orchard, applied usually when the cover crop is seeded. The author emphasizes that no single general recommendation will suit all conditions.

"1937 Connecticut Agricultural Conservation Program, Payment for Soil-building Practices," Agr. Exp. Sta., New Haven, Conn., Bul. A, Feb. 1937.

"Soybeans in Relation to Soil Improvement," Agr. Exp. Sta., Urbana, Ill., Mar. 1937, O. H. Sears and W. L. Burlison.

"Lime the Land to Grow Better Soil Conserving Crops," Agr. Ext. Serv., Lafayette, Ind., Mar. 1937, M. O. Pence.

"Soils of Iowa," Agr. Exp. Sta., Ames, Iowa, Sp. Rp. No. 3, Nov. 1936, P. E. Brown.

"Conservation Program for Michigan 4-H Clubs," Agr. Ext. Serv., East Lansing, Mich., Club. Bul. 29, Apr. 1937, A. G. Kettunen.

"Soils of Teton County. Soil Reconnoissance of Montana, Preliminary Report," Agr. Expt. Station, Bozeman, Mont., Bul. 332, Jan. 1937, L. F. Gieseker.

"Effect of Soil Reaction on Growth, Yield, and Market Quality of Potatoes," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 664, Jan. 1937, Ora Smith.

"Soil Survey of Broome County, New York," U. S. D. A., Washington, D. C. Series 1932, No. 11, Clarence Lounsbury, A. H. Hasty, D. F. Kinsman and J. H. Baran.

"Rich Land, Poor Land," Agr. Ext. Serv., Columbus, Ohio.

"Lime, Phosphate and Legumes in the 1937 Agricultural Conservation Program," Agr. Ext. Serv., Knoxville, Tenn., Pub. 208, Mar. 1937, H. E. Hendricks.

"Soil Survey of Wheeler County, Texas," U. S. D. A., Washington, D. C., Series 1932, No. 10, A. H. Bean, T. C. Reitch, and Z. C. Foster.

"Soil Survey of Augusta County, Virginia," U. S. D. A., Washington, D. C., Series 1932, No. 13, Pub. Feb. 1937, R. C. Jurney, R. E. Devereux, G. W. Patterson, and Edward Shulkcum.

"Fourteen Ways to Conserve Soil and Qualify for Payments in Connecticut," "Sixteen Ways to Conserve Soil and Qualify for Payments in Maine," "Eighteen Ways to Conserve Soil and Qualify for Payments in Massachusetts," "Twenty Ways to Conserve Soil and Qualify for Payments in New York," "Fourteen Ways to Conserve Soil and Qualify for Payments in Pennsylvania," "Nine Ways to Conserve Soil and Qualify for Payments in Rhode Island," U. S. D. A., Washington, D. C., Reg. Inf. Series, NER Leaflets No. 102.

"Better-balanced Farming for the Oklahoma and Texas Wheat and Grain-Sorghum Area," U. S. D. A., Washington, D. C., Reg. Inf. Series, SR Leaflet 102.

"Agricultural Conservation in Nevada," "Agricultural Conservation in Utah," "Agricultural Conservation in Washington," U. S. D. A., Washington, D. C., Reg. Inf. Series, WR Leaflets 102.

"Administrative Instructions Relating to the Execution of Forms in Connection with the 1937 Agricultural Conservation Program," U. S. D. A., Washington, D. C., WRB-103-Sup. 1, Mar. 1937.

"Emergency Wind-erosion Control," U. S. D. A., Washington, D. C., Cir. 430, Feb. 1937, Glenn K. Rule.

"Topsoil—Its Preservation," U. S. D. A., Washington, D. C., Soil Cons. Serv., Reg. 5, Feb. 1937.

Crops

"Raspberry Growing in Massachusetts," is the title of Mass. Extension Service Leaflet 48, by Professor Ralph A. Van Meter. The chief points outlined for raspberry growing begin with building up the soil to a high level of fertility before planting and the selection of disease-resistant varieties. Planting disease-free stock either very early in the spring or autumn is very important, the leaflet directs. A cover crop planted in late summer will aid in checking growth. Other points that should be looked after are keeping the rows narrow at the bottom, eliminating common pests before the population builds up, and studying the plants and adjusting cultural operations to secure a clean, vigorous and productive growth. The merits of the different red, black, and purple varieties are described. Each has certain advantages over the others in the section where it is best adapted to the requirements of growers. The systems of culture for the different raspberry types are briefly discussed. Animal manures and commercial fertilizers have proved very valuable in supplying the plant-food needs for this crop. The standard 5-8-7 mixture at the rate of 500 to 800 pounds per acre, depending upon the soil, appears the best fertilization practice at the present time. The time to apply the fertilizer is early spring before growth begins. As stated above, cover crops should be sown when cultivation is discontinued. In addition to checking cane growth, they also serve to discourage weeds and to cover the soil during the winter. The care of the raspberry plants during the first season, methods of pruning, cultivation, harvesting, and descriptions of diseases and insect pests with their control are other points discussed in this interesting publication.

"Annual Report of the Director for the Fiscal Year Ending June 30, 1936," Agr. Exp. Sta., Newark, Del., Bul. 205, Dec. 1936, C. A. McCue, Director.

"Flowering Plants Grown in Florida," St. Dept. of Agr., Tallahassee, Fla., new Series Bul. 59, Oct. 1936, Nathan Mayo, Comm.

"Forage and Pasture Crops in Florida," Dept. of Agr., Tallahassee, Fla., New Series, No. 68, July 1934, Nathan Mayo, Comm.

"Cold Storage Studies of Florida Citrus Fruits. Part I, Effect of Temperature and Maturity on the Changes in Composition and Keeping Quality of Oranges and Grapefruit in Cold Storage," Agr. Exp. Sta., Gainesville, Fla., Bul. 303, Oct. 1936, Arthur L. Stahl and A. F. Camp.

"Cold Storage Studies of Florida Citrus Fruits. Part II, Effect of Various Wrappers and Temperatures on the Preservation of Citrus Fruits in Storage," Agr. Exp. Sta., Gainesville, Fla., Bul. 304, Oct. 1936, Arthur L. Stahl and Willard M. Fifield.

"The 1936 Iowa Corn Yield Test," Agr. Exp. Sta., Ames, Iowa, Bul. 355, Feb. 1937, M. M. Rhoades and Joe L. Robinson.

"The Relations of Reserves to Cold Resistance in Alfalfa," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 208, Oct. 1936, J. J. Mark.

"The Relationship Between the Internal Structure and Photosynthetic Behavior of Apple Leaves," Agr. Exp. Sta., Manhattan, Kans., Tech. Bul. 42, Feb. 1937, Wm. F. Pickett.

"Biennial Report of the Northeast Louisiana Experiment Station, St. Joseph, Louisiana, 1935-36," Agr. Exp. Sta., Baton Rouge, La., C. B. Haddon, Supt.

"Biennial Report of the North Louisiana Experiment Station, Calhoun, Louisiana, 1935-36," Agr. Exp. Sta., Baton Rouge, La., Sidney Stewart, Supt.

"Annual Report of the Maine Extension Service for the Year Ending June 30, 1936," Agr. Ext. Serv., Orono, Me., Bul. 229, Nov. 1936, A. L. Deering, Director.

"Potatoes from the Consumer's Standpoint," Agr. Ext. Serv., Orono, Me., Bul. 230, Nov. 1936, Marion D. Sweetman and Leone M. Dakin.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., Vol. 1, No. 3, Apr. 1937, Paul W. Dempsey, E. F. Guba, W. D. Whitcomb, and F. H. Branch.

"Oat Culture in Michigan," Agr. Ext. Div., East Lansing, Mich., Ext. Bul. 177, Apr. 1937, E. E. Down and J. W. Thayer, Jr.

"A Mixture of Alfalfa and Smooth Brome Grass for Pasture," Agr. Exp. Sta., East Lansing, Mich., Cir. Bul. 159, Mar. 1937, H. C. Rather, C. M. Harrison, G. A. Brown, and G. E. Taylor.

"Pollination and Fruit Setting," Agr. Exp. Sta., Columbia, Mo., Bul. 379, Mar. 1937, A. E. Murneek.

"Missouri Peach Culture," Agr. Exp. Sta., Columbia, Mo., Bul. 380, Mar. 1937, T. J. Talbert.

"Good Varieties of Cotton for Missouri," Agr. Exp. Sta., Columbia, Mo., Cir. 194, Mar. 1937, B. M. King.

"The Restoration of Bluegrass Pastures in Missouri," Agr. Ext. Serv., Columbia, Mo., Cir. 358, Mar. 1937, E. Marion Brown.

"Soybeans—Their Adaptation and Production in Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 335, Feb. 1937, A. H. Post.

"Some Chemical Constituents of Apple Associated with Susceptibility to Fire-blight," Agr. Exp. Sta., New Brunswick, N. J., Bul. 613, Nov. 1936, Alice Allen Nightingale.

"Soil and Plant Response to Certain Methods of Potato Cultivation," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 662, Jan. 1937, George C. Moore.

"Raspberry Growing in New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 153, Rev. Jan. 1937, G. L. Slate, L. M. Cooley, and F. L. Gambrell.

"Ornamental Evergreens," Agr. Ext. Serv., Columbus, Ohio, Bul. 113, Rev. July 1936, L. C. Chadwick.

"The Bimonthly Bulletin," Agr. Exp. Sta.,

Wooster, Ohio. Vol. XXII, No. 185, March-April 1937.

"Experiments with Snap Beans at the Truck Experiment Station," Agr. Exp. Sta., Clemson, S. C., Sp. Cir. No. 2, Feb. 1937, J. M. Jenkins, Jr.

"The Effect of Exposure in the Field on Grade, Strength, and Color of Raw Cotton," Agr. Exp. Sta., College Station, Texas, Bul. 538, Nov. 1936, Mary Anna Grimes.

"Department of Agriculture—Immigration of Virginia," Richmond, Va., Bul. 346, Mar. 1937, and Bul. 347, Apr. 1937.

"Forty-sixth Annual Report of the University of Wyoming Agricultural Experiment Station," Agr. Exp. Sta., Laramie, Wyo., J. A. Hill, Dir.

"Progress Report of the State Experiment Farms," Agr. Exp. Sta., Laramie, Wyo., Bul. 219, Feb. 1937, W. L. Quayle.

"The Dasheen, A Southern Root Crop for Home Use and Market," U. S. D. A., Washington, D. C., Farmers' Bul. 1936, Rev. Dec. 1936, Robert A. Young.

"High-grade Alfalfa Hay—Methods of Producing, Baling, and Loading for Market," U. S. D. A., Washington, D. C., Farmers' Bul. 1539, Rev. Oct. 1932, Edward C. Parker.

"Extension as a Profession," U. S. D. A., Washington, D. C., Ext. Serv. Cir. 252, Dec. 1936, C. B. Smith.

"List of Available Publications of the U. S. D. A.," U. S. D. A., Washington, D. C., Misc. Pub. 60, Jan. 2, 1937, F. L. Zimmerman.

"Do We Want To Be Farmers, An Outline of Information for Use in 4-H Club Discussion Programs," U. S. D. A., Washington, D. C., G-66, Apr. 1937.

"A Digest of Pasture Research Literature in the Continental United States and Canada 1885 to 1935, Corrections and Additions, February 1937," U. S. D. A., Washington, D. C., A. J. Pieters.

Economics

Active interest in current problems of land use led the staff of the Iowa Experiment Station to a study, the findings of which are being presented in research bulletin No. 209, "Economics of Agricultural Land Use Adjustments," by Rainer Schickele. In order to treat the subject thoroughly from every angle, various departments of the Experiment Station cooperated in formulating a sound agricultural policy for Iowa, and then to bridge the gap between theory and practice, these conclusions were subjected to the criticism of a selected group of Iowa farmers. Highly interesting and usable information resulted, making the bulletin of value to a wide range of agricultural workers and practical growers.

"The ultimate goal of agricultural policy is to provide a secure foundation for the sound development of farm life," the author points out. Two crucial problems of adjustments to keep this policy in line are (1) unbalanced production relative to the demand situation and (2) soil wastage. The major issues involved in the development of a long-time program of fundamental land use adjustments in the Corn Belt are: "(1) Introduction of soil conservation as a major objective of agricultural policy and the correlation of this objective with orderly production; (2) Establishment of suitable standards of land use and soil management adapted to regional and local conditions. Historical bases for acreages of specific crops should be avoided as they tend to 'freeze' acreages and production according to a pattern incidental to a few base years and are wholly inadequate for a great number of farms; (3) Differentiation of adjustments between regions as well as between individual farms within each region on the basis of land types. This differentiation should be determined largely by the requirements of soil conservation and such factors as alternative opportunities for various products in a given region, and comparative advantage of various regions for a given product."

In order to more fully understand and to facilitate the study, Iowa was considered not as a whole, but from the standpoint of the various types of farming areas within the state. The acreages of the various crops, such as intertilled, hay, and pasture, were considered for each area, as well as the movements of feeds and grains between areas. In some areas, adjustments in land use were comparatively simple, while in others the problem was extremely difficult. For instance, in southern Iowa farmers were more conservation-minded, and the acreage of intertilled crops such as corn had been held to the minimum in order to maintain the soil fertility and check erosion. In this area the farms were small and the percentage of intensive crops was already low. It would be extremely difficult to lower the acreages of the more intensive crops from a historical base, because any further reduction would reduce farm income and create undesirable living conditions. In the grain-farming areas the limiting factor was the high rate of tenancy.

While there is more than one method of soil conservation, such as withdrawal of land from cultivation, changing of crop systems, terracing, strip-cropping, etc., the study dealt primarily with the changes in crop systems in the direction of less intertilled crops and more grasses and legumes. Corn, obviously the most important crop in the Corn Belt, is also the most exploitative grain crop from the viewpoint of soil fertility. It removes large quantities of plant foods, fosters erosion, and exhausts the organic content of the soil more quickly than any other crop. It appears inevitable that the Corn Belt will sooner or later face a serious problem of soil conservation, and such is already the case in large sections.

It was pointed out the soil conservation attainable through a judicious use of crop rotation was necessarily limited to the maintenance of the nitrogen and organic content of the soil and to the retention of the soil itself. Minerals are inevitably lost wherever any crops are harvested or livestock is pastured, regardless of the rotation. Minerals can only be fully replaced by application of commercial fertilizers. However, the objective of soil conservation under the study was not a complete replacement of all plant nutrients removed by crops, because of minerals being released by the gradual decomposition of the soil constituents, and nitrogen being added through rains and bacterial activities, nor was this replacement necessarily economical. The questions to be considered are: (1) The character and natural fertility of the soil, (2) the rate of plant food removal through crop systems, and (3) the price relationship between farm products and fertilizer.

The author states that one of the most difficult problems of any soil conservation policy is to accomplish an adequate regional allocation, in terms of public funds and human efforts employed. Soil conservation as an objective of public policy is of a relative rather than absolute character. Instead of diffusing available funds over wide regions regardless of the various land classes and their relative need for conservation, such funds should be concentrated upon those land classes where conservation is most urgent in the interest of public welfare. The research activities in the field must necessarily transgress the lines of specific departments. They must include particularly the cooperative efforts of workers in agronomy, animal husbandry, and economics.

"Classification of Fertilizer Sales Reported to Date for the Quarter Ended December 31, 1936," St. Dept. of Agr. Sacramento, Calif., Apr. 10, 1937, A. A. Brock, Director.

"Types of Farming and Type of Farming Areas in Connecticut," Agr. Exp. Sta., Storrs, Conn., Bul. 213, Dec. 1936, I. G. Davis.

"Connecticut Vegetable Acreages, 1934, '35, and '36," St. Dept. of Agr., Hartford, Conn., Bul. 43, Nov. 1936, Olcott F. King, Comm.

"Quarterly Bulletin," St. Bd. of Agr., Dover, Del., Vol. 26, No. 4, for Quarter Ending Dec. 31, 1936.

"Per Acre Rates of Payment for Fertilizing New Seedings and Green Manure Crops with Fertilizer or Varying Analyses and Varying Amounts," Agr. Exp., Sta., Orono, Me., 1937.

"Massachusetts Soil Building Practices and Rates of Payment," U. S. D. A., Washington, D. C. Practice No., Liming 1.

"1936 Fertilizer Analyses and Registrations," St. Dept. of Agr., St. Paul, Minn., H. A. Halvorson.

"Analyses of Commercial Fertilizers," Agr. Exp. Sta., Bozeman, Mont., Bul. 331, Fert. Rp. No. 1, Jan. 1937, A. P. Bruce and Edmund Burke.

"Inspection of Commercial Fertilizers for 1936," Agr. Exp. Sta., Durham, N. H., Bul. 294, Dec. 1936, T. O. Smith and H. A. Davis.

"Analyses of Commercial Fertilizers, Fertilizer Supplies, and Home Mixtures for 1936," Agr. Exp. Sta., New Brunswick, N. J., Bul. 619, Nov. 1936, Charles S. Cathcart.

"Farm Management for Fruit Growers," Cornell Univ. Ext. Serv., Ithaca, N. Y., Bul. 355, Aug. 1936, T. E. Lamont and Paul Williamson.

"Farm Economics," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., No. 100, Mar. 1937.

"Report of Analyses of Commercial Fertilizers Sold in New York State from July 1, 1935 to June 30, 1936," Dept. of Agr. and Markets, Albany, N. Y., Bul. 308, Sept. 1936, Peter G. Ten Eyck, Comm.

"Report of Analyses of Samples of Lime Materials Used for Agricultural Purposes Sold in New York State July 1, 1935 to June 30, 1936," Dept. of Agr. and Markets, Albany, N. Y., Bul. 309, Oct. 1936, Peter G. Ten Eyck, Comm.

"Department of Agriculture of Oregon Bulletin," St. Dept. of Agr., Salem, Oreg., No. 63, Mar. 1937.

"Lime Report, 1932-1935," St. Dept. of Agr., Harrisburg, Pa., Vol. 19, No. 6, Aug. 1, 1936, J. Hansell French, Secretary.

"Commercial Fertilizers—1937," St. Dept. of Agr., Madison, Wis., No. 181, Feb. 1937, W. B. Griem.

"The Farmer's Share of the Consumer's Food Dollar," U. S. D. A., Washington, D. C., Leaflet No. 123, Feb. 1937.

"Agricultural Conservation—1937. What Farmers Should Know About the AAA Program," U. D. S. A., Washington, D. C., Reg. Inf. Series, NCR Leaflet No. 102.

"Conservation of the Soil"

ANOTHER step forward in fulfilling a great need for practical information on the problem of soil erosion induced by wind and water is presented in a new book, "Conservation of the Soil," by Professor A. F. Gustafson, Professor of Soil Technology, Cornell University (McGraw-Hill Book Co., Inc., New York, $3.00). A lifelong devotee to the study of controlling erosion, dating back to his early boyhood when he experienced the toil of replanting corn which had been washed out by heavy thundershowers, the author possesses a thorough understanding of the subjects treated. The book gives data on soil losses under various conditions in different parts of the country and on the relative success of control methods. Maintaining high soil productivity and a protective cover for the soil are among the important necessities stressed.

There are 17 chapters comprising the book. The introduction in the first chapter gives a background in sequence, beginning with "lessons from the past," etc., to the "establishment of the Federal Soil Conservation Service." Soil Erosion—wind, water, and waves; Results of Soil Erosion; Influence of Precipitation and Latitude; Influence of Slope and Soil; and Influence of Natural Land Cover on Soil Erosion, are primarily the chapters devoted to the natural causes of erosion. The remaining chapters deal with the methods of control that involve the use of inexpensive farm practices and materials that are within the attainment of the individual landowner and operator. These include, in general, providing the soil with vegetative covers to protect the soil, conducting tillage operations and seeding all crops on the contour, and contour strip-cropping and terracing on sloping lands.

Well Illustrated

Besides the excellent presentation of material in text style, there are 195 appropriate illustrations that contribute a great deal to the reader's interest throughout the book. These show typical examples of what careless neglect has done to our soils. In contrast to a most dismal scene in the past, several illustrations portray what can be done by following such treatments that have proved "land savers."

In the author's own words, "Soil erosion in the United States has been recognized as a menace to agriculture, if not to the population as a whole, for many years. A beginning has been made during the past 30 years, and more particularly during the past decade, in obtaining accurate information on the losses of soil by erosion and on methods of controlling these losses under varied cropping systems."

Because of his fundamental knowledge of erosion control measures, and having recently been on leave of absence from his regular duties to serve as chief soil erosion expert on a Federal Soil Conservation Demonstrator Project in southern New York, the author is especially well qualified to write up-to-date authoritative information on conservation of the soil. The book is of concern to landowners and operators, county agricultural agents, to college and high school courses in soil conservation, and to general readers.

Ohio Flood Wastes Tons of Fertile Upland Soil

Of the many million tons of fertile soil washed from upland farms by the January floods, nearly 40 million tons were spread over bottomland and city streets in the Ohio Valley, reports the Soil Conservation Service. The report is based on a survey which included actual measurements of soil removal and silt deposits all along the valley from Pittsburgh, Pa., to Cairo, Ill. Even larger quantities of agricultural soil probably were carried down the river below Cairo.

The swiftly moving waters deposited more than 25 million tons of silt in the rural areas of the valley proper, a further 8 million tons on the bottomland of several tributaries near the confluences, and nearly 4 million tons in 165 towns and cities of the valley—based on sample measurements in 27 river communities most seriously affected.

Farming land in the valley also was damaged severely by more than 11 million tons of sand churned up from the river bottom and laid down over adjoining fields and meadows.

"These studies show clearly that flood damage is by no means confined to the casualties caused by the actual inundation," says H. H. Bennett, Chief of the Service. "In addition to the burden and expense imposed on the cities and riparian farms, this silt represents an enormous soil loss to the agricultural communities of the entire watershed."

Apply Boron to Prevent Darkening of Turnips

(*From page 22*)

double amounts, but single rates had been insufficient for complete control and without buffer rows, his checks may have been influenced slightly by cross feeding roots. A rate of less than 10 pounds apparently applied was insufficient to overcome the boron deficiency of that soil.

From our experiences to date, some suggestions may be noted:

1. Borax definitely controlled dark center of rutabagas in all tests where used in sufficient amounts (15 to 30-pound rates).

2. Boron apparently is deficient in many soils of the State evidenced at least so far as dark center of rutabagas serves as an indicator crop.

3. That ordinary soil amendments commonly used fail to supply necessary amounts of boron to prevent dark center.

4. That further demonstrational work should be done to determine the probable effect of repeated applications of borax, rate of fixation and leaching.

5. That a method should be established for the most practical procedure of supplying boron to soils, whether as borax broadcast, sprayed, drilled, or supplied in regular fertilizer mixtures.

Potato Improvement in Wisconsin

(*From page* 12)

both materials running high in lime content.

Last year through the cooperation of local dealers 4 carloads of muriate of potash were distributed to local farmers. Potash is the kind of plant food that has most seriously been removed from the soil through the exportation of potatoes. Early this year, with the assistance of their County Agent and local dealers, Waushara potato growers placed their orders for nearly a trainload of potash.

A far-reaching and what appears to be a successful potato seed improvement program was inaugurated last spring by the Waushara Agricultural Committee through the introduction of a carload of the finest russet rural seed potatoes available. These potatoes were distributed mostly in 500-pound lots to farmers at cost. They were purchased early in the season when prices were still low, and therefore most farmers were able to sell their own stock at about the same price that they were asked to pay for this new seed. In spite of the drought and unfavorable growing weather, this seed averaged 138 bushels per acre, thereby making available about 13,800 bushels for seed for local growers in this county this year—enough to plant approximately 2,300 seed acres.

Of course these results are for one year only, but growers who tried out this seed tell us that it:

1. Is resistant to scab, although scab was not serious last season,
2. Is a high-yielding strain,
3. Produces a good stand,
4. Reproduces good type,
5. Produces an eating potato of high quality.

Working with nature in this soil-building program, Waushara potato growers are going to solve the most serious of their potato-growing problems. In the meantime we are looking to the plant breeders for new varieties which are resistant to scab.

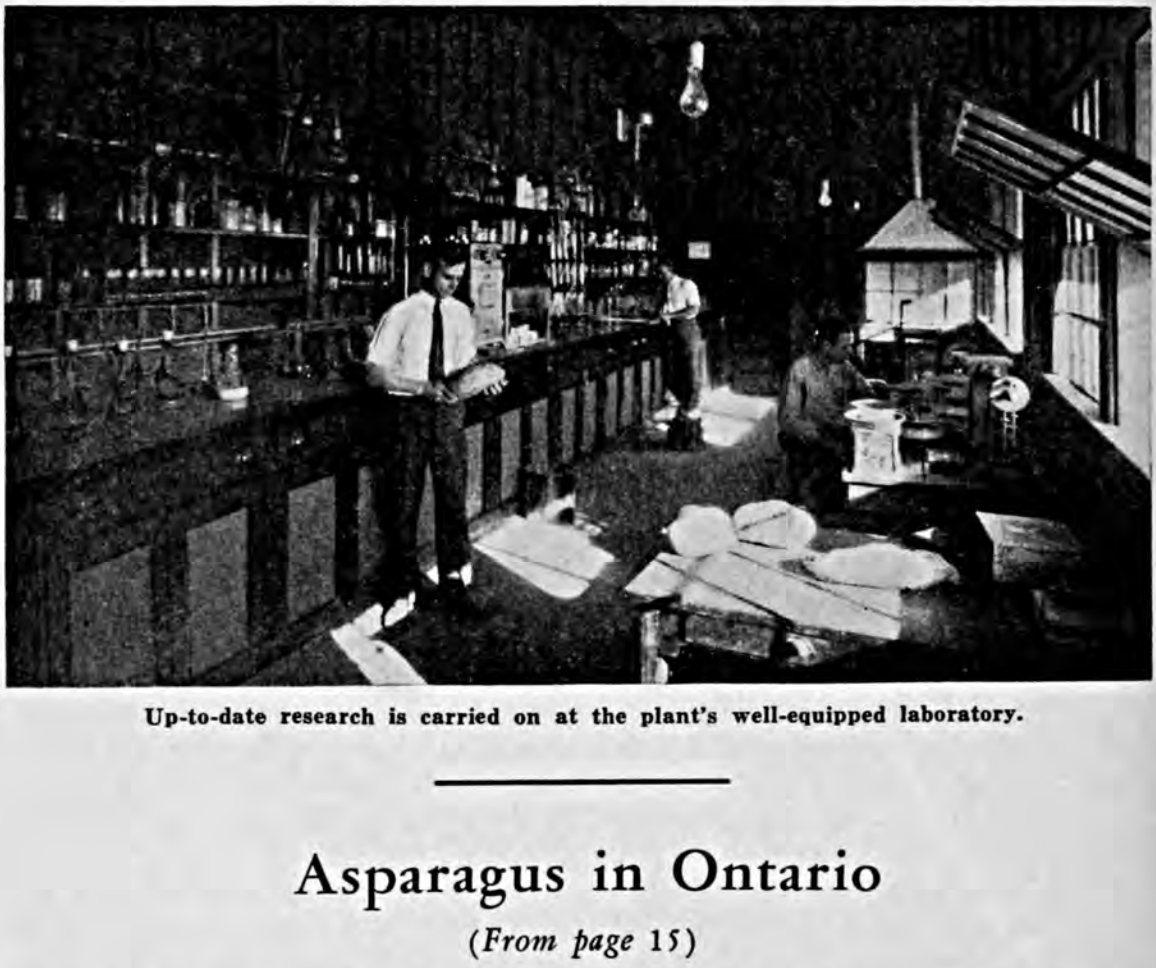
In the future these potato growers with their trucks and car trailers will be going after their old market, not with the under-grade product that has been produced in the past decade, but with a high quality, health product, individually packed and labeled. The Waushara County Potato Improvement Program is a hook-up of common sense, science, and nature, with the sporting blood of true potato-minded farmers—a heritage from the pioneer Potato Kings of the 90's.

From Pine Forests to Sweet Potatoes

(*From page* 19)

tato starch can be used in the place of both white potato and Cassava starch. At the price farmers are getting for the raw product, sweet potato starch can compete with white starch, but the low cost of Cassava makes it a harder item to replace.

Farmers living within a radius of about 20 miles of Laurel furnish the plant its raw material. Most of them are cotton farmers who are using the sweet potato as a supplementary cash crop, and although raising sweet potatoes is not a "get rich" enterprise they are adding to their cash income regularly. If it's a wet year and the cotton crop fails, the sweet potatoes come through; and if it happens to be too dry for sweet potatoes, cotton usually thrives.



Up-to-date research is carried on at the plant's well-equipped laboratory.

Asparagus in Ontario

(*From page* 15)

able unless accompanied by deep planting and then only on very favorable soil where long life of the patch is expected. In general, rows 4 feet apart and plants 18 to 24 inches apart in the row are best for shallow plantings, as the maximum yield per acre is reached earlier. On high-priced land, such as is used for much of the asparagus in Ontario, it is more profitable to bring the young plantings to full yield as soon as possible even though they may not live as long.

The Mary Washington variety is grown in Ontario almost entirely, but the high standard of the original stock is not being maintained in some of the stocks offered today. This variety carries some resistance to the rust disease *Puccinia Asparagi.* It should be very vigorous in growth, producing large, thick sprouts which do not bud out early. It should also carry a fair degree of uniformity as to type and color.

Rust and Insects

The rust is seldom serious in Ontario, but may be found in nearly every patch. Where it is noticed to any extent it would be wise to cut and burn the tops in late fall. This also applies to the control of insects. Many growers prefer to leave the tops over winter to collect snow. The old tops are disked into the soil early in the spring. This adds both moisture and humus to the soil.

There are two insects which frequently injure the asparagus crop. The common and more serious one is a small, bluish-black beetle with yellow markings on the wing covers. *Creoceris Asparagi L.* It is most noticeable when wintered-over adults are feeding on the young sprouts and young top growth. Egg-laying on sprouts is also objectionable as the eggs are difficult to remove. This insect does more serious injury, however, on the top or summer growth of the plant. It may seriously reduce the yield for the following season. The other insect is larger and called the spotted asparagus beetle. It is reddish in color with 12 black spots on the wing covers. It is not so common nor nearly so injurious as the first. The larva usually feed only on the seed berries.

The best control measures for both insects are to cut the bearing plants frequently, to spray young plants and the late growth after cutting season with a poison spray (2 pounds of arsenate of lead to 40 gals. water with 2 pounds of soap), and to cut and burn the tops and other nearby rubbish in late fall.

On Apple Orchards Use "Congenial" Fertilizers

(*From page* 10)

balanced diet, it would be well to consider these elements at all times.

It should be stated that there is some variation in the amounts shown to be removed by the fruit. The best level from which to make computations is from analyses of fruits taken from unfertilized trees, since heavily fertilized trees and their fruits will draw more heavily and show much higher amounts of the different nutrient salts. Additional investigation in this connection should be of much value, particularly with unfertilized trees grown in a definitely analyzed soil.

Profit Increases With Age

With an expenditure of 10 cents per tree for complete fertilization, the yield of a typical root-crowded apple orchard was increased by over 2 bushels per tree. At this rate apples selling at 50 cents a bushel would bring a gross profit of $1.90 per tree. Attention should be directed to the possibility of a higher rate of profit from complete fertilization in many apple orchards as the trees gradually increase in age.

Until within recent years apple growers were almost dogmatically urged to make application of fertilizers to apple trees only in the spring, several weeks before blossoming. Reports made by the writer in 1926 showed some superior results from fall applications. In the conclusions, the writer pointed out that certain nitrogenous applications can be made in other periods beside the traditional spring recommendations, with equal or in some instances better growth and yield responses.

Since then these results have in various phases been verified by other investigators. Among these are Browne of the Dominion Experimental Farm at Abbotsford, Quebec, Kimball in Canadian Horticulture, Olney and Magill of Missouri, Gourley of Ohio, Lewis of Ohio, Schrader and Auchter of Maryland, and Harlan and Collison of New York.

Fall Applications

Recently Professor A. H. Teske of the Extension Division of Virginia Polytechnic Institute, commented as follows: "In the past, fertilizer applications to fruit trees have generally been made in the spring from the time that the buds began to swell up until and through the blooming period. In recent years fall applications have come into use to some extent. The work that has been done to date with fall applications indicates that not only can satisfactory results be expected with fall treatments, but that under certain conditions and tree performance there may be some distinct advantages gained from applying fertilizers to apple trees in the fall. It has been shown that there is an increase in the nitrogen of the rootlets and larger roots, from fall applications, and that there is a larger percentage of starch in the non-bearing spurs during June. That being the case, fall applications may have a distinct advantage in short crop years as is the case at the present time."

Another comment made recently is that of Dr. J. H. Gourley of the Ohio Experiment Station. This statement by Dr. Gourley is of especial significance. Interesting particulars quoted from his results are as follows: "Fall fertilization of orchards appears to be on the increase. There is ample evidence that at least equally good results can be secured if the fertilizer is applied from the middle of September to the middle of November, and without injury to the trees."

It has been found by the writer over a period of 10 years' observations that active development of feeding rootlets come to almost a definite stop about the middle of July. Resumption of development commences again in about the second week of August. This activity continues well into heavy freezing weather. Of course, under laboratory conditions, there is very little solute intake as the temperature approaches freezing, but in the orchard with a varying amount of insulation from different soil media, rootlet activity may continue with air temperatures as low as 10 degrees above zero Fahrenheit. Spring resumption of rootlet activity is often much slower than the activity that is in progress up to the severe freezing temperatures approaching winter. It often takes until the middle to the last part of April for maximum rootlet activity. All of this very likely accounts for some of the more noticeable responses due to fall fertilizer applications.

In experiments conducted by Aldrich of the U. S. D. A., it is observed that during winter nitrogen taken up by the small rootlets was translocated into larger roots, and that this translocation in sections north of Virginia continues during the 3 to 4 months following a fall or winter nitrate application. In the medium-sized roots of the unfertilized trees, it was found that the nitrogen was apparently moved out into other parts of the tree faster than it was moved in from the absorbing rootlets.

It is the opinion of this investigator that since on May 15 at full bloom the medium-sized roots were higher in nitrogen than those of the unfertilized groups, the large roots function as storage tissues. "The fact that medium-sized roots from the unfertilized trees decreased in nitrogen content during the winter indicates that in the case of all trees there was some movement of nitrogen out of the larger roots into other parts of the tree during that time." The most significant point indicated in these investigations is the earlier nitrogen content due to earlier fall applications.

Winter-killing

It is very frequently asked by fruit growers of this state, "To what extent are apple trees in Virginia subject to winter-killing as the result of different seasonal fertilizer applications?" A relatively long period of observations made by the writer and the records in a 25-year-old experimental orchard in Blacksburg offer interesting information in these particulars.

One series in this experimental orchard has been kept in clean cultivation throughout the entire growing season, another under partial cultivation, and the third in sod. These cultivations are crossed by replicate fertilizer treatments. In the plots of the clean-cultivated series to which nitrogenous fertilizers have been applied, particularly in the lower spots with a prevalence of liberal moisture and food supply, the conditions were such as to allow for uninterrupted growth up to freezing temperatures. In the sod the trees in most places were deprived of moisture long in advance of such freezing temperatures, especially in the higher parts of the orchard and where no fertilizers were added.

On the whole, this experimental orchard provided a very representative assortment of conditions for prolonged and for checked growth through the usual growing season up to the time of freezing temperatures. Likewise, during this period of 25 years several zero and sub-zero temperatures were recorded. Some of the lowest temperatures during this period are recorded as follows: 1912—zero, 1913—6° above, 1914—15° above, 1915—6° above, 1916—3° above, 1917—27° below, 1918—16° above, 1919—zero, 1920—1° above, 1921—3° above, 1922—9° above, 1923—5° above, 1924—6° above, 1925—4° above, 1930—1° above, 1931—3° above, 1932—9° above, 1933—zero, 1934—4° above, 1935—4° below.

During this entire period there was no perceptible winter injury other than an occasional longitudinal bark-splitting in some Grimes and Stayman trees in the sod series that were not fertilized and some in trees that were injured by mice. In another nearby orchard of Grimes, Starking, Stayman, and York, no winter injury was found where applications were made of either calcium cyanamid, sodium nitrate, or ammonium sulphate, long before the summer growing activity of the trees receded, and in spite of the fact that such applications may have caused succulent growth to continue into freezing weather.

Observations made of many trees that were killed during the winters of 1931, '32, and '33 showed that in every instance these trees had been suffering either from lack of sufficient summer or fall soil moisture or from some factor that deprived them of maintaining a proper condition of health and vigor. Such factors as mouse injury, wooly aphis on the roots, borer infestation, root-rot ravages, or various canker injuries may cause apple trees to become so weakened that they are unable to survive the further desiccating effects during the winter periods which usually finally cause these weakened trees to die. Yet injured trees may very frequently survive some very severe winter temperatures, if the summer or fall months had been visited with an abundance of rainfall so that the trees may have the opportunity for relatively larger solute intake. Winter-killing is generally the more severe following dry summer or fall months or both, when solute intake is impeded and the trees become more checked in vigor. An interesting report is made as follows by Dunegan and Smith.

"Observations made in the Ozark section of Missouri showed that hundreds of apple trees died. . . . It was noticeable that the loss of trees of the Ben Davis variety was much greater than that of any other variety. In this section there are many orchards of Ben Davis from 25 to 35 years old. . . . Figures on 26 scattered orchards showed them all to be infested with Illinois blister canker (Numularia discreta) in varying degrees of severity during the past season. As would be expected, these diseased trees were the first to show the effects of water shortage." These were the first to succumb to the subsequent freezing temperatures.

Keep Trees Vigorous

In their recent work, "Winter Injury of Baldwin Apple Trees and Its Relation to Previous Tree Performance and Nutritional Treatment," Collison and Harlan, of the New York Agricultural Experiment Station, report: "The fact the odd trees in the orchard which received no fertilizers showed the greatest injury indicates that fertilizers generally reduced the injury." Especially significant of certain interactional activities that occur between nitrogen, phosphorus, and potash, it would be well to emphasize these authors' statement made as follows: "Some of the treatments had specific effects, due to their action under the particular soil conditions of this orchard, which indicates that the nitrogen carrier should be fitted to the orchard soil and perhaps to the apple variety."

Winter injuries are far less severe if the summer and fall months or both are such as to allow for ample and even luxuriant growth. Trees that have been adequately nourished and watered during the growing season even up to freezing temperatures stand much better chances of surviving severe winters than trees that have had their growth checked. From the evidence secured at this station, it is safe to fertilize apple trees any time during the growing season. There is less danger of winter injury to trees that are kept vigorous and well fed prior to freezing temperatures.

Accumulated Reserves

Much valuable work has been carried on by Professor M. A. Blake, Chief, Department of Horticulture, New Jersey State College of Agriculture. In a recent article he refers to soils' accumulated reserves. He points out that during the first 15 to 18 years of this century or until the time of the World War, animal manures were available to growers, and complete fertilizers were used quite liberally in New Jersey. "Well-formed soils possessed reserves of organic matter and nutrients. Furthermore, tillage was largely done by horse-drawn tools. Then came the period when some reports from field experiments in orchards appeared to indicate that nitrogen was the only nutrient that would give worth-while commercial results in orchards. Some went as far as to suggest that only one source of nitrogen was to be recommended. Of course, such a simple solution to the orchard fertilization problem obviously had a popular appeal and was widely adopted.

"It was not at all surprising that nitrogen alone appeared to give results equal to a complete fertilizer for a time. In many cases the orchards were upon at least fairly fertile soils, and many of them had received applications of manure either before or after planting, or both. Orchards were not infrequently planted upon areas which had previously been devoted to vegetable crops and heavily fertilized for years. Applications of 40 tons of manure to the acre were sometimes made for vegetable crops.

. . . After a period of years, the first element likely to become deficient, if any, after such a practice would be nitrogen. . . . Facts will concentrate attention upon the importance of ents supplied by the soil or from a fertilizer bag. It is equally dependent upon a supply of carbohydrates synthesized largely by the leaves and upon a conditioning of the plant, both nat-

Fig. 5—Without sufficient organic matter in the orchard soil, fruit trees cannot be expected to make sufficient growth and be vigorous yielders of high-grade fruit. The organic content of such soils must be materially increased.

judging the nutritional needs of plants by means of their external appearance and not by soil conditions alone.

Proper Conditioning

"Last, but not least, is the matter of the proper conditioning of plants, which is fundamental to success in commercial fruit growing. An athlete is said to be in good condition when he is in good health and attains maximum endurance and physical ability. It is not merely a matter of being well fed. Likewise, a plant may be well fed but in either a poor or a good condition for production. Healthy, vigorous, 1 to 3-year-old apple trees do not produce fruit, and no modification of a nutrient treatment will maintain their growth and health and enable them to produce a crop of fruit. A plant does not grow and fruit merely as a result of nutri- ural and artificial, which is favorable to fruit production.

"An apple tree which makes an excessive vegetative growth in spring will develop shoots and water sprouts instead of fruit buds and be unproductive. Any fruits which are produced will be dull, smoky red in color, and of poor texture and quality. This means that we are rapidly approaching a stage where sound and correct fertilization of orchards will be based upon the kind of fruit, the variety and age of the trees, the growth status of same, as well as the class and fertility of the soil, and the nature of the climate. In New Jersey where the trees, cover crops, and weeds all make a good growth, a 3-12-6 fertilizer is recommended as a basic treatment to be applied broadcast. The amount which should be used will vary from 500 to 1,000 pounds per acre according to the kind of fruit, the variety, the age and size of the trees, the character of the soil, and the climatic conditions of the area. Additional nitrogen should be applied as a supplement to this basic fertilizer according to the needs."

Ample Soil Moisture

There is no factor of greater importance to the growth and fruiting of apple trees than ample soil moisture. Without this factor, apple growing would be futile, no matter how rich and fertile the soil may be. Next to controlled irrigation, a system of maintaining as much organic matter in the soil as possible is the most effective practice. The growing of certain cover crops in the soil still remains one of the best ways of securing the larger amounts of such organic matter. Just when and what to use for such orchard cover crops will differ under various conditions.

In some cases the soil is strong enough to support a lush, luxuriant vegetation. Such soil could be left to the growth of volunteer ground cover eventually to establish a sod growth which could be broken up or "cracked" occasionally as conditions require. To maintain a more luxuriant growth, applications of a 10-6-4 fertilizer at the rate of 600 to 800 and in some instances even 1,000 pounds will be found to be very profitable. These applications at such rates will also be very beneficial to plantings of rye and vetch in the fall with supplemental sprinklings of lespedeza in March. At this station we have increased the organic content of our soils materially with rye plantings in this manner. Our rye was allowed to grow to full maturity, after which it was mowed. This made a most excellent mulch over the drier summer months, added large amounts of organic matter to the soil, and then came up as a volunteer crop the following fall.

Such volunteer re-seeding has been observed for over a period of 10 years. Since a permanent sod and the accumulation of trash is liable to encourage a fire and mouse hazard, it becomes imperative to break up or "crack" the orchard ground cover at the necessary periods to effect the proper control. With such precautions, a strong orchard soil can be maintained which will more nearly supply the tree and its developing fruit with the moisture that is necessary. Apple trees amply supplied with soil moisture when the need is critical will more likely produce sound, well-finished, and highly colored fruit. Such trees will be more likely to produce crops with greater regularity from year to year and survive the more trying periods of both summer and winter.

Well-balanced Diet

Fruit growers are becoming increasingly aware of the value of keeping their fruit trees on a well-balanced diet, especially after several heavy crop years. From the results secured at the Virginia Agricultural Experiment Station, it may be concluded that in the end it becomes necessary to apply materials other than nitrogen to apple trees. To be sure, the more outstanding responses will show up from nitrogenous applications and in some instances will suffice adequately. But as apple trees grow older, the root systems become more crowded, and large crops are removed, attention must also be given to applications of phosphorus and potash. Since soil moisture is a most important factor in apple soil management, and this factor is greatly enhanced by a system of cover cropping, it is imperative that orchard soils are adequately supplied with phosphorus and potash as well as nitrogen.

"Melvin! MelVIN!"

"What, ma?"

"Are you spitting in the fish bowl?"

"No, but I been comin' pretty close."

Nix on Nostalgia

(*From page 5*)

in tribute to our meager training or the heroism of the folks who made it possible.

Across the street a stocky cupola rises above the Tudor-Gothic-Yankee-notion architecture comprising the Methodist parish church. My father was not an addict to religious fervor, even though in his youth the camp-meetings were the only vaudeville shows permitted in his bailiwick. Yet he expected me to sidle into my best pants every Sunday and answer the roll call for Sabbath school, as his proxy.

OUR class of boys occupied a slippery, golden-oak pew in the corner, with a fat, bulky, lady teacher (wife of the hardware merchant) standing like a mattress at the only open end to keep us safely corralled while the pennies were collected and the "leaves of love" distributed. It was my experience here which steeled me in later years to assume class leadership of a group of "calf-stage" lads who had the same uncanny ability that we did, to turn the Sabbath conversation from the apostles to athletics or from old miracles to modern marvels.

Probably our methods were faulty. We taught that faith is the substance of things hoped for, the evidence of things not seen, as Paul averred. But to restless, ever-modern youth faith is fed on realities, and no saintly topics we discussed, from mystic voices on Sinai to the burning bush of Moses, could beat the radio, the aeroplane, or the automobile for spiritual exaltation.

Taking my cue, therefore, from these remembrances, I clamber into the car again and resolve to return to the present and acknowledge the wonders of the hour. Better a few bright notions and current nonsense than too much nostalgia.

IF there be any excuse open to our elder generation to hark back to and harp upon the past, it may lie in the conditions some of us experienced. Possibly we are not looking backward to "better times," but rather putting ourselves in tune so as to help young folks enjoy the present, and thereby enjoy it with them.

Many of us rural youngsters of other days fell far short of living the lives we should, and it was largely lack of adult inspiration and imagination which denied us that opportunity. By this I refer to community and to group leadership, not necessarily involving much money, but merely appreciation of the needs of youth. It is true that some of us had parents with ideals far beyond the circle in which their lots were cast, but being in a minority they could do little to enliven the whole.

THIS same stagnant hamlet whose streets I rambled as an urchin was primarily for dignified elders and the treasures they cherished selfishly. Any young, exuberant person with fun-loving propensities had a pretty difficult road to tread. The greed of the elders in authority lined the streets with saloons and other questionable enterprises, but expected youth to lead copy-book lives of orderly decorum so they might in turn acquire property rights or inherit some grubby business in the same old, cheerless social desert.

There were few ingenious ones to devise delightful ways for youth to exert its vitality and talent. We kids day-dreamed and mooned around, often growing morbid, possibly forlorn and misunderstood—all for want of the vitalizing influence of the group activities which today are working wonders for the rural boys and girls.

If the girls were unwed at 25 they were classed as unlovely old maids and expected to dress the part or get a bad name! If a penniless boy showed manly distaste for the gossip and goose-stepping of Main Street, he was apt to be iceberged out of the community or obliged to remain in it as a poorly-paid bachelor, working dully beside the faded beauties he once glanced at with warmth and romance. Our doting parents joked with us about certain girls, but they knew as we did that marriage was as highly problematical as a good job, and our final revolt and leave-taking was a needless tragedy to them and to the welfare (perhaps) of the community. And sad to say, the girls of those times were hardly the independent creatures they are today, and therefore doomed to exert their motherly instincts as teachers or "practical nurses," with hopes and hope-chests relegated to the attic.

FOR the thing that ailed us all was lack of heroes and hero-worship, except the drab, second-hand articles we got out of the town library or bought for a dime from the shilling-shocker shelves. We were forever reading of achievements in some golden age of Guineveres, Ronalds, and Lancelots, intermixed with Susan B. Anthony, Florence Nightingale, Daniel Webster, and—Nick Carter or Bob Fitzsimmons, *sub rosa!*

Our frustrated parents persisted in giving the air of distinction to distant and unapproachable divinities and demigods of the day, and made cold marble shrines out of such people who were as ordinary and comical as we, when they retired in their flannel nightgowns. The de-bunkers came too late for us fellows! For it was the de-bunkers, you know, who have made our heroes lovable and human, touchable and approachable. They have worked with the youth movements of today in making it possible for youngsters to *participate* in hero-making instead of merely reading and moping about it.

In other words, my friendly readers, "them was the daze" of inferiority-complex courses, taken right at home without tuition fees. Many juveniles were made into brass monkeys in those smug little spots; and they heard nothing, saw nothing, and said nothing—and the old world whizzed by and left them stranded in the backwaters of fear and mediocrity.

That's why you and I insist on our kids joining something and doing something, even if it keeps us from a golf club, which we don't care for anyhow! It seems to me that with our counsel and encouragement, they will go a long way in reforming the places where we were hatched in such "artificial heat." If they can make this present scene a trifle easier and nicer to live in, they will improve on their forerunners, who seemed to think chiefly of two discordant things, their money and the millennium!

ALL I need to do is to spend a half day in that seedy, little tank town and work my memory a trifle. Then I hastily take an antidote by listening to the Future Farmers broadcasting their chapter meeting, or watch the girls rehearse a dress revue for the 4-H rally.

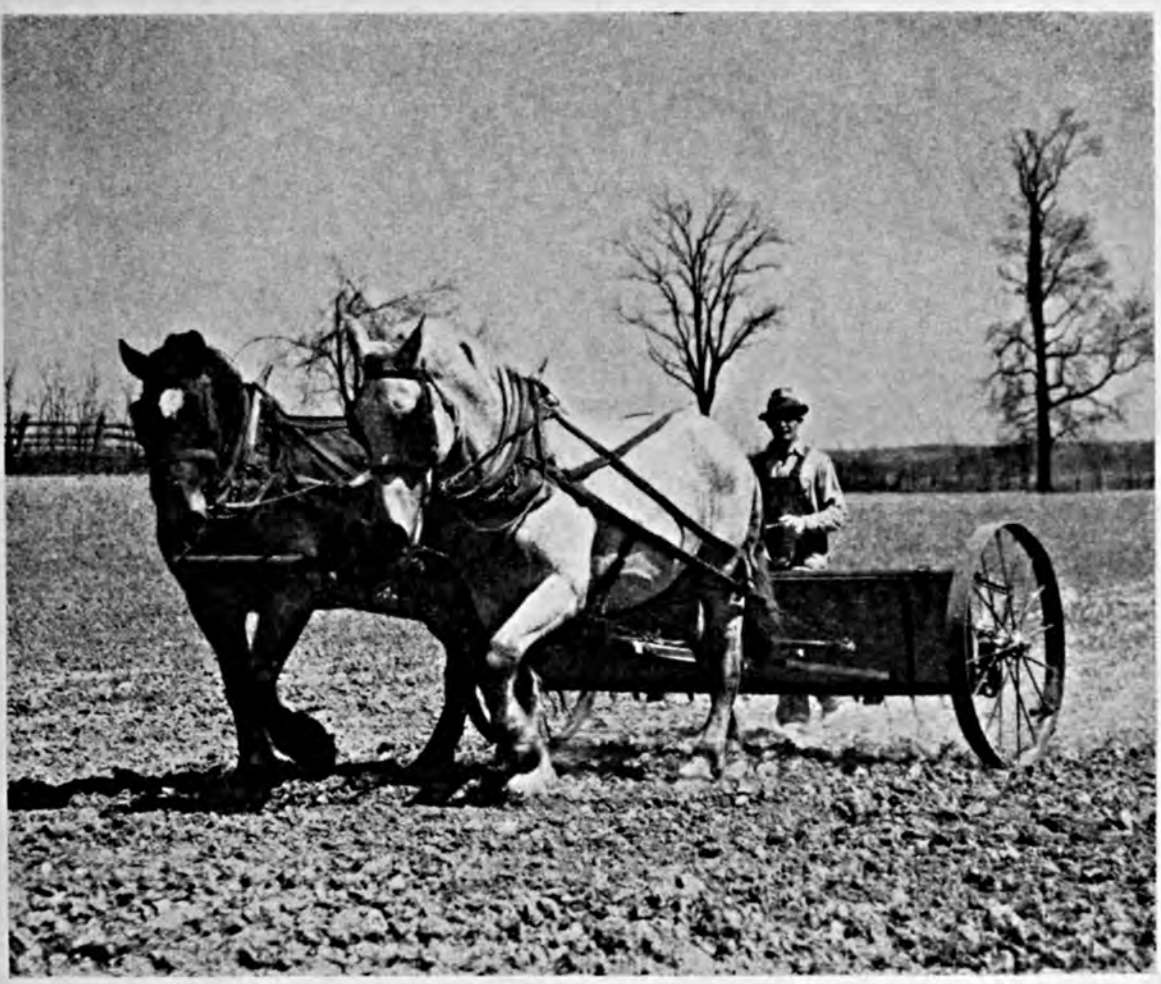
This and a couple of high-school debates, a band tournament, a travel club, and a junior dramatic society pretty well cure me of my "noxious nostalgia."

If you were born under the same stunted star, you likewise have reached the same conclusion. And this is it!

A doctor had an urgent phone call from a gentleman saying his small son had swallowed his fountain pen.

"All right! I'll come at once," replied the doctor. "What are you doing in the meantime?"

Whereto came the unexpected answer, "Using a pencil."



A Few Whinnies

GREAT GAME

For the fiftieth time the two rather careful boxers had fallen into a clinch.

"Turn aht the lights!" shouted a voice from the gallery. "Them two lovin' 'earts want to be alone!"

"Leave them lights alone!" shouted another voice. "I want to read!"

A man went into a shop to buy a fountain pen. The assistant gave him one to try, and he covered several sheets of paper with the words, "Tempus Fugit" ("Time Flies").

The assistant offered him another pen. "Perhaps," she said, "you'd like one of these better, Mr. Fugit."

THERE'S SOME MISTAKE

Scene: A Mississippi plantation. A negro boy knocks on the door of a cabin.

"Oh, Uncle Joe, I jes saw a daid man laying over in the holler, and thought maybe 'twas you."

Uncle Joe (coming to door): "What'd he look lak?"

Black Boy: "He wuz about your size, and——"

Uncle Joe: "Did he hab on a flannel shirt?"

Black Boy: "Yup."

Uncle Joe: "Wid red and white checks on it?"

Black Boy: "Nossuh, it wuz plain gray."

Uncle Joe (closing door): "Nope, it warn't me."

Stranger: "I hear you have a fine cow now. What will you take for her?"

Farmer (cautiously): "Wait a minute! Are you the new tax assessor or has my cow been killed on the railroad?"

Percival: "Daddy, do they raise political plums from seeds?"

Daddy (who never had one): "No, young man. Political plums are more often the result of a bit of clever grafting."

Clerk: "Mr. McPherson, how about buying the latest atlas?"

Mr. McPherson: "Not noo, mon; I'll wait until the affairs in Europe are more settled."

SLIGHT OF HAM

A big buck Indian had just ordered a ham sandwich at a drug counter and was peering between the slices of bread when he turned and said to the waiter: "Ugh, you slice 'em ham?"

The waiter replied: "Yes I sliced the ham."

"Ugh," grunted the Indian. "You damn near miss 'em."

Greatly agitated, a woman carrying an infant dashed into a drug store.

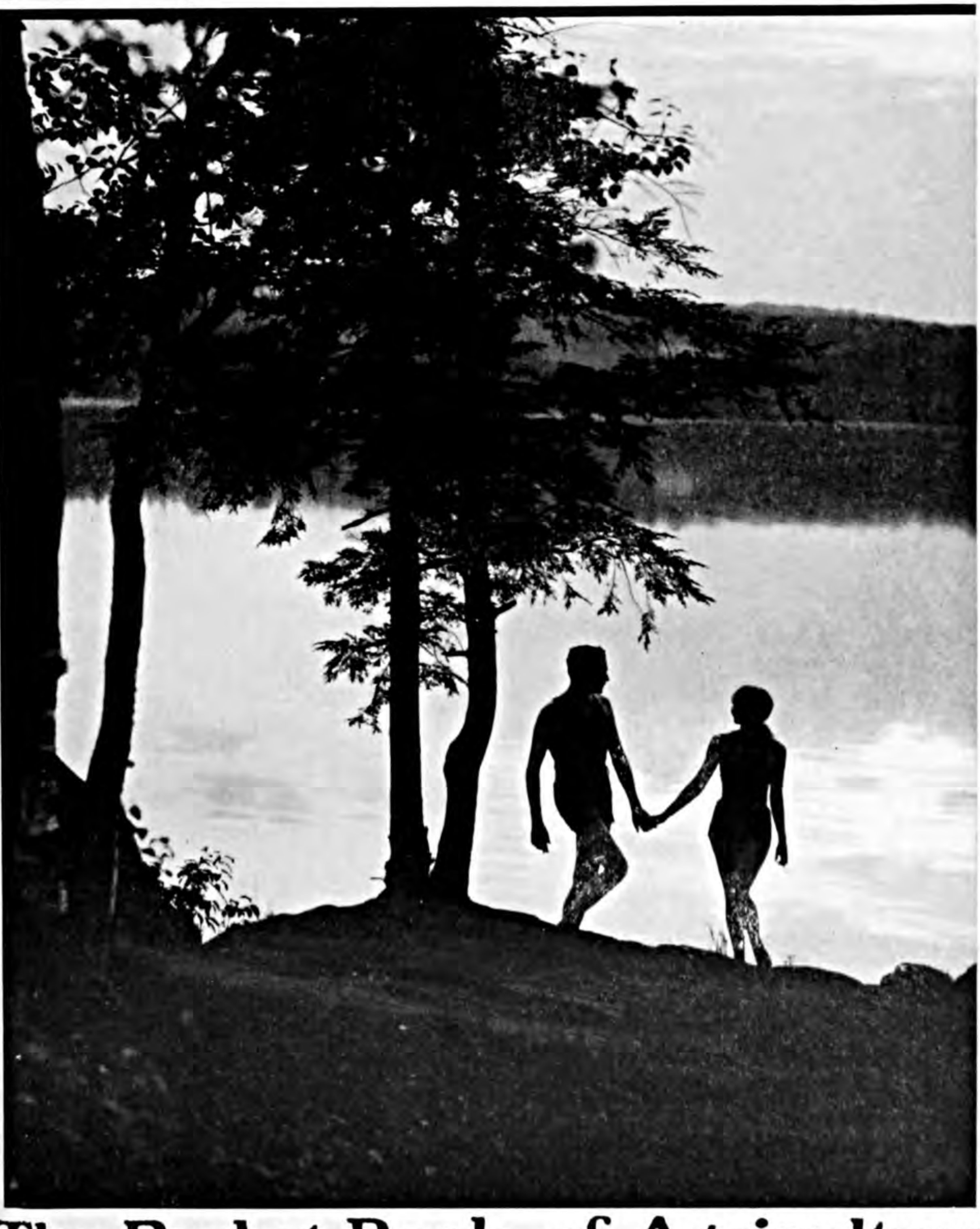
"My baby has swallowed a bullet," she cried. "What shall I do?"

"Give him the contents of this bottle of castor oil," replied the druggist calmly. "And then be sure you don't point him at anyone!"

Printed in U.S.A.

Better Crops WITH PLANT FOOD

June-July 1937 10 Cents



The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XXI NUMBER EIGHT

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American Potash Institute, Inc.

Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*

G. J. CALLISTER, *Vice-President and Secretary*

TIME OUT FOR A WELL-EARNED DRINK.

Better Crops with PLANT FOOD

PUBLISHED FOR THE AMERICAN POTASH INSTITUTE, INC., INVESTMENT BUILDING, WASHINGTON, D. C. SUBSCRIPTION, $1.00 FOR 12 ISSUES; 10c PER COPY.

VOL. XXI WASHINGTON, D. C., JUNE-JULY 1937 No. 8

Jeff goes up to bat for —

Alfalfa Athletics

Jeff McDermid

IF I AM elected to Congress before all the Government money gives out and before the taxpayers start a sit-down strike, my maiden speech will *not* be on economics. It will touch a new and refreshing viewpoint naturally expected of one who has harbored so many inspirations. I shall lift sundry buckets of rhetoric from the "well of the House" in favor of my bill to establish a new Federal corporate authority called the Rural Athletic Talent Syndicate (RATS).

Its object, as it will appear spread in the appendix of the Record (to make my constituents think I "spellbound" for two whole hours instead of five minutes), will be to underwrite and encourage, promote, foster, finance, and perpetuate the swatters and sweaters of rural athletic America, who by organization of a new alfalfa league will do much to keep pastures pleasant, cows contented, and enable their owners and chattel mortgagors to forget drought, hard times, and painful, soil-depleting regulations.

My bill will put the generous Government—or what is left of its generosity—squarely behind rural relaxation by giving the hay-shakers a free day weekly in the bleachers, always providing that milk be substituted for beer and that no oleo be used to butter the pop-corn; likewise, that the umpire shall not be one known to favor reciprocal agreements or putting women on the supreme court.

Precedent and reason dictate my choice of a fighting cause, and I am not so sure that taxpayers would complain much either. Most of them spend plenty for athletics now, and this scheme would give them a series ticket in exchange for their tax receipts—which is a blamed sight more than many of them get at present.

MOREOVER, the public appreciates that the bush league plowpushers have been the best bets for major scouts during the past 50 years of baseball, not to mention big Swedes from up-state forties who crashed down goal posts, and steam-shovel mat maulers who kept Iowa corn-huskers triumphant wrestling champs over eyegouging Greeks for two decades. The patient paying public knows that the talent is ready if Uncle Sam will furnish the tin to finance suits, seats, and sustenance. My bill is sure to bring in resolutions from every cross-roads post office, and the wires will be scorched plenty.

My second valid excuse for mentioning this grand and comprehensive plan well in advance of its adoption is the condition in which we find agriculture today. Consider, my friends, and then instruct your budding legislators to follow my flag in the pennant race and cast their votes for HR something-or-other.

What then is the situation in which we find the denuded and inundated dirt leaguers? Simply this: That returning prosperity, in the wage of an awkward wakefulness and since the preservation of the "round" dollar has caught the hog-callers off their guard in respect to callisthenics. Now that farming has become so automatic and mechanical with all these many gas gadgets and push-button arrangements, the ruralites must go in for personal athletics in order to get some exercise. The dyspeptic roll-top desker has nothing on them. Farm electricity saves steps but it slows up digestion. If we do not arouse them by Government subsidy into a sharp participation in everything lively short of enlisting in the Spanish war, they will join their old horses in a genuine case of azoturia.

Calli no longer decorate and distinguish the honest palms and rugged soles of our agriculturists. They are found in the seats of their pants. Instead of using so much lubrication grease to loosen the pitmans and tumbling rods of farm implements, let RATS be established to hire trainers to rub incense and lotions into the muscles of farm athletes, thereby saving on mineral oils and giving zest and joy to the populace on the benches.

THIS in turn suggests another reason for my propitious proposition. Bucolic audiences have so long been put into trances, comas, and dreams by wordy economists and plow-land planners that they have forgotten how to cuss an umpire, toss a pop bottle, or read a score card. That this is too un-American and unnatural for our tradition of carefree, country carelessness needs no proof. The great American emblem is the eagle, but lately we have made a shrine for the lugubrious owl. What we need is a bracer of the same kind that gave us Abe Lincoln, Ty Cobb, Billy Sunday, and Will Rogers. Weak-kneed solemnity and intellectual gymnastics won't take the place of fresh air and a little fun. We face a heck of a long time in the bone-yard but too short a space in the ball park!

Talent is begging for its chance to cavort. Put long-armed hay pitchers on the mound, deft pig catchers behind the plate or spraddling at short. and blue-streak dinner-bell responders running the bases for home!

Though Illinois has borne the sucker title lo these many years, we must hand it to them for their farm-bureau ball-league idea, now more popular than Father Devine in Harlem. This and the corn-husking extravaganza have lifted agriculture further from the slough of despondency than benefit payments and corn whisky. It would

take a mighty mean-minded customer to keep right on thinking of "parity" when the old ball game had got into 12 innings and two bozos were out with the bags full! If any trained seal among the select ones in Congress can think of slicker salve for a blistered bank account, let him speak out before roll call on my measure. Otherwise I'll have it under the President's nose for signature in a couple of shakes! Not even the histrionic ability of Senator Ashurst could block RATS when the story is all told.

MY plea is for keeping the best athletic brains on the ranch instead of letting them go to the city. Bob Feller is not the first young feller to jump from the farm to fame just by a talent for throwing something away. King of all the rubes who went from haystack to diamond was the Big Train, Walter Perry Johnson. He was the son of a Humboldt, Kans., farmer, and finally he was scouted by a Washington fan while he was smoking 'em over the pan at Weiser, Idaho. Walter cost the Nats only $250 and carfare! Five presidents tossed him the opening ball in Griffith Stadium. He played 807 games and had 3,949 strike-outs in 5,916 innings, with 110 absolute shutouts on his ledger. A few other farm marvels might be added, including old Cy Young, of Boston; Rube Waddell, the eccentric south-paw; Christy Mathewson, with 83 shut-outs in 17 years, and the universal favorite, Grover Cleveland Alexander.

WE need more of the play spirit in agriculture, because the traditions to date have been much the opposite. My forebears at any rate were too engrossed with weeds and warpaths to mind much about sports, although if I inherit all the zest of an uncle or two of mine when bears were plentiful, I must have real hidden talents for the track. There were of course certain moments of relaxation, which history hates to admit in recitals of the prowess and backwoods statecraft of the departed generations.

It is claimed that in colonial times the Dutch played ball with a lopsided sphere stuffed with horsehair. There was no limit to the number of players or the amount of liquid refreshments, and to retire a base runner it was needful to swipe him with the ball on some portion of his anatomy that would halt him dead and put him out in more ways than one. This was tamer sport, however, than the burghers enjoyed in the times of Peter Stuyvesant. For then clubbing the cat and pulling the goose were leading outdoor pastimes. The feline was knocked out of a loosely staved cask, and the goose with greased head was yanked off the ground by contesting horsemen who leaned over and tackled the bird at the neck in passing. If the Dutchmen had visioned the shining mark destined for umpires and referees they would have abandoned the cat and goose games as mild imitations.

Baseball had a country birth in its

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Fertilizer Response On Colby Silt Loam

By F. L. Musbach

Marshfield Experiment Station, Wisconsin College of Agriculture, Madison, Wisconsin

THE Colby silt loam occupies an area of nearly 5,000 square miles in central Wisconsin. This important soil type embraces the largest area of generally uniform soil found perhaps anywhere in the United States. The basic material constituting the soil mass is granite, which underlies the region. The entire area has been worked over by old drift sheets, and part of it by more recent ice sheets which at one time covered much of the state.

Because of the material involved in its origin the supply of potassium is relatively high, ranging from 35,000 to 40,000 pounds per acre to a depth of 8 inches. The phosphorus content averages 1,200 to 1,500 pounds. Since neither the parent material nor the drift contained lime carbonate, the soil is acid ranging from a pH of 5.0 to 5.5.

Natural Grass Country

Texturally the soil is largely silt loam, comprised of 60 to 70 per cent silt, 10 to 12 per cent clay, and the balance of various sized sand fractions. The subsoil is a mottled, silty, clay loam rather impervious to movement of water.

Because of the texture and the tight subsoil, the region is considered a natural grass country. In the early years clovers made excellent yields. With increasing age a gradual change has occurred in the soil, making it more difficult to maintain stands of these legumes. Alfalfa is not a dependable crop even when the acidity has been reduced and the mineral requirements satisfied.

The Marshfield Experiment Station was established in this area and researches on soils and crops have been carried on intensively. The station farm has been under crop not to exceed 40 years, and much of it less than a quarter of a century. Throughout the Colby area the income on farms has come from the livestock enterprise, yet under this system of farming, in a relatively short period marked soil deficiencies have manifested themselves. The result is noticeable in the stand of forage, particularly legumes, and in the yield and quality of grain crops produced. Clover failures are usually attributed to changing weather conditions, but as a matter of fact these failures are due more often to the need of available plant food—lime, phosphorus, and potash.

Some work herein reported is of interest in connection with crop response to various fertilizer treatments. The field upon which these plots are laid out has been under plow approximately 30 years. The entire field was limed at the rate of 4 tons per acre during the past 8 to 10 years. The rotation originally was alfalfa 2 years, corn, and barley. Due to the uncertainty of alfalfa the seeding mixture now consists of 4 pounds of timothy and 10 pounds of alfalfa. All of the plots (in quadruplicate) received a

TABLE NO. 1.—CROP YIELDS WITH USE OF VARIOUS FERTILIZER MIXTURES

No.	Fertilizer treatment	Barley Grain, bu.	Barley Straw, lbs.	1st yr. hay, lbs.	2nd yr. hay, lbs.	Corn Grain, bu.	Corn Stover, lbs.	Fertilizer cost
1	Control	22.61	2,156	4,861	4,008	45.81	2,320	....
2	250# 0-20-0	28.30	2,180	5,230	4,421	47.58	2,542	$3.18
3	250# 0-20-10	31.36	2,294	5,470	4,669	51.61	2,552	5.01
4	250# 0-20-20	32.91	2,445	5,580	4,860	51.90	2,645	6.24
5	250# 2-20-10	32.15	2,364	5,557	4,718	51.30	2,696	5.47
6	250# 0-20-20 on 1st. Yr. Hay	24.48	2,251	5,776	4,596	52.05	2,677	6.24
7	600# Rock Phos.	25.30	2,218	5,084	4,430	50.35	2,359	5.18
8	600# Rock Phos. 100# Mur. Potash	28.19	2,459	5,374	4,818	50.23	2,241	7.43
9	111# 0-45-0	28.97	2,277	5,091	4,415	50.38	2,692	3.03
10	111# 0-45-0 and 150# Gypsum	28.61	2,240	5,214	4,233	50.38	2,515	4.30

uniform manure treatment of 8 tons per acre, and 125 pounds of 0-16-4 in the hill for the corn crop. The various commercials shown in the table are applied on the barley crop with one exception, and that is where the first-year hay crop receives the treatment. In table 1 the yields for the various crops are indicated. The barley yields are for an average of 5 years, and each of the other crops for a 2-year period.

It will be noted that each of the different treatments resulted in increased yields, but that considerable variations in yields are secured depending upon the composition of the fertilizer and the crop to which applied.

In order to examine more conveniently the value of crop response, table 2 has been prepared giving the total value of the four crops, and also segregating the increased values of each of the four crops. Corn is valued at 75c per bushel; stover at $4.00 per ton; barley at 75c per bushel; straw at $3.00 per ton; and alfalfa-timothy hay at $12.00 per ton. The control receiving no commercials produced crops having a total value of $115.65. The application of 250 pounds of 0-20-0 gave a value of $126.42 or an increase of $10.77 over the control. Of this $10.77 representing the increase over the control, the barley crop is responsible for $4.33; the two hay crops, $4.69; and the corn crop, $1.75.

The response to various phosphorus carriers is interesting. As will be noted, phosphorus is derived from the

The barley on the left was fertilized with 250 lbs. of an 0-20-10 per acre and yielded 34.1 bushels. On the right where no fertilizer was used the yield was only 18.3 bushels per acre.

soluble 20 per cent, and 45 per cent superphosphates, and the less easily soluble rock phosphate. The latter is used at the rate of 600 pounds per acre, the soluble phosphate at the rate of 250 pounds of the 0-20-0, and the equivalent in phosphoric acid where the 0-45-0 is employed. Because of the calcium sulphate contained in the 0-20-0, one set of plots is included in which 150 pounds of gypsum are added to the 0-45-0.

As indicated, the soluble phosphate gave an increased value of $4.00 to $5.00, whereas the rock phosphate returned somewhat better than $2.00 for the barley crop. In the case of hay the residual effect shows less differences though on the average somewhat better results were obtained with the soluble carriers than with the finely ground rock.

While the various phosphorus carriers have been used at a profit in all instances, yet it appears that phosphorus used alone is insufficient to produce the maximum benefit. This is brought out clearly where potash has been included in the 0-20-10 and in the 0-20-20, also where muriate of potash supplements rock phosphate. In the latter case the same amount of K_2O was added as is contained in 250 pounds of the 0-20-20. In the case of the 0-20-10 the value of the increase of the four crops over the control plot is $19.38, and stepping up the potash to 20 per cent secured the largest increase, $23.23. Again the potash effects may be studied in comparing the rock phosphate treatment with that where the same amount of rock phosphate was supplemented with 100 pounds of muriate of potash. The increase for rock phosphate alone is $9.54 as compared with $16.16 for the rock phosphate-potash plot.

The benefits of nitrogen are brought out in the comparison—the 0-20-10 with the 2-20-10 both applied at the same rate. The total value of the increase for 2-20-10 is $21.07 as against $19.38 for the fertilizer without nitrogen. Nitrogen apparently has been of benefit not only for the barley but also the hay crops.

One other plot is included in which 0-20-20 is applied on the first-year hay instead of on the grain crop. The value of the increase is $16.08 as compared to $23.22 where the same fertilizer is applied on the barley crop. The increase in the first-year hay is $5.49 as compared to $4.31 for the 0-20-20 applied on the barley. The grain crop coming the fourth year later shows very little effect of the

(*Turn to page* 44)

TABLE NO. 2.—TOTAL VALUE OF CROPS AND OF INCREASES DUE TO VARIOUS FERTILIZER MIXTURES

No.	Fertilizer treatment	Value of crops: Barley	1st year hay	2nd year hay	Corn	Total	Total value of increase over control	Value of increase secured by each of the four crops: Barley	1st year hay	2nd year hay	Corn
1	Control	23.43	29.17	24.05	39.00	115.65	....	...	...	...	...
2	250# 0-20-0.......	27.76	31.38	26.53	40.75	126.42	10.77	4.33	2.21	2.48	1.75
3	250# 0-20-10......	30.40	32.82	28.01	43.80	135.03	19.38	6.97	3.65	3.96	4.80
4	250# 0-20-20......	32.01	33.48	29.16	44.22	138.87	23.22	8.58	4.31	5.11	5.22
5	250# 2-20-10......	31.20	33.34	28.31	43.87	136.72	21.07	7.77	4.17	4.26	4.87
6	250# 0-20-20 on 1st yr. hay	25.11	34.66	27.57	44.39	131.73	16.08	1.68	5.49	3.52	5.39
7	600# Rock Phos...	25.63	30.50	26.58	42.48	125.19	9.54	2.20	1.33	2.53	3.48
8	600# Rock Phos. 100# Mur. Potash.	28.51	32.24	28.91	42.15	131.81	16.16	5.08	3.07	4.86	3.15
9	111# 0.45-0.......	28.56	30.54	26.49	43.17	128.76	13.11	5.13	1.37	2.44	4.17
10	111# 0-45-0 and 150# Gypsum.....	28.18	31.28	25.40	42.82	127.68	12.03	4.75	2.11	1.35	3.82

The pines planted on this badly eroded slope in southeastern Ohio need help such as locusts, lespedeza, and other legumes could give to accomplish erosion control and restore the slope to production.

Controlling Soil Erosion In Northern States

By A. F. Gustafson

Professor of Soil Technology, New York State College of Agriculture, Ithaca, New York

DURING the centuries before the white man came to America the soil was protected by vegetation. In parts of the Midwest and on the Great Plains the soil was held in place by prairie grasses and by trees along some of the larger streams. In the East the forest with its litter-covered floor prevented soil erosion. In these forested areas bottom lands were covered originally with trees. This suggests that the alluvial soil was deposited in its present position before the adjacent uplands attained vegetative protection.

Soil erosion as a serious present-day problem dates from a time shortly after the pioneer destroyed the protecting vegetative cover. Burning it in preparing the land for cropping exposed the soil to the action of wind and water. In the early days land that is now regarded as too steep for cropping was needed for food production. Immediately after clearing, these steep slopes produced good yields of wheat; but as the original organic matter decomposed and disappeared, and as readily available plant nutrients were used up, crops failed to protect the soil from washing.

Rich topsoil is being lost by erosion from highly productive lands more rapidly than is generally appreciated. Spring dust storms are becoming an almost annual affair. The work of the wind is more spectacular than that of water, yet the latter is highly destructive. Moderately steep slopes planted to corn, potatoes, and beans have lost 50 tons of soil from an acre in 1 year. Since an acre-7-inches of soil weighs 1,000 tons, all of the topsoil may be lost while growing 20 such cultivated crops. If a 4-year rotation is followed and if there is but slight loss of soil during the other 3 years, all of the surface soil may be lost in 75 to 100 years. Such loss has occurred over large areas in the older sections.

Leaving grass in the waterways on this slope helps materially in preventing gully formation. Wider strips of grass would be even more effective.

Damage from Water

This type of loss, known as sheet erosion, is often unnoticed until, as in the Midwest, the "clay points" that have lost their dark colored surface soil appear. On timber soils poor, thin growth of crops and low yields result from loss of surface soil by sheetwashing. Even gentle slopes lose much surface soil during spring thaws and heavy summer rains.

Sheet erosion is less noticeable than gully erosion which results principally from extremely heavy rainfall, sometimes for only brief periods. Two inches or more of rain falling in half an hour are not unusual in many sections. Very few soils can absorb so much water in so short a time; much of it therefore runs off and carries surface soil away with it.

Heavy short-duration rains cause the most serious damage when they fall on loose, tilled soil or on soil already full of water from previous rains. Every effort should be made to bring about absorption of rain water by the soil. Once water leaves the land on which it fell, it becomes a public problem. Good farm land is ruined by sheet washing and gullying. Good valley land is ruined by a covering of gravel and stones washed from uplands; road and railroad bridges and embankments are washed out; and cities and crops on valley lands are damaged or ruined by flood waters.

Many acres of hilly land have been washed so badly during recent years that forest production is their best use during the next few generations. Rolling soils of somewhat higher productivity, especially if they contain some lime, can produce good returns as pasture. In the East the use of phosphorus, and sometimes lime and potash too, accompanied by proper management, produces profitable returns on these lands. A thrifty pasture sward protects the soil against all forms of erosion.

Methods of Control

Moderate slopes may be cultivated safely if recognized soil erosion control methods are practiced. Among these are:

1. Maintaining the supply of active organic matter in the soil by turning under farmyard manure, crop residues, and green manures.

2. Keeping up the productivity of the soil by using lime as needed for legumes and other crops and by using phosphorus, and potash and nitrogen, too, if economical.

Adding phosphorus where deficient is essential for the production of good yields and equally important for the development of large root systems of all crops and of a thick stand of grains, clover, and hay grasses, and a dense pasture sward. Fibrous root systems hold soil against erosion, and a dense cover of grasses protects the soil from the beating of raindrops. Thus vegetation holds the soil against both wind and rain.

Small grains, clovers, and pasture and meadow grasses bring about the absorption of much rain water, consequently less runs away from land thus protected. Experimental work has shown that little soil is lost from thrifty meadows and pastures even on rather steep slopes.

3. Plowing for, and planting and cultivating cabbage, cauliflower, potatoes, cotton, sorghums, corn, and other intertilled crops, and seeding millet, Sudan grass, oats, barley, and wheat on the contour is good practice. The crop rows, as well as the ridges made by implements, hold water against run-off and consequently, the soil against erosion.

4. Building broad-base terraces which are virutally wide, flat-bottomed, diversion ditches is useful on the more moderate slopes where safe outlets may be developed. This, however, is often difficult on long, steep slopes. In the South, and more recently in the Midwest, terraces have attained well-deserved popularity.

5. Cropping in contour strips avoids the erosion that occurs during heavy rains on long slopes plowed and planted up and down hill to a clean-cultivated crop, which is done all too often in many sections. Moreover, contour tillage saves power.

The proper width of strip depends on the length and steepness of slope, type of rainfall, size of the concentration area from which water comes down over the slope, rate of absorption of water by the soil, its water-holding power, and the proportion of slope plowed and planted to intertilled crops at one time. On soils that take up water reasonably well, strips may safely be considerably wider than on tight, clay soils. On slopes of 5 per cent the strips may be fairly wide, but they must be much narrower on slopes steeper than 15 per cent. Growing corn, potatoes, buckwheat, cabbage, beans, or other erosive crops on long slopes steeper than 20 per cent is seldom feasible, particularly on imperfectly or poorly drained soils, because the strips must be too narrow for economical operation. Not more than one-half, and better still, one-fourth of the slope should be plowed at one time.

Water-laid soils wash so easily that slopes of 2 to 5 per cent need as careful protection as do much steeper slopes on glacial or stony soils like those prevailing in the Northeast. Recommending exact widths of strips for various conditions must await the results of further experimental work.

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Replace Plant Food Losses in Crops

By H. L. Garrard

Lafayette, Indiana

"THAT soil won't grow good corn, so I've been growing soybeans for hay for the last four years." This was part of the explanation received when I asked G. Wooldridge, near Lowell, Ind., what made the uneven growth of soybeans, as shown in Fig. 1. I could see that the field would not grow good soybeans either, except in spots. These regularly spaced spots of tall green soybeans amidst yellowish, stunted plants showing symptoms of potash-starvation had aroused my curiosity. I wanted to know what caused their growth. The soil was a black sandy loam, high in lime and low in available potash.

In 1935 Mr. Wooldridge cut his soybean hay and put it in shocks to cure. His barn was full, so he decided to feed the hay from the field during the fall. However, heavy snows came before the hay was fed out, and it became badly weathered. Several rows of shocks were still on the south end of the field when he started to plow the next spring. He scattered out some of the shocks so they could be turned under and the remainder were burned in place.

Starved for Potash

The vigorous green soybeans were growing as a result of potash leached from the shocks of soybean hay. We could not tell where the shocks had been burned and where they had been plowed under. Most of the potash in all plants can be leached out with water as soon as the plants are dead.

Outside of these small green spots, the remainder of the soybeans on this alkaline, black sandy soil were starving for potash, as indicated by leaf symptoms (Fig. 3). No potash fertilizers had been tried on this field.

Fig. 1—Tall green soybeans grew on spots where potash had leached from soybean hay shocks the year previous. The rest were stunted, yellowish, potash-starved. G. Wooldridge farm, Lowell, Indiana.

Another instance of the residual effects of the potash in soybeans plowed under was noted on the farm of W. K. Powers, Duncombe, Iowa. In the dry season of 1934, Mr. Powers turned under a rather poor crop of soybeans in compliance with his AAA contract. The photograph of his corn field (Fig. 2) taken July 11, 1936, shows the residual effects of potash from the soybean crop two years previous. This soil also was low in available potash, and the corn on the left showed typical symptoms of potash-starvation.

Surprising Losses

The beneficial effects from crops plowed down have been widely noted. Growers should expect a corresponding reduction in fertility when these crops are removed from the soil, yet most of them do not realize (1) just how much plant food is actually required by crops, especially the legumes, and (2) how much is lost from the soil when crops are harvested. These are very important considerations from the soil conservation standpoint. The soil-improving values of legumes depend entirely on whether they are plowed down as green manures, or cut for hay. Legumes are usually considered as soil-conserving crops even though cut for hay, because inoculated legumes do add to, or at least conserve, the nitrogen and organic matter supply in the soil. However, the losses of phosphates and potash in alfalfa, clover, and soybean hay crops are surprisingly great.

To present the picture of actual plant-food losses in crops and the theoretical amounts of fertilizer equal to the amounts of minerals contained in the different crops the accompanying table has been arranged. Ordinary yields of crops, with the pounds of phosphoric acid and potash contained, and an amount of phosphate-potash fertilizer necessary to equal the plant food in each crop are given.

From this table it will be noted that most crops require from 2 to 5 times as much potash as phosphate. The legumes take a greater proportion of potash than the grain crops. Truck crops, especially those grown on muck soils where large yields are possible, require large amounts of these mineral plant foods.

The fertilizer recommendations for muck and peat soils follow closely the approximate plant-food ratios as indicated by the plant-food removals. Although the plant-food removal ratios would remain somewhat the same on heavier silt loam or clay soils, a relatively greater proportion of phosphate is usually advised. These variations in fertilizer recommendations seem more logical when certain differences in the chemical nature of the two types of soil are considered: (1) there is less total potash in peat or muck soils; (2) much of the potash in peat soils is easily soluble, while in heavy silt loam soils the greater potash reserve is in a form which becomes available more slowly; and (3) many silt loam soils are lower in available phosphates. Fertilizer recommendations should be based upon two factors, the plant-food needs of the individual crop, and the supply of the nutrients available in any particular soil at the time.

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Fig. 2—Note the contrast between the potash-starved corn on the left and the corn on the right which shows the residual effects of a soybean crop plowed under 2 years before. W. K. Powers farm, Duncombe, Iowa.

Circle M Ranch Makes A Profitable Comeback

By F. J. Hurst

Extension Editor, Mississippi State College, State College, Mississippi

SCIENTIFIC surveys of the soil to determine its qualities and deficiencies and field plant-feeding tests to ascertain crop-food requirements seem destined to play a more important role in farming in the future. Such steps might have done much to prevent many of the tragic failures in farming in the past.

The story of how Circle M Ranch, a 14,000-acre plantation in eastern Noxubee County, Mississippi, under new ownership and competent management, in a few short years has been brought back from bankruptcy to a status of profitable farming and better living for the 700 people who live on it, is a striking illustration of the value of putting science to work in a practical way on the farm.

Lute Minor, manager of Circle M Ranch.

"Fifteen years ago no one in the community thought cotton could be produced profitably on the plantation," Lute Minor, the alert and keenly observant manager, told County Agent Bode Hughes and me on a recent visit to the famous ranch.

"Yields averaged only a little over 200 pounds of seed cotton per acre. Corn on much of the land would grow up about waist high and fall over. Continued efforts to grow crops successfully failed, and the plantation changed hands," Mr. Minor said.

Although the new owners purchased the plantation primarily as a game preserve and hunting reservation, they were keenly interested in good farming. As successful business men they were not accustomed to losing money on so large an investment, so they determined to make the plantation at least pay its way, and if possible return a profit.

Realizing that if they were to succeed their first problem was to discover the cause of the abnormally low crop yields, the new owners made arrangements with the state experiment station of Mississippi State College to make a soil survey of the farm and to conduct fertilizer tests with cotton.

A large portion of the soil on the ranch is fine sandy loam, a small portion is red clay loam, and a consider-

Quail production is an important part of the farm program, and 40 individual laying houses have been built.

able area is known locally as glade land. The fertilizer tests revealed that the soils were deficient in the essential plant-food elements, and the glade land particularly was highly responsive to liberal applications of potash.

In the three tests with cotton in 1929 and 1930, the experiment station found that an application of 600 pounds of a 6-8-4 fertilizer per acre gave an average increase for the 2 years of 454 pounds of seed cotton per acre on fine sandy loam and 441 pounds per acre on red clay loam.

Needed Complete Fertilizer

The station in bulletin 289 stated that the results indicated that nitrogen, phosphorus, and potash were needed on the soil, and that a 6-8-4 was a good analysis. The test showed, the report said, that 600 pounds were more profitable than 300 pounds or 900 pounds.

In the test on sandy glade land, the station reported that the yield without fertilizer was only 219 pounds of seed cotton per acre. On this land 600 pounds of an 0-8-8 gave best results with an increase of 490 pounds of seed cotton per acre and an added profit of $23.44 per acre. The station reported that potash was profitable on this type of soil up to 48 pounds per acre.

Discovering the need of a complete fertilizer high in potash, Mr. Minor has gradually increased the amount of fertilizer used each year. In 1936 he applied 400 pounds of 6-6-8 on his tenants' crops, totalling 1,500 acres in cotton. He harvested ¾ of a bale per acre from 1,500 acres. On 80 acres of "wages crop" he used 600 pounds of 6-6-8 per acre and harvested 80 bales of cotton from the 80 acres and estimated that about 4 or 5 bales were lost due to late picking.

Mr. Minor attributed the increased yield of a quarter bale per acre on his wages crop to the 200-pound per acre higher application of fertilizer, because he always cultivated his tenants' cotton first and also harvested their crop first.

This year 1,800 acres have been planted to cotton, all fertilized with 500 pounds of 6-6-8 per acre except 10 acres, which were fertilized with 400 pounds of 6-6-15 per acre.

But Mr. Minor does not believe in fertilizer alone. He says that fertilizer will not serve as a substitute for poor stands and good cultivation. He

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Weeds Are "Sissies"— Treat Them as Such

By E. B. Swingle

Publications Department, Michigan State College, East Lansing, Michigan

WEEDS are like humans. For crop pests have peculiar weaknesses just as they have strong points.

On that basis a study by Dr. S. T. Dexter, research associate in farm crops at Michigan State College, has enabled him to hang the label of "sissy" on some of the worst weeds that bother Michigan farmers. So far this list includes quack grass, Canada thistles, and the bindweeds.

Dexter has an inquiring mind that lends itself to the type of experimentation that is considered of service to agriculture. In some of the work he is now conducting, his logic is proving out in field results.

He started on the assumption that weeds were taken too much for granted, or else were attacked with vigor instead of science on the average farm. Experiments for many years have brought out processes and other means of obtaining better yields of desirable crops. Why not study weeds to find out what they like and what they do not like, and then give them the latter?

So Dexter began with quack grass. Projects were started in field tests. One of the first was on a badly infested field usually used for potato production on the college experiment station farm at Lake City. The weed was so firmly entrenched that the field was more like a meadow. Certainly it was a good place to make a test, for results would show up if they were obtained.

With quack grass the reasoning employed was that perhaps the weed could be fooled with fertilizer. An application of fertilizer would certainly stimulate quack, because on the typically light and shallow soil the roots lie close enough to the surface to soak up plant food and any available moisture.

In the spring of 1935 the work began, and results have just been summarized, for it was a project that

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"Where there's no life to rhizomes there'll be no quack," says Dr. S. T. Dexter. He is examining quack grass rhizomes after a sprouting test in a germinator. Those which have had more fertilizer and contain more nitrogen sprout vigorously and then rot, while normal roots continue sprouting and are less susceptible to freezing damage.

The Role of Potash In California Soils

By M. E. McCollam

San Jose, California

TO UNDERSTAND the relation of potash to California soils it will be helpful to set down certain statements which are becoming substantiated in fact, as research progresses.

Although many of our soil types are characterized by present supplies of available potash which appear sufficient for most crops, there are also a great many of our soils which either already have, or are approaching, low levels of available potash. The wide variation which apparently exists in this level of available potash makes impossible any sweeping disposition of the subject of potash in the form of positive or negative recommendations of potash fertilizer for the state as a whole.

Aside from the variation in actual content of available potash in our soils, there exists a variation in the ability of soils to supply potash to the growing plant over a period of time. Some soils which show a rather high test for available potash in the initial years of an intensive cropping program, may become exhausted of potash over a relatively short period of years. Other soils which show much lower readings for potash may be capable of supplying their potash over a long period of intensive cropping at a rate sufficient to maintain a satisfactory production of crops of certain kinds.

In addition to these potash relations another must be considered also. This is the characteristic possessed by some soils which we call the power to fix potash. Again, our soils vary in this characteristic, and the problem of method of applying potash so as to obtain a response becomes a serious consideration on soils of high fixing power, whereas potash response is much more readily obtained on soils of low fixing power.

In pursuing a program of potash research in California, it was thought very desirable to obtain information of a systematic nature on the available potash content of the soils. A great deal of excellent work has been done in the state on physical classification of soils, but there is no comparable volume of data on the chemical nature of soils, including existing levels of available potash.

Determining Availability

During the last few years a cooperative project with the University of California has enabled us to conduct soil sampling and soil testing operations in a number of crop areas. The magnitude which it is possible for this investigation to assume can be realized when we think of the number of soil types in the state. As mapped at the present time about 264 separate Soil Series exist. Within these series are hundreds more of the various soil types, such as sandy loams, gravelly loam, clays, etc., as classified under each soil series.

At least, a start has been made on this work of sampling and testing. The Neubauer test has been chosen and used as the best method for arriving at the available potash content of a soil. As far as the work has progressed in several crop areas of the state, we can say that a wide variation exists in potash content, and many low readings for potash have been found. Before giving some examples of the range in the readings obtained, it may be helpful to mention the minimum potash requirements of several crops as determined by Neubauer, for the sake of comparison with potash readings obtained in California soils.

NEUBAUER LIMIT VALUES

	Mgs. K_2O per 100 gms. soil
Rye	17
Wheat	20
Barley	24
Sugar beets	25
Alfalfa	35
Potatoes	37

The following tabulation shows the range in potash readings obtained in the first foot of soil in various locations:

RANGE OF NEUBAUER POTASH READINGS CALIFORNIA SOILS

Locality	High reading—mgs. K_2O per 100 gms. 1st foot	Low reading—mgs. K_2O per 100 gms. 1st foot
Hollister area	32	10
Napa—Sonoma area	57	1
Santa Clara Valley area	43	3
Salinas—Watsonville area	46	7
Livermore area	64	14
Oakdale (San Joaquin Valley)	17	4
Chico (Sacramento Valley)	55	8
Southern California (Scattered locations)	49	16

The possibility has been considered that we may be able to work out a correlation between the classified soil type and its available potash content. For instance, it may be possible to say in a general way that our Yolo silt loam soils are well supplied with potash while our Rincon loam soils have a low level of potash. We have not gone far enough with the potash survey to find this out, but there have been enough samples taken on several types to say that there seems to be a trend in some cases. The Yolo silt loam and silty clay loam soils appear with few exceptions in the high and medium potash soil groups. The same is true of Salinas silty clay loam, Metz silty clay loam, and Bale loam. Rincon loam soils appear most frequently in the low potash soil group, as do Goldridge fine sandy loam, Pinole loam, and Farwell loam soils.

That there will be a strong correlation between classified soil type and potash content is very doubtful. It is quite reasonable to expect numerous examples of Bale loams, for instance, showing a low potash level due to exhaustive cropping practices, and there may also be numerous instances of Rincon loam showing a good level of potash due to good soil management practices. With a greater volume of soil sampling and testing we may, however, be able to assign some degree of significance, as far as available potash is concerned, to the physical soil type as classified.

As we are able to expand this soil sampling and Neubauer testing program to other crop areas in California, it appears likely that many other soils will be found which show low readings for available potassium. It also appears likely that more or less extensive local areas of low-potassium soils may be found, such as already exist in the Northern Sacramento Valley, Sonoma Valley, and Santa Clara Valley.

From the standpoint of the potential use of potash fertilizer in California it is of interest that we have found low potash readings in each of the several areas in which work has been done thus far. A brief list of some of the

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High Potash Fertilizers Grow Better Tomatoes

By L. M. Youngblood

County Agent, Vernon County, Indiana

IN ORDER to overcome a deficiency both in yield and quality of canning tomatoes produced on the light-colored slash or silt loam soil of southern Indiana, a definite study of plant-food needs of tomatoes grown on this type of soil was begun in 1931 by County Agent L. M. Youngblood of Jennings County. This type of soil is used largely for tomato productions throughout southern Indiana, because of its great capacity for holding moisture. Results of the study show that greatest profits from growing tomatoes on this soil depend upon the proper amount of potash in the fertilizer used.

At the time this work was started there were at least three things that greatly bothered both the tomato raiser and the canning factories. Tomatoes were ripening very slowly and would not color up uniformly, remaining green around the stem. In addition to this slow ripening, which left a large tonnage of tomatoes in the patch after frost, there were both lateral and vertical cracking around the stem. When the canner trimmed off the green and cracked core around the stem, at least one-fourth of the tomato was gone, and the remainder was not the solid, red, ripe type of tomato that weighed heavy for the farmer or made a quality pack for the canner.

In 1931 4-H Club boys were given various amounts of nitrate of soda, superphosphate, and potash in an effort to see just where the plant-food

The tomatoes on the left received 300 lbs. of 2-8-16 per acre and ripened a deep red evenly up to the stem with practically no cracking. Those on the right received the same amount of 2-16-8 and never got very red, retaining a hard, green core around the stem and cracking badly.

deficiency occurred with the tomato crop. Where the soil was in good enough condition to produce profitable crops of any kind, there was no very noticeable effect in increasing the amount of nitrate of soda or phosphate above the amount normally used in the 2-12-6 fertilizer commonly recommended for tomatoes. However, there was a very noticeable increase in the vigor of the plant and in the yield and quality of the tomatoes where extra potash was added. For example,

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Plant Sudan Grass In Emergencies

By E. N. Bressman

United States Department of Agriculture

FOR July and August the cheapest feed that the average farmer in most regions, except the Far North, can grow is Sudan grass, the annual grass-type sorghum. This crop, a stranger until a quarter of a century ago, when it was introduced from Sudan in north central Africa, was fairly slow in becoming recognized in most farming areas. The very dry years, 1934 and 1936, directed wide attention to the valuable drought-resistant characteristics of Sudan grass, and many farmers who formerly looked upon it as a freak crop now know that it is a reliable crop with many advantages that greatly outweigh its shortcomings.

A Fast Growing Feed

Doubtless, the chief value of this grass lies in its ability to grow rapidly in the hot months when other forage crops languish. It does not make "June in January," but it does make spring pasture in the summer. In addition, when established, it smothers weeds, does not require expensive cultivation, may be used for either pasture or a hay equivalent to the well-known and highly-esteemed timothy. It must be admitted, however, that Sudan grass hay is coarse, as is any crop that will attain a height of 5 or 6 feet within a few months and produce from 2 to 4 tons of hay. The plant stools greatly and is leafy. This offsets the coarseness of the stems. Most growers, however, will be surprised to know that its feeding value is at least equal to that of timothy and is considered by some experts to be even greater.

Adapted to Warm Weather

Sudan grass is a crop that formerly grew in semi-tropical regions. It is adapted, therefore, to the warmest growing conditions prevailing in our general farming areas. Like soybeans, it requires just about the same conditions as corn. Sudan grass, however, and this is important, must not be planted until about 2 weeks after corn-planting time. In Iowa it has been found that best results are obtained when it is seeded from the last of May to the middle of June. In some cases it may be planted even later than the middle of June, but yields fall off rapidly, and late plantings are advisable only under emergency conditions.

Right now the two chief emergency crops are soybeans and Sudan grass. In many ways Sudan grass is superior, since it is cheaper, requires only a fairly well-prepared seed bed, grows more rapidly, is equally valuable for pasture and hay, does not cause bloat, fights weeds better, can be planted over a wider period, and—of real importance—it requires no cultivation. One of the chief limitations of Sudan grass, however, is that chinch bugs attack it readily. It is not, therefore, a good substitute or emergency crop to take the place of corn damaged by the first brood of chinch bugs.

Sudan grass is not a soil improver, and in this respect is inferior to soybeans. It is not a legume and cannot, of course, be compared with good legume crops, such as alfalfa and clover. This, however, is a small matter when an emergency crop must be grown. Often, the important thing is to get any kind of hay or pasture, however coarse, to carry livestock through the hot summer months. Sudan grass has an extensive fibrous root system, and once established it withstands long hot periods and quickly revives after rains. The root system of the sorghums is much greater than that of corn and is claimed to be more efficient in getting nutrients and moisture from the soil. Also, Sudan grass has the ability to become somewhat dormant in periods of drought, and then revive with the rains.

Ordinarily, Sudan grass is planted at the rate of from 20 to 25 pounds per acre, regardless of what use is to be made of the crop. Seed is usually cheap, less than 10 cents a pound, so that the cost per acre for seed is comparatively low. Usually, an ordinary grain drill is used for seeding. Most drills can be set for "2 pecks on the wheat side" for seeding Sudan grass. It can be broadcast and covered lightly with a harrow.

Develops Sturdy Roots

Sudan grass grows slowly at first, for it establishes a strong root system before making much top growth. This is the only time that Sudan grass does not compete well with weeds. A seed bed free of weeds, then, is advantageous in getting the crop off to a good start. Like other grasses, Sudan grass needs to be seeded only deep enough to enable it to get in contact with moisture—1 or 2 inches is sufficient. The use of cold, wet soils should be avoided; otherwise, ordinary soils are satisfactory. It is well known that the sorghums are adapted to a wider range of soils than are corn and other leading crops. Lime is rarely needed, but 200 or 300 pounds of superphosphate per acre are often helpful. The only time that Sudan grass needs much moisture is when it is getting started. It often fails, therefore, when planted after the harvest of a crop like oats taken off early. Under these conditions, its success usually depends upon proper moisture conditions.

Can Be Combined

Only rarely is it of value to mix plantings of crops, with the exception, of course, of permanent pastures. Some growers have mixed soybeans and Sudan grass to produce a hay of higher value, due to the legume. When used as a combination crop, these should be drilled together, the grass seed attachment of the drill being used for the Sudan grass. The combination is usually about half-and-half.

Due to its extraordinarily rapid growth, Sudan grass often may be pastured within a month after seeding, and it is not unusual for it to grow a foot or more in from 4 to 6 weeks' time. After the crop is established and has grown to a height of 12 or 15 inches, it should be pastured fairly heavily. Livestock do not like the coarse plants that develop when it is not heavily pastured. Or course, resting the crop by rotating pastures is helpful to Sudan grass as well as to other pasture crops. Ordinarily, an acre will pasture from one to three cows, or an equivalent of sheep, pigs, and horses through the summer and up until the first of October.

Its chief value as a hay crop lies in its great yielding ability. On the other hand, its chief drawback lies in the difficulty growers frequently experience in trying to get the hay cured properly. It should be cut soon after it heads, and every precaution to insure proper curing should be taken. It is not unusual for growers to lose much of their hay crop due to difficulty in curing the tall, coarse stems, which dry out slowly. But if the crop is cut promptly and cured properly, it will, as stated above, produce a fair quality of hay, equal to, or better than, timothy in feeding value. Also, a second crop, or aftermath, for pasturing is usually obtained.

The hay crop is cut from 8 to 10 weeks after seeding. It is not unusual to get a hay crop in 2 months' time. If rain does not interfere, it takes about 4 days to cure. Most growers leave the crop in the swath for 2 days and in the windrow for 2 days. It need not be turned unless rained on. This procedure appears to be more satisfactory than curing in cocks or cutting with a binder and attempting to cure in shocks.

Use Weed-Free Seed

Some growers save Sudan grass for seed, but this is not of any great importance outside of the great seed-producing areas in the Southwest. As previously stated, seed is cheap, and unless some arrangements can be made before harvest for disposing of the crop there is no particular reason why the average farmer should save a seed crop. As a rule, seed production is a specialty that very few farmers can carry on with great success. Often it is a temptation to save seed, but in the case of most forages this is best left to the grower equipped for seed handling.

In the southern part of the Corn Belt, growers buying Sudan grass seed must be on the lookout for mixtures with Johnson grass, one of the worst weeds in the South. Many growers in northern sections have been lulled into a sense of security against the danger of Johnson grass, feeling that it would not survive the cold winters. In the southern part of the Corn Belt and in protected areas, however, Johnson grass has survived the winters, and in certain regions has become quite troublesome. Sudan grass and Johnson grass are similar in seed and plant characteristics, with the important exception that Johnson grass has underground stems that make it a persistent perennial in warmer areas. Anyone that has had experience with quack grass can appreciate the troubles that Johnson grass can cause in cultivated fields.

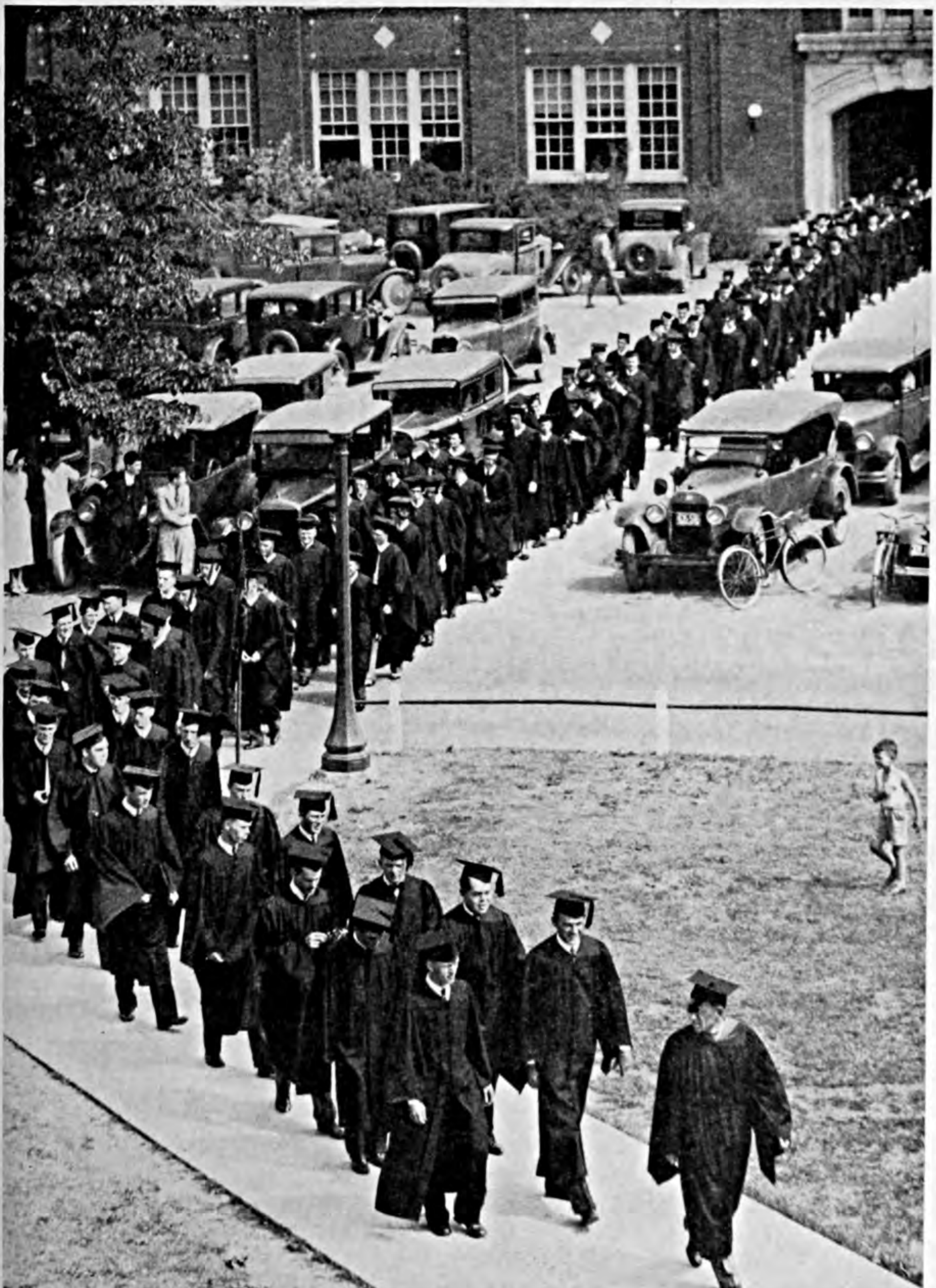
Avoid Acid Poisoning

The last 6 or 7 years have been characterized by unusual weather conditions, and farmers have had to adjust their cropping plans accordingly. This situation has brought Sudan grass into the picture as both an emergency and a regular crop. Many growers rely greatly on Sudan grass, even though they realize that difficulty may be encountered with prussic acid poisoning if the crop is arrested in its growth. It is rather widely known that pasturing Sudan grass that has been severely stunted by either drought or frost should be avoided. This condition presents no serious difficulty, however, since methods for overcoming prussic acid poisoning have been developed. Also, one experiment station has already developed a strain of Sudan grass that does not cause prussic acid poisoning.

Insures Food Supply

No one knows what kind of weather we shall have in 1937—whether there will be droughts, or floods, or combinations of them. Ordinarily, an extremely dry year does not follow a dry year like 1936. Whatever the conditions, a small patch of Sudan grass is something to fall back on, providing additional insurance that livestock of all kinds will have something to eat during the hot months and during the cold months some hay that is "better eating than snowballs."

PICTORIAL



Harvesting America's most important crop—graduates eager to carve for themselves a place in the world beyond college walls.

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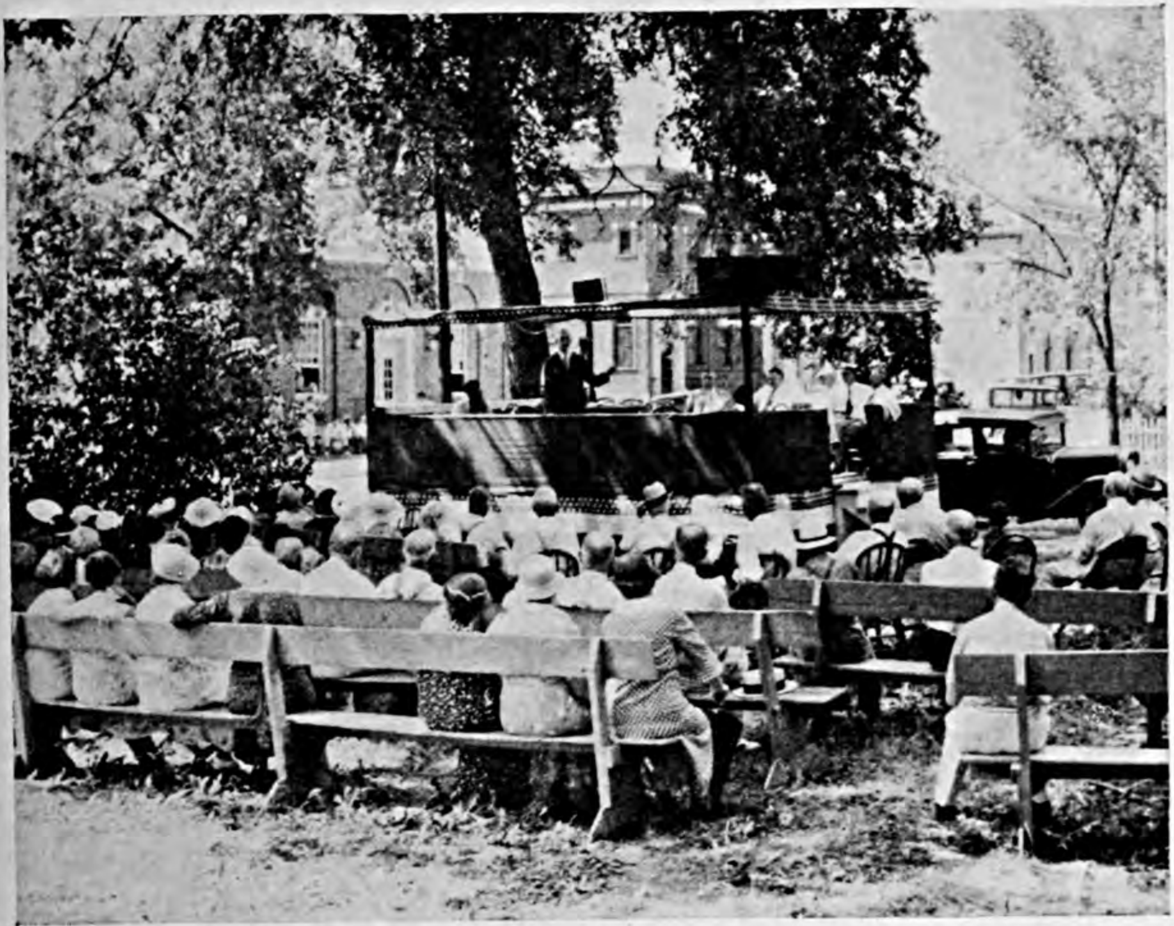

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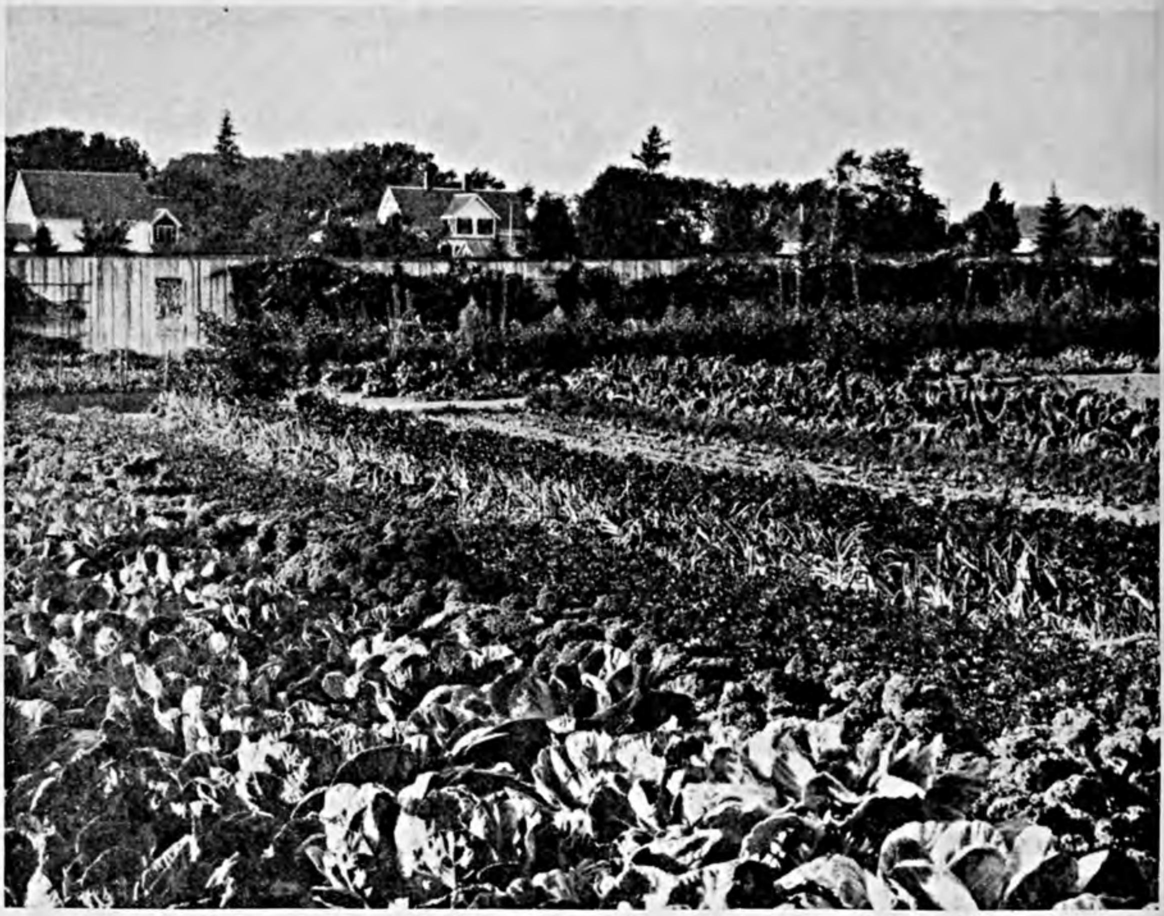

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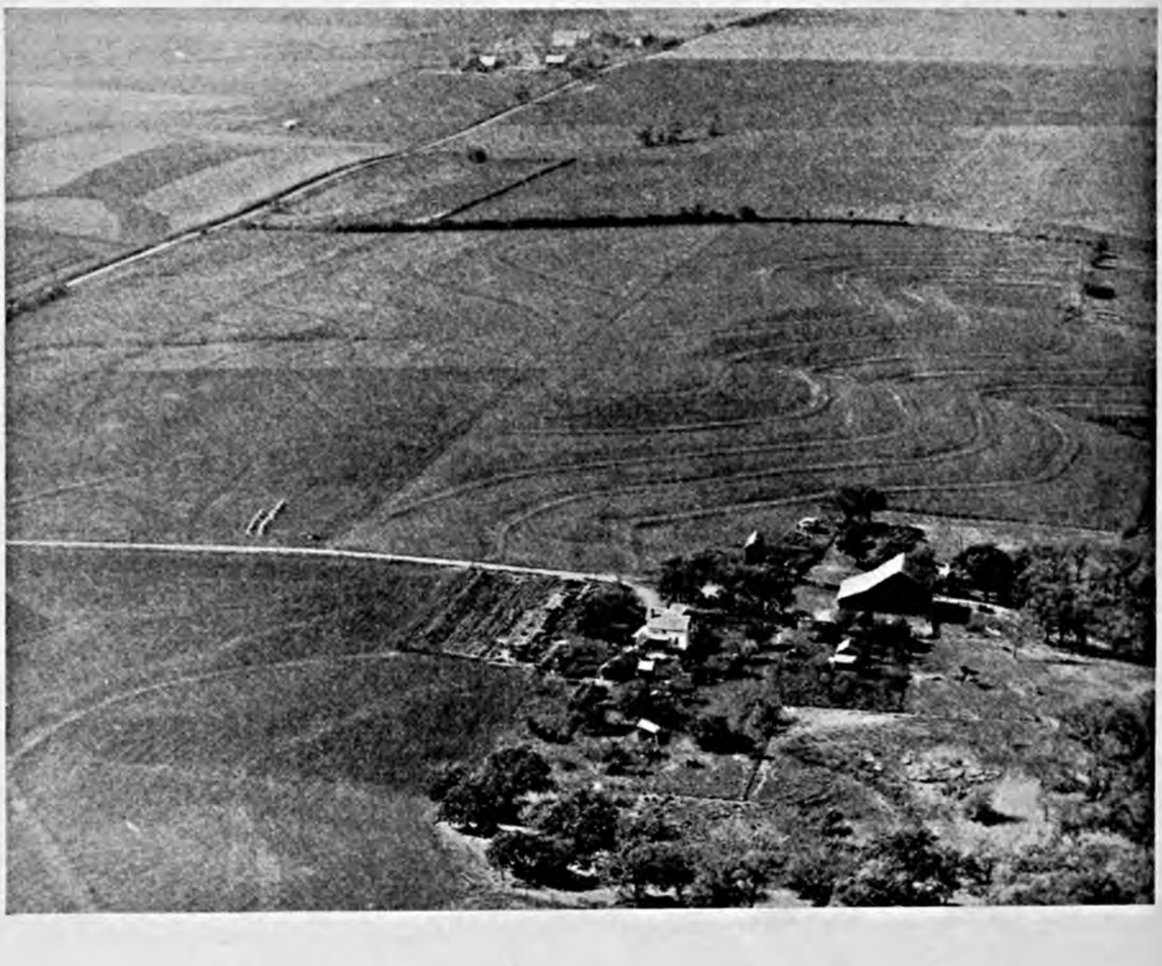
**Above: Many suburban families have gardens that would put their country cousins to shame.
Below: Terraced farm land makes interesting patterns of the countryside.**



The Editors Talk

Convene to Cooperate

On June 7-9 at White Sulphur Springs, W. Va., the National Fertilizer Association successfully held their thirteenth annual convention. With a large attendance reflecting satisfactory trade conditions, several highlights of the convention point to the interest within the industry in the problems and activities of allied fields. Personal problems are ever paramount, but when viewpoints are broadened and lengthened to include the problems of others, progress is set in motion.

This concept was borne out in the address of Dr. T. S. Buie of the Soil Conservation Service who in his discussion of the relation of soil and water conservation to the fertilizer industry said, "if you would retain your markets, you must be interested in the maintenance of productive soil—soil sufficiently productive to make the use of fertilizer economically feasible and profitable. To illustrate, Dr. Buie described two South Carolina townships, one located in an area only moderately eroded, the other in a severely eroded area. In the area of moderate erosion 29.7 per cent of the total land had been planted to cotton, but in the other area only 11.8 per cent was in cotton. The difference was not due to diversion to other cash crops. In the first area each square mile produced 108 bales of cotton annually, while the eroded area produced only 35 bales on each square mile. After showing that such an eroded area is a poor sales prospect for the industry, Dr. Buie discussed the importance of fertilizer use in preventing the degeneration of the land to such a condition.

Dr. Henry G. Knight, chief, Bureau of Chemistry and Soils, United States Department of Agriculture, told the assembly that research holds the key to the solution of some of our toughest farm problems. Constructive research in the fertilizer field has lowered the cost of fertilizer to the farmer and has furnished him with a better quality of plant food. Dr. Knight further pointed out that in decreasing the cost of fertilizer mixtures, the present problem is not the production of cheaper fertilizer materials but the formulation of higher analysis mixtures of high efficiency from materials already on the market.

From the agronomic viewpoint presented in the address of Professor T. B. Hutcheson of the Virginia Polytechnic Institute came the opinion that it is unfortunate that legumes ever were called soil-improving or soil-conserving crops, for statements carrying those ideas have convinced many farmers that all they have to do is to plant legumes, take them off clean if they want them, and still have improved soils. An examination of the analyses of a number of crops shows that if the plant food in crops is given the value paid for it in fertilizers, it costs the soil more to grow a crop of legumes than a crop of non-legumes. If legumes are not inoculated, of course, no benefit is derived from them at all, and even when inoculated they draw heavily upon the mineral resources of the soil. "If we can get our farmers to realize the truthfulness of those statements, we will have made a great stride in agricultural development," Professor Hutcheson stated. "Practical farmers have failed to realize that we cannot continue to grow crops and improve yields unless plant food is returned to the soil in amounts at least equivalent to those removed by crops."

International observation came in the address of G. H. Holford of the Fertilizer Advisory Service, Auckland, New Zealand, who spoke on "Fertilizing Pastures in New Zealand," and showed several reels of colored moving pictures of different parts of New Zealand. The clearly indicated differences between fertilized and unfertilized pastures, particularly as photographed from the air, provided striking evidence of what that country has done to improve its pastoral agriculture. Mr. Holford commented on the fact that, while possibilities for fertilizer use in New Zealand are largely limited to pastures, the appropriations in that country for educational work are much larger in proportion to tonnage sales than is the case in this country where the possibilities of increasing grass fertilization are just becoming realized.

It is good for industries to convene and for groups within industries to get together to discuss problems in common. And whenever in these conventions viewpoints are freshened by outside sources, new inspiration and encouragement result.

S-O-S

Now, in the height of the growing season, is the best time to heed the S-O-S (Signs of Starvation) which plant life makes manifest. Plant-food deficiency symptoms are easily read by those who have learned to recognize them. The spreading of this knowledge among growers is a service which they should welcome and which should realize for them dollars and cents on the information gained.

Not only do plants indicate a general lack of plant food, but many of them reveal the lack of any particular plant food. White spotting around the edges of clover and alfalfa leaves, scorching of leaves of fruit trees, darkened color and crinkling of the leaves of potato plants, firing and scorching of the edges of corn leaves, the appearance of rust on cotton plants—all are easily recognized symptoms of potash deficiency. Likewise, various plants will show their need for nitrogen, phosphoric acid, magnesium, and other essential nutrients.

Although in most cases it is too late to help the crops which are showing starvation this year, these symptoms should be carefully noted and should serve as a guide to the fertilization program for another growing season. They indicate the soil's inability to supply the available plant food. However, long before they appear, yields may be reduced due to supplies of plant food insufficient to maintain crops at their maximum. It is not economical to wait for starvation signs before taking steps to maintain soil fertility at levels which will insure profitable yields.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Fertilizing Farm Crops," by J. B. R. Dickey, Pennsylvania Agricultural Leaflet 26 (Revised), is a very informative publication that gives a number of helpful suggestions to farmers of that state on the fertilization of their crops. With reference to higher analysis mixtures, repeated experiments indicate they are at least equal in efficiency to the standard forms when the plant food is applied in equivalent amounts. The higher analysis goods usually are lower in price per unit of plant food. Where the freight rate is high and the labor of hauling and handling burdensome, the higher analysis fertilizers are especially economical. Owing to the higher analysis fertilizers now available, it seems desirable to base recommendations on the best ratio of the three plant-food elements, rather than a definite percentage of each. The 1-2-2 ratio, represented by 4-8-8, 5-10-10, or an 8-16-16, furnishing 160 to 240 pounds of plant food per acre, for example, seems best for potatoes. Recommendations for other field crops based on experiments and good farm practices are listed in a form easily understood. Fertilizing for greatest economic returns, accompanied by crop rotation and the proper application of lime when required, will usually take good care of the soil fertility, the author states.

According to a recent mimeographed publication compiled by the Soils Department of Michigan State College, fertilizer sales as reported by the companies doing business in Michigan totalled 125,693 tons, of which 68,195 tons were sold in the spring and 57,498 tons in the fall. Of special significance are the facts that of the total tonnage 78 per cent was composed of grades or ratios recommended by the Soils Department and that 81 per cent of all the mixed goods sold contained 20 per cent or more of plant food. Out of 79 licensed grades, 10 grades made up 80.5 per cent of the total sales. An increase of 11.5 per cent over last year's total sales is indicated. Especially gratifying is the indicated percentage increase in sales over those of 1935 of 17.2 per cent of 2-12-6, 105.9 per cent of 2-16-8, 40.3 per cent of 4-16-4, 5.6 per cent of 0-20-0, and 20 per cent of 4-16-8, while the sales of 2-12-2 decreased 17.7 per cent. The most important single analysis was 2-12-6, which represented 41.4 per cent of all fertilizer sold in this state in 1936.

"Suggested Fertilizer Recommendations for Indiana," Agr. Exp. Sta., Lafayette, Ind., Unnumbered Mimeographed sheet.

"The Seasonal Course of Soluble Nitrogen and Phosphate Phosphorus in the Shoot Growth of Winesap Apple and Elberta Peach," Agr. Exp. Sta., Lexington, Ky., Bul. 367, C. S. Waltman.

"Fertilizers for Cotton on the Red and Mississippi River Alluvial Soils of Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 284, Apr. 1937, H. C. Lovett and Franklin L. Davis.

"Fertilizers for Cotton on the Coastal Plain Soils of Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 285, Apr. 1937, Franklin L. Davis and H. C. Lovett.

"Fertilizers for Cotton on the Prairie Soils

of Southwest Louisiana," Agr. Exp. Sta., Baton Rouge, La., Bul. 286, Apr. 1937, H. C. Lovett and Franklin L. Davis.

"Strawberry Fertilizer Studies in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 403, Sept. 1936, W. E. Whitehouse and A. L. Schrader.

"Nitrogen and Carbohydrate Content of the Strawberry Plant," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 252, March 1937, J. H. Long and A. E. Murneek.

"Fertilizer Recommendations for New York," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., Bul. 281, Rev. Apr. 1936.

"Fertilizing the Hop Crop," N. Y. Agr. Exp. Sta., Geneva, N. Y., Mimeographed Progress Report, J. D. Harlan.

Soils

The wide-spread demand for Dr. M. F. Morgan's Bulletin 372 (Connecticut Agricultural Experiment Station) entitled, "The Universal Soil Testing System," exhausted the supply much sooner than was anticipated, therefore, prompting a revised edition of this popular publication as Bulletin 392. A few minor changes and additions in the testing methods and their interpretations have been made in the new publication. The distinguishing characteristic of this scheme of testing is the employment of a highly buffered mixture of acetic acid and sodium acetate for the extraction of the soil sample. All of the significant tests are conducted on portions of this extract; hence great speed and economy of operation are provided.

Detailed instructions on the fundamentals of procuring accurate soil samples, preparing the various chemical reagents, and conducting and interpreting the test are given. Other pertinent factors, such as verifying a case of suspected crop deficiency or nutrient abnormality by means of chemical examination of the plant itself and application of tests to drainage water from soils, are given consideration. The author explains that while soil testing promises to be a valuable contribution to the more intelligent management of the soil in helping to forestall crop failure due to improper fertilization, as well as preventing the wasteful use of unnecessary fertilizer ingredients, the best fertilizer and liming practices cannot overcome the injurious effects of deficient or excessive moisture conditions, improper cultural methods, etc. The grouping of crops with respect to their lime, nitrogen, phosphoric acid, and potash requirements affords a most helpful guide in making fertilizer recommendations.

"Soils of Cascade County. Soil Reconnaissance of Montana, Preliminary Report," Agr. Exp. Sta., Bozeman, Mont., Bul. 337, Mar. 1937, L. F. Gieseker.

"Erosion Control in Ohio Farming," Agr. Ext. Serv., Columbus, Ohio, Bul. 186, D. R. Dodd.

"Soil Conservation Practices in Actual Use by Farmers," Agr. Exp. Sta., Knoxville, Tenn., Monograph No. 28, Feb. 20, 1937, Charles E. Allred and Dalson H. Esry.

"Truck Crop Investigations—Liming Coastal Plain Soils," Truck Exp. Sta., Norfolk, Va., Bul. 91, Apr. 1, 1936, Jackson B. Hester, M. M. Parker, and H. H. Zimmerley.

"Preventing Soil Blowing on the Southern Great Plains," U. S. D. A., Washington, D. C., Farmers' Bul. 1771, Mar. 1937, E. F. Chilcott.

"Trace Elements in the Soils from the Erosion Experiment Stations, with Supplementary Data on Other Soils," U. S. D. A., Washington, D. C., Tech. Bul. 552, Jan. 1937, C. S. Slater, R. S. Holmes, and H. G. Byers.

Crops

According to Minnesota Agricultural Extension Special Bulletin 182, entitled "Potato Pointers," by A. G. Tolaas, plenty of plant food must be available to obtain a good crop of well-shaped potatoes. The author points out that both phosphorus and potash are very essential to the production of high-quality potatoes. Although plowing under certain crops and applying barnyard manure supply considerable amounts of plant food, particularly nitrogen, more phosphoric acid and potash are required in proportion to the nitrogen supplied by these practices. The deficiency of both these elements may be supplied through commercial fertilizer mixtures. Since turning under legumes and applying barnyard manure make soils hold moisture better, fields so treated give better results from commercial fertilizers than fields on which grain preceded potatoes. The bulletin suggests that fertilizer be placed on the level with the seed piece or slightly below it in bands 2 inches away to obtain best results and insure against fertilizer injury. A considerable section of this interesting publication is devoted to the selection of varieties to grow. In addition to describing the characteristics of the different potato varieties grown in the state, photographs portraying their typical shapes and other features contribute much to making this a very attractive and useful publication. Among the other points discussed are crop rotation, soil preparation, planting, cultivating the crop, and controlling insects and disease.

"Producing Spinach and Other Leafy Vegetables for Market," Agr. Ext. Serv., Little Rock, Ark., Cir. 190, Rev. June 1936, Claude Woolsey.

"The Family Vegetable Garden," Agr. Ext. Serv., Little Rock, Ark., Cir. 304, Rev. June 1936, Claude Woolsey.

"Propagation of Grapevines," Agr. Ext. Serv., Berkeley, Calif., Cir. 101, Nov. 1936, H. E. Jacob.

"Almond Culture in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 103, Jan. 1937, Milo N. Wood.

"Tobacco Substation at Windsor, Report for 1936," Agr. Exp. Sta., New Haven, Conn., Bul. 391, Jan. 1937, P. J. Anderson, T. R. Swanback, and O. E. Street.

"Grape Culture in Georgia," Agr. Ext. Serv., Athens, Ga., Cir. 265, Dec. 1936, Dr. T. H. McHatton.

"Report of the Director, July 1, 1935 to June 30, 1936," Agr. Ext. Serv., Lafayette, Ind., J. H. Skinner, Director.

"Strawberries for Home and Market," Agr. Ext. Serv., Lafayette, Ind., Ext. Bul. 174, Rev. Oct. 1936, Monroe McCowan and Clarence E. Baker.

"Biennial Report of the Rice Experiment Station, Crowley, Louisiana, 1935-1936," Agr. Exp. Sta., Baton Rouge, La., J. Mitchell Jenkins, Supt.

"Crops and Soils Information," Agr. Exp. Sta., Baton Rouge, La., Bul. 283, Mar. 1937.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., Vol. 1, No. 4, May 1937.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 19, No. 4, May 1937.

"Garden Beans," Agr. Exp. Sta., Columbia, Mo., Cir. 195, May 1937, C. G. Vinson.

"The Effect of Tillage Method, Crop Sequence, and Date of Seeding Upon the Yield and Quality of Cereals and Other Crops Grown Under Dry-Land Conditions in North-Central Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 336, Feb. 1937, M. A. Bell.

"Fiftieth Annual Report of the Agricultural Experiment Station of Nebraska," Agr. Exp. Sta., Lincoln, Nebr., W. W. Burr, Director.

"Should More Jerusalem Artichokes Be Grown?" Agr. Ext. Serv., Lincoln, Nebr., Cir. 108, 1937, T. A. Kiesselbach.

"Stored Moisture Assures Potato Crop for Western Dry Land," Agr. Ext. Serv., Lincoln, Nebr., Cir. 1215, 1937, H. O. Werner.

"Forty-seventh Annual Report, 1935-1936," Agr. Exp. Sta., State College, N. M., Fabian Garcia, Director.

"Dry-Land Crops at the Tucumcari Field Station," Agr. Exp. Sta., State College, N. M., Bul. 244, Nov. 1936, Donald R. Burnham and John S. Cole.

"Report of the North Carolina Department of Agriculture from July 1, 1934 to June 30, 1936," St. Dept. of Agr., Raleigh, N. C., Wm. A. Graham, Comm.

"Important Factors in Cotton Growing in North Carolina," Agr. Exp. Sta., Raleigh, N. C., Agron. Inf. Cir. 106, Mar. 1937, P. H. Kime.

"Fifty-fifth Annual Report, 1935-1936," Agr. Exp. Sta., Wooster, Ohio, Bul. 579, Mar. 1937, C. G. Williams, Director.

"How Water, Organic Matter, and Rotations Contribute to Sugar Beet Yields" and "Fertilizing Ohio Soils for Sugar Beets," Agr. Ext. Serv., Columbus, Ohio, Unnumbered Mimeograph, Mar. 27, 1937, E. P. Reed and John A. Slipher.

"Serving the Farm and Home Interests of Oregon, 1934-1936," Agr. Ext. Serv., Corvallis, Oreg., Bul. 493, No. 1936, Frank L. Ballard.

"Report of the Department of Agriculture, April 1, 1935, to December 31, 1936," St. Dept. of Agr., Salem., Oreg., S. T. White, Director.

"Soybeans," Agr. Ext. Serv., Clemson College, S. C., Bul. 76, Rev. June 1936, R. W. Hamilton.

"Annual Report of the South Dakota Agricultural Experiment Station for the Fiscal Year Ending June 30, 1936," Agr. Exp. Sta., Brookings, S. Dak., James W. Wilson, Director.

"Forty-ninth Annual Report, 1936," Agr. Exp. Sta., Knoxville, Tenn., C. A. Mooers, Director.

"Eighth Biennial Report of the Utah State Board of Agriculture," July 1, 1934, to June 30, 1936, State Dept. of Agr., Salt Lake City, Utah, David F. Smith, Comm.

"Growing Timber on the Vermont Farm,"

Agr. Ext. Serv., Burlington, Vt., Cir. 90, June 1936, George W. C. Turner.

"Hints on Flower Gardening," Agr. Ext. Serv., Burlington, Vt., Cir. 92, Mar. 1937, Charlotte Pierpont Brooks.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 348, May 1937.

"Findings in Farm Science," Agr. Exp. Sta., Madison, Wis., Bul. 438 (An. Rpt. of Dir., 1935-36), Mar. 1937, Chris L. Christensen, Director.

"Crop Rotation and Tillage Experiments at the Northern Great Plains Field Station, Mandan, N. Dak.," U. S. D. A., Washington, D. C., Tech. Bul. 536, Dec. 1936, J. T. Sarvis and J. C. Thysell.

"Wheat in the United States," U. S. D. A., Washington, D. C., G-68, Gen. Inf. Series, Apr. 1937.

"High-grade Timothy and Clover Hay—Methods of Producing, Baling, and Loading for Market," U. S. D. A., Washington, D. C., Farmers' Bul. 1770, Feb. 1937, E. O. Pollock and W. H. Hosterman.

Economics

The activities of the County Agricultural Planning Committees of Iowa are summarized by Herbert G. Folken in Iowa Extension Circular No. 233, "County Land Use Planning by Iowa Farmers." Believing, as they do, that the problem of land planning should be approached from the community standpoint, groups of farmers ranging from 15 to 30 in number in each Iowa county began in the fall of 1935 to study the use to which the agricultural resources of their county were being put, to attempt to evolve a type of agriculture that would be more desirable for their county, and to outline the practices essential to a permanent agricultural conservation program.

In former years when foreign markets were taking increasing volumes of farm products, worn-out farms were being abandoned, and new ones purchased at very low prices in rich undeveloped areas, industry was expanding with sufficient rapidity to absorb the surplus farm population. Few people were concerned about the conservation of our agricultural land.

Following the World War and the depression of 1930, there appeared significant changes. All of the available fertile land had been brought into cultivation, productivity of the older soils was decreasing, pastures had been plowed up to be turned into crop land, and wet areas within farms had been made more productive through drainage. There had been a steady increase in the abandoned acreage of farm land. All of these factors changed the problems of agricultural production. From the consumption standpoint a substantial part of the foreign market for farm products had been lost and the prospects for the reestablishment of these markets was slight. The domestic market for farm commodities had also undergone important changes. Population was not increasing as rapidly as formerly and the American mode of living was changing. As a consequence, the requirement for energy-producing food was less. Since 1929, the movement of farm people to cities has been greatly reduced due to the difficulties of finding a ready place in industry.

In Iowa especially, the pattern of farm tenure and occupancy has changed. The proportion of the capital value of farm land owned by the operator has been shrinking, first due to extended use of credit by operators to acquire or to expand their holdings and then to the subjection of farms to foreclosure. At the present time one-half of the farm families in Iowa are tenants and three-fifths of the farm land is rented.

With the above facts in mind the committees set themselves to the task of, first, taking an inventory of the farm resources and, second, recommending certain adjustments which they consider desirable for their communities. They used as a basis the cropping practices which they observed on typical farms, the crop acreages which have prevailed in the county, and the studies and research reports of the Experiment Station pertaining to the agricultural resources of the particular county.

In general, the committees set up four classes of land use based on the conserving or depleting effect of the use on the land. These classes were: (1) permanent vegetation, (2) rotated grassland, (3) small grains, (4) intertilled crops.

For the state as a whole, the committees recommended that 23 per cent of all lands in farms should be in the form of permanent vegetation. Approximately 5 per cent is occupied by roads, lots, buildings, etc. Thus, 72 per cent of all land in farms was considered suitable for cultivation as rotated land. The proportion of all land in farms recommended for each of these uses ranged from 18 per cent in permanent vegetation, 18 per cent in rotated grass, 26 per cent small grain, and 38 per cent in intertilled crops in farming type area 4 in central Iowa, to 46 per cent in permanent vegetation, 20 per cent in rotated grass, 15 per cent in small grains, and 19 per cent in intertilled crops in area 7 in southeastern Iowa. The recommendations of the committees depended upon the topography of the soil, the relative absorbing capacity of the subsoil, the depth and type of topsoil, and the general productivity of the area.

The rotations which the county committees selected as being the most desirable for the various soil groups placed 42 per cent of the rotated land of the state into intertilled crops, 29 per cent into small grain, and 29 per cent into grassland. It is interesting to note that the small grain acreage recommended by the committees is 4 per cent smaller than the 1929 acreage harvested. A 27 per cent increase over 1929 of all tame hay acreage, exclusive of soybean hay, was recommended. This included an alfalfa acreage more than twice that of 1929 with a slightly decreased acreage of other types of tame hay. The recommended total pasture acreage is 9 per cent larger than that of 1929.

The recommended intertilled acreage is about 8 per cent smaller than the 1935 harvested acreage, with about a 3 per cent decrease for corn, about 56 per cent for soybeans, and about 1 per cent for other intertilled crops. The recommended small grain acreage is 3 per cent smaller than that harvested in 1935.

A great variety of factors entered into the recommended changes in livestock production. Among such factors are the prices of various kinds of livestock in relation to each other and in relation to the prices of various kinds of feeds. The committees, however, did indicate that with a smaller corn acreage and more roughage there would probably be an increase in cattle and sheep and a decrease in hog production.

Problems which will be taken up in the future by the county committees are: (1) The adaptation of livestock enterprises to the soil conservation program, (2) the relation of soil conservation to production control, (3) farm tenure, and (4) measures for effecting conservation on individual farms.

"Economic Digest," Conn. St. Col., Storrs, Conn., No. 68, Apr. 1937.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 22 and 23, Mar. and Apr. 1937.

"Production Requirements and Costs on Irrigated Farms in Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 338, Apr. 1937, P. L. Slagsvold and Clyde Howard.

"Seventh Annual Report of the New Mexico Feed and Fertilizer Control Office for Year Ending December 31, 1936," N. M. Feed and Fert. Control Office, State College, N. M., Mar. 15, 1937, R. W. Ludwick and Lewis T. Elliott.

"Fertilizer Consumption by Counties in New Mexico," N. M. Feed and Fert. Control Office, State College, N. M., Unnumbered Mimeograph, Jan. 1, 1936 to Dec. 31, 1936.

"Fertilizers Sold in North Carolina from July 1, 1936, to Dec. 31, 1936," N. C. Dept. of Agr., Raleigh, N. C., Unnumbered Mimeo.

"Types of Farming in Utah," Agr. Exp. Sta., Logan, Utah, Bul. 275, Nov. 1936, Marion Clawson, Walter U. Fuhriman, George T. Blanch, and W. Preston Thomas.

Hybrid Corn Won't Yield Well Without Good Soil

SEED CORN may be too good for the land it is planted in. Or, as A. L. Lang, Illinois Agricultural Experiment Station soils specialist says, "Hybrid corn cannot be expected to take the backache out of hauling limestone nor remove the pain when it is necessary to extract money from the family purse for potash and phosphate."

A corn grower cannot expect to grow 90-bushel or 100-bushel corn on 30-bushel land, and he may be wasting high quality seed if he tries it. On the other hand if he has high quality soil capable of yielding big crops, he is wasteful if he does not buy seed good enough to make full use of the land. Practical tests have shown over and over again that good hybrid seed corn well adapted to the soil and the climate will yield enough more grain to return many times the extra investment in seed.

How the seed should fit the land and the land should fit the seed has been revealed clearly in plantings in Illinois, say agrononomists of the United States Department of Agriculture who have been cooperating in this corn work. In comparing yields from the best five varieties of hybrid corn with the yields from the best five open-pollinated varieties, tests were made on fields of varying fertility. On the least fertile fields, the hybrids outyielded the open-pollinated varieties by only 5 bushels to the acre, but on the most fertile fields there was a difference of 24 bushels to the acre in favor of the hybrid corn.

One good feature of corn improvement by hybrid breeding, Lang points out, is that superior hybrids may make it possible to obtain much larger returns from good systems of soil improvement than has been possible in the past. In other words, a farmer need no longer fear that he is getting his land too good for his seed.

Nutrient Requirements For Good Barley

THE importance of nitrogen, phosphoric acid, and potash in the growth of barley is shown in experiments reported by F. G. Gregory and E. C. D. Baptiste of the Imperial College of Science and Technology, London, in the July, 1936, issue of the Annals of Botany. They grew barley with various treatments ranging from a complete fertilizer to other combinations in which nitrogen, phosphoric acid, or potash each were omitted. They found that plants deficient in one of these nutriments showed certain definite types of growth which might be described as hunger signs for those particular nutrients. They state that the nitrogen-deficient plants were much reduced in size with much less tillering and that the younger leaves were smaller in size and pale green in color. Phosphorus-deficient plants showed a typical red coloration of the leaves with the exception of the youngest leaves which were more normal in appearance. The potash-starved plants had light green, succulent leaves, especially in the case of the younger ones. These plants tillered freely and the individual leaves died rapidly. Potash-deficient plants were also characterized by standard stems and failure to produce a head. Nitrogen and phosphorus-deficient plants produced their leaves much more slowly than did the completely fertilized plants or those lacking potash.

The lack of any of the nutrients affected the function of the plant in a way that would have a very important effect on the quality and therefore the value of the crop. When nitrogen was lacking, the production of protein was reduced 52 per cent from that of the completely fertilized plants. A lack of phosphorus reduced protein production 21 per cent, and a lack of potash reduced it 32 per cent. These data refer to the protein content of the leaves only. The sugar content of the leaves was increased when nitrogen was lacking but decreased to some extent when phosphorus was lacking, and decreased to a larger degree when potash was lacking. The effect of the lack of various nutrient on grain composition is not given by the authors, but there is every reason to believe that disturbances in the normal functioning of the leaves would exert an unfavorable influence on the quality of the grain produced.

Survey Seeks to Cut Market-Basket Costs

THE major portion of the housewife's dollar for fruits and vegetables goes to pay the distribution costs from the farm to the consumer.

One of the greatest possibilities for reducing these costs, as well as increasing prices received by farmers for these commodities, appears to be the improvement of wholesale and jobbing markets which handle the fruits and vegetables before they reach the consumer.

Improvement in wholesale and jobbing markets in cities, the purpose behind a series of studies of the larger city fruit and vegetable markets now being made by the Bureau of Agricultural Economics, should increase the purchasing power of the housewife's dollar.

In many large cities, the fruit and vegetable market has grown like Topsy—mainly without any coordinated plan. In some cities facilities are out of date. Where new markets have been built, many have not been carefully designed; in some cases they have been established for the benefit of certain elements of the trade or individual railroads rather than with any definite plan for bringing about efficiency in marketing and distribution.

The Bureau already has published a report of its study of the Philadelphia wholesale fruit and vegetable market and is now extending its survey into 39 other principal cities of the United States. A committee representing carlot receivers in Philadelphia has been appointed to study the report for that city and to make recommendations to the trade. Another committee representing several farm organizations in New Jersey is studying the report to see if it supplies the answers to some of the distribution problems in that state. Several meetings of farmers have been arranged in New Jersey and Pennsylvania to discuss the report.

The purpose of the present Bureau surveys in 39 cities is to get the essential facts about the location of facilities, amount of business done, total cross-hauling between markets, relative importance of rail and truck receipts, prevailing charges for trucking and commissions, and the principal regulations governing marketing practices and methods. More detailed studies will be made later in several cities.

The need for improving wholesale fruit and vegetable markets of large cities has been emphasized in recent years by changed conditions and methods of marketing and distribution.

Changes in buying habits of consumers, increased marketing costs, and development of motor-truck transportation and chain-store methods of purchase and sale—all have affected the wholesale fruit and vegetable markets. With these changing conditions there has come a growing feeling among growers, consumers, and members of the trade that better markets are necessary to the welfare of both the farmer and the consumer.

It Takes 30 to 40 Leaves To Produce a Good Peach

HOW many leaves are required to produce enough food to develop a good peach? Experiments by the United States Department of Agriculture indicate at least 30 to 40 leaves are necessary. Forty to fifty leaves are required to develop a good-sized apple, and about 50 for an orange.

Producers of large peaches provide larger leaf areas—more than 40 leaves per peach—by thinning the fruit closely. This permits the peaches left on the tree to get more food from the leaves. When the fruit set is light for the entire tree—but perhaps heavy on certain branches and the leaves plentiful—the fruit may be left unthinned.

After a damaging freeze fruit may set only at the base of the shoots. When this occurs the leaves on the bearing and nonbearing shoots will under favorable conditions produce peaches of good size and quality although the fruit may be only a few inches apart. Leaves far away from the fruit and those on the nonbearing shoots also help to manufacture food.

Hope To Grow Melons To Fit Average Icebox

A WATERMELON to fit the average refrigerator is something which the United States Department of Agriculture hopes to develop in its new vegetable breeding laboratory near Charleston, S. C.

There is a place, the Bureau of Plant Industry recognizes, for enormous melons that grow in size like fish stories of the one that got away. But the huge melons are unsuited for consumers who cannot chill them whole.

A melon is too large if the family cannot consume most of it at a single slicing. It is too large if it is necessary to cut it to get it into the refrigerator, for a melon cut before it is chilled loses quality.

Other qualities desired in watermelons are: A tough (but not thick) rind for shipping, disease resistance, and, of course, delicious flavor. Seed of melons from Asia and Africa may contribute some of these qualities, but for flavor breeders know no melons better than the best of the American varieties.

Too Much Cultivation Cuts Sugar-Beet Yield

AS with potatoes, corn, cotton, and several other crops, cultivating sugar beets oftener than necessary for weed control probably does not pay. It may even damage the crop during dry weather, says the United States Department of Agriculture.

Many beet growers reduce yields by cultivating deeply to "bring up the moisture." Tests by the Department and the Colorado Experiment Station show deep cultivation prunes the beet roots and allows soil moisture to evaporate easily. Beets around which the soil was scraped once during the season with a hoe for weed control produced just as many tons in the tests as those cultivated one to seven times. Close and consistent row tillage in another test reduced the yield 12 per cent. The Department recommends cultivating beets after heavy rains or irrigation early in the season to keep the soil from forming a heavy crust and to control weeds.

Investigations by the Department indicate that excessive cultivation may harm other growing crops. In a 3-year test at Presque Isle, Me., potatoes cultivated once yield slightly more on an average than those cultivated five times. In Illinois and Nebraska tests showed that cultivating corn oftener than necessary for weed control does not pay the grower for the extra work. Similar results have been obtained with cotton.

The Role of Potash in California Soils

(*From page* 18)

soil types with the lowest readings follow:

Locality	Soil type	Mgs. K_2O per 100 gms. soil Surface	Subsoil
Santa Clara Valley	Pinole loam	4	8
" " "	Rincon loam	3	1
" " "	San Ysidro silty loam	11	5
Napa-Sonoma	Laguna loam	5	7
" "	Goldridge fine sandy loam	1	0
" "	Fresno loam	2	11
" "	Madera loam	6	6
" "	Corning gravelly loam	9	10
" "	Tehama loam	12	8
" "	Altamount silty clay loam	6	1
Salinas-Watsonville	Pajaro heavy silt loam	17	12
" "	Chualar sandy loam	14	4
" "	Antioch fine sandy loam	7	1
Oakdale	Oakdale sandy loam	4	4
Hayward	Yolo loam	8	6

Turning to the subject of the soils' supplying power for potassium, we find this may vary greatly. As mentioned previously, one soil with a fairly high reading may become exhausted by intensive cropping for a period of years, while another soil with only a medium reading may produce satisfactory crops indefinitely.

Aiken clay is a soil which according to D. R. Hoagland, of the California Experiment Station, shows a fairly good potassium level, but may readily become exhausted of potassium under intensive cropping practice. After 4 or 5 years of intensive cropping to barley and tomatoes these crops suddenly failed on Aiken clay soil.

On the other hand Ramona loam soil is one which under intensive cropping to barley and tomatoes has not shown evidence of becoming exhausted, and produced satisfactory crops over a long period even though the initial reading for potassium was much lower than the Aiken clay soil. Quite evidently there is some mineral fraction in this Ramona loam soil which is capable of continuously giving up its potassium in sufficient quantity for satisfactory development of the barley and tomato plants.

To get information of this kind on our soils is a long, tedius task, but it is of utmost importance to a better knowledge of the use of potash on our soils. Not only would it explain the lack of response from potash fertilizers on some of our soils, but it would likewise tell us upon which soils potassium levels are readily lowered by cropping, so that we might guard against serious deficiencies.

Certain soils in California have what is termed a fixing power for potassium. This simply means that a certain mineral fraction of the soil has such a strong affinity for the potassium ion that if potassium is added, a large proportion of it becomes fixed in a form very slowly available to the plant. This condition exists in an aggravated form in the Farwell loam, Vina clay, and Elder silt loam soils in the Northern Sacramento Valley. Fixing power seems to be a property not related to the level of available potassium in the soil. We cannot say that low-potassium soils have a high fixing power or high-potassium soils have a low fixing power.

FIXING POWER OF SOILS FOR K*

Soil type	PPM replaceable K	K added to soil	Per cent K fixed
Delhi sand	115	68	47
Fresno fine sandy loam	140	321	61
Oakdale sandy loam	175	155	63
Goldridge fine sandy loam	55	212	75
Aiken clay	270	264	84
Vina clay	395	390	93
Farwell loam	85	385	96
Elder silty loam	125	215	99

* Data selected from article by Hoagland and Martin in "Soil Science," Volume 36, No. 1, July 1933.

Soils Vary in Fixing Power

Some California soils studied in regard to their fixing power for potassium appear in the above table which shows the replaceable potassium reading of the soil, potassium added to the soil, and percentage of potassium fixed.

It is apparent from this study of a relatively few California soils that fixing power for potassium varies widely in different soils, and it cannot be said to preclude potash response on all soils. It is certainly a factor to be considered however. This has been proven by the work of O. Lilleland, of the California Experiment Station, in the case of the soils mentioned in the Northern Sacramento Valley. Prune trees growing on these soils exhibit severe die-back symptoms apparently because of a lack of available potash, but because of soil fixing, applications of potash have thus far failed to permanently cure the trouble.

Fixation is most serious where deep rooted crops, such as trees, are concerned. Shallow rooted annual crops feed mostly in the surface soil where potassium accumulates, and their root systems can make the best use of it.

There is some indication that animal manures and green manures help make potash more effective on soils of high fixing power. Later research may arrive at some combination of materials with potash which will overcome fixing power, or at least slow down the fixing process so that the potassium will have a chance to penetrate to soil depths below the surface 8 to 10 inches.

Up to the present time the most promising means of making potash applications more effective on soils of high fixing power seems to lie in method of application. Methods of fertilizer application are receiving an increasing amount of much deserved attention, and without doubt have a direct relation to potassium fixation.

In order to guard against potassium fixation on soils of high fixing power it is unquestionably best to concentrate the applications of potash fertilizers in furrows rather than make broadcast applications. Broadcasting the fertilizer over a large part of the surface soil furnishes just the distribution favorable to a high percentage of fixation. Concentrating the fertilizer in a furrow, however, where it comes in contact with a much reduced soil area, allows a higher percentage of the potash to go into the soil solution in the vicinity of the fertilizer, thus becoming available to the plant roots.

The Best Method

Placement of fertilizer in ribbons or furrows is of course coming to be widely accepted as the best method for row crops, and its more extensive practice only waits upon distributing machines which will adapt the method to various crops.

In most orchard districts, except where an extensive surface feeding root system has been encouraged, it is doubtful that the tree can make much use of the accumulations of plant food in the surface 6 to 8 inches. Broadcast applications, distributing the fertilizer over a large surface area, are simply adding to surface accumulations, and if the soil has a high fixing power, phosphorus and potash applied in this way may never do the tree much good.

The adaptation of the furrow method of fertilizer application in orchards would seem to be a long step ahead of the broadcast application where potassium and phosphorus are concerned. This method would minimize fixation difficulties where these are serious, and would enable the tree to get at least some of the applied potassium and phosphorus.

It is not meant by this dicsussion to convey the idea that the relations of potash to California soils are hopelessly complex ones. We have soils which show low levels of potassium, we have soils which quite evidently are becoming exhausted of their potassium, we have soils which vary widely in fixing power for potassium, meaning that fixing power is not by any means a blanket argument for not applying potash, and lastly we have soils which respond to applications of potash.

As our survey of available potash in California soils progresses, as we become more familiar with potash deficiency symptoms and potash response in the great variety of crops with which we have to deal, and as we are able to correlate chemical soil information with plant behavior, there appears to be no reason why potash should not assume a place of steadily increasing usefulness on the farms of the state.

Controlling Soil Erosion in Northern States

(*From page* 11)

6. Seeding rye or other cover in intertilled crops wherever feasible affords some winter and early spring protection.

7. Avoiding the formation of wheeltracks or other depressions on slopes is essential. Paths made by animals up and down pasture slopes usually lead to gullying. Open furrows in connection with the turnrow along fences or field divisions and dead furrows often develop into bad gullies which are more easily prevented than cured.

8. Leaving grass or seeding it in waterways aids in the prevention of gully formation.

9. Making contour furrows or level terraces for holding water on pastures, meadows, or newly-reforested

areas aids in erosion control. These devices conserve much water and are of special value in the drier areas.

10. Filling small gullies in cultivated fields by means of grasses, clovers, or other vegetation, such as shrubs and trees, is feasible. Such vegetation holds soil washed in from adjacent plowed land and eventually fills the gullies. Straw or brush, or both, staked down in gullies checks erosion and helps vegetation to complete its control. Any reduction in the velocity of water causes deposition of silt, sand, and stones. Large gullies often require more extensive control measures, such as ditches for diverting water away from the gullies and check dams, of logs, stones, concrete, or paving, but these structures may well be avoided in cultivated fields wherever simpler means of control are effective.

11. The control of wind erosion may be accomplished by maintaining high productivity, a good supply of active organic matter in the soil, and a live vegetative cover on the soil; by keeping the surface of cultivated land rough; and by conducting tillage and seeding operations in general at right angles to the direction of prevailing winds. In areas of severe wind action seeding crops across the main rows occasionally gives additional protection when the direction of the wind changes.

Replace Plant Food Losses in Crops

(*From page* 13)

In a soil with a large reserve of any one plant food it is logical to "farm out" and deplete that plant food asset in crop production, provided the available plant food is not depleted to a point where subsequent crop yields are lowered. Where a soil already has a low reserve of available potash, the use of legume hay crops will soon cause a shortage of this nutrient. This is what had happened on the Wooldridge farm. Where soybeans or alfalfa are harvested for hay, liberal applications of phosphate-potash fertilizers to the grain and legume seedings will increase the legume hay yields and also maintain the productivity balance of the soil.

In a soil where the limiting factor is nitrogen or organic matter, continuous legume culture will improve the fertility for a time, until the lack of available phosphates or potash becomes the next limiting element. The old theory that a lime-legume-phosphate program of soil management will make potash available fast enough for crop needs has been definitely discarded by most agricultural authorities. In fact, the addition of any one fertilizer material or treatment which increases yields of crops, automatically increases the demands for the

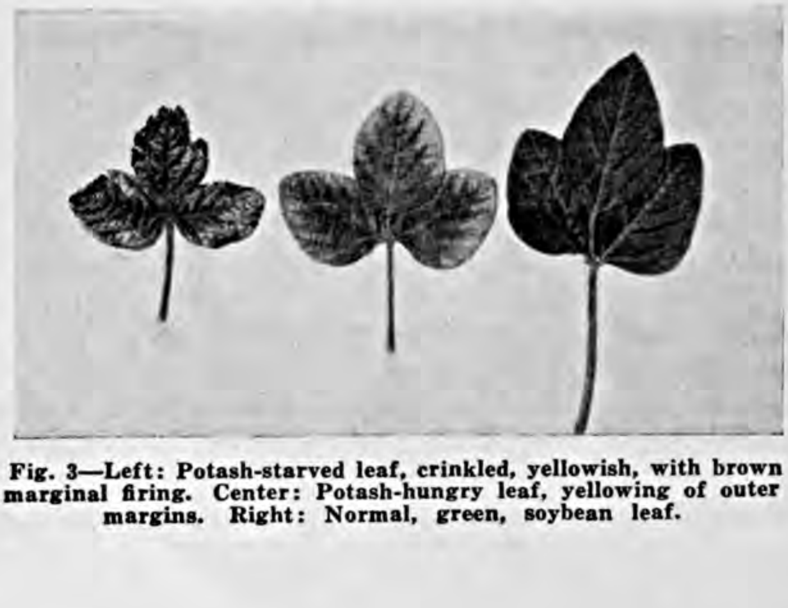


Fig. 3—Left: Potash-starved leaf, crinkled, yellowish, with brown marginal firing. Center: Potash-hungry leaf, yellowing of outer margins. Right: Normal, green, soybean leaf.

other plant foods. Therefore, one must be on the lookout for deficiencies which may develop in a soil as a result of crop removals.

Constant checking on the available plant foods, by soil tests and observations of plant symptoms, enables one to start using proper fertilizers before yields are retarded too much by extreme deficiencies.

PLANT-FOOD LOSSES IN CROPS AND EQUIVALENT AMOUNTS OF FERTILIZERS

Crop Yields per Acre	Plant Foods Removed by Crops: Phosphoric Acid (P_2O_5) Lbs.	Plant Foods Removed by Crops: Potash (K_2O) Lbs.	Fertilizers per Acre Required to Equal the Plant Foods Removed by Crops
Alfalfa—3 T.	32.4	133.8	405 lbs. 0-8-33
Red clover—2 T.	15.6	65.2	195 lbs. 0-8-33.4
Soybean hay—2.5 T.	34.0	116.5	425 lbs. 0-8-27.4
Timothy—2 T.	12.4	54.4	155 lbs. 0-8-35
Reed Canary grass—4 T.	41.6	151.2	520 lbs. 0-8-29.1
Corn—60 bus. ears	23.2	13.4	
2.5 T. stover	22.5	64.5	
Total crop	45.7	77.9	571 lbs. 0-8-13.6
Wheat—30 bus. grain	15.3	9.0	
1.5 T. straw	3.9	22.2	
Total crop	19.2	31.2	240 lbs. 0-8-13
Barley—50 bus. grain	20.5	18.0	
1.5 T. straw	5.4	36.0	
Total crop	25.9	54.0	324 lbs. 0-8-16.6
Oats—60 bus. grain	15.6	10.8	
1.5 T. straw	6.3	45.0	
Total crop	21.9	55.8	274 lbs. 0-8-20.4
Potatoes—300 bus. tubers	21.6	95.4	270 lbs. 0-8-35.3
Onions—800 bus. bulbs	40.3	98.6	504 lbs. 0-8-19.6
Tomatoes—10 T.	14.0	70.0	175 lbs. 0-8-40
Cabbage—20 T.	28.0	116.0	350 lbs. 0-8-33.1
Celery—25 T.	100.0	375.0	1,250 lbs. 0-8-30
Carrots—20 T.	44.0	108.0	550 lbs. 0-8-19.6
Table beets—12 T.	24.0	204.0	300 lbs. 0-8-68
Sugar beets—14 T. roots	22.4	89.6	
8 T. tops	16.0	102.4	
Total crop	38.4	192.0	480 lbs. 0-8-40
Tobacco—1,500 lbs. leaves	12.4	80.8	155 lbs. 0-8-52

Weeds Are "Sissies"—Treat Them as Such

(*From page* 16)

carried over into the second crop season.

Various applications of ammonium sulphate were made. On some plots it was put on at the rate of 100 pounds to the acre, while other applications were as much as 600 pounds to the acre.

"The quack grew fast and furious," relates Dexter. "We were able to cut more than 2 tons of good green hay to the acre before the field was plowed and put into potatoes. That quack just tried to sprout itself to death, apparently. That same year there was plenty of quack in the field and portions of it again looked more like meadow than field, but the potato crop from an additional application of 400 pounds of 4-16-4 fertilizer was fairly good and ran around 130 bushels to the acre.

"As soon as the potatoes were dug, which stirred up the quack roots considerable, a field cultivator was put to work and we kicked the roots around as much as possible. In the spring the field was deep plowed and another potato planting put in the field and fertilized.

"That treatment certainly worked, for in 1936 we had a clean field with only a few spears of quack showing. The year was dry but the potatoes had no competition and yielded about 180 bushels to the acre."

What happened was this, according to Dexter's explanation. By stimulating the quack grass, the weed was encouraged to give up its time and energy into producing as much top growth as possible and to neglect its usual sturdiness in roots and rhizomes. When it was kicked around in the fall it was unprepared for wintering. Roots lying on the surface or near the soil surface "just couldn't take it." It was just like a bear trying to hibernate without remembering to prepare himself with his usual layers of fat for winter protection. The process is to be repeated in 1937 to determine the most practical method of obtaining the results.

Plans Future Work

Now Dexter has transferred some of his study to the Canada thistle and the bindweeds that have taken out of profitable operation some of the most fertile lands in the state. These weeds are remarkably tender when exposed to temperatures not very far below freezing. At 6 to 8 degrees Centigrade, or around 22 degrees Fahrenheit, the roots are killed. He is studying the possibilities of coaxing the weed roots to the surface or making them somewhat less resistant, so that weather conditions such as drouth or winter freezing can enter the fight and put them under control.

Circle M Ranch Makes a Profitable Comeback

(*From page* 15)

plants 2½ bushels of seed per acre in 3-foot rows and thins the plants to three stalks to the hill a foot apart in the drill.

He insists on planting good seed of the best variety. He grows enough foundation seed each year to supply the entire plantation with first-year increase seed. The ranch has its own gin, so no trouble is encountered in keeping the seed from mixing at the gin.

Believing in growing his own feed but with little land adapted to corn, Mr. Minor is turning to the production of soybeans as a substitute for corn. He plants Biloxi soybeans in all corn and grows a large acreage in Mammoth Yellow beans planted alone.

Quail production is an important part of the farm program and cowpeas, common lespedeza, and lespedeza sericea are grown on each 40 acres of land on the plantation. The acreage in lespedeza sericea is being doubled this year. Four hundred acres of Kobe, Korean, and Tennessee were grown last year, but Mr. Minor does not expect to plant any more Korean, as it is too subject to winter-killing.

The planting of summer legumes for hay, for grazing work stock, and for quail feed enables him to build up the soil-building allowance for the farm under the agricultural conservation program.

Forty individual laying houses have been built for quail. One pair of birds is placed in each house. A 2,300-egg-capacity incubator has been installed and brooder houses built. As soon as the young birds are large enough they will be released on the reservation.

Another interesting feature of the

plantation management is that each of the 150 tenant families is required to grow a good home garden and home orchard and produce enough livestock and livestock products for home use. On no plantation which I have visited have I seen more good gardens and splendid orchards.

Each tenant family is required to grow a good home garden and orchard and produce enough livestock and livestock products for home use.

Arrangements have been completed for giving practical training to negro children in agricultural vocational work and home economics. A well-equipped work shop has been constructed in connection with the school, and the boys are receiving excellent training in carpentering and blacksmithing.

High Potash Fertilizers Grow Better Tomatoes

(*From page* 19)

Grover Bear, a 4-H Club member, increased his yield 60 per cent by adding 100 pounds of potash on one-half acre in addition to the 250 pounds of 2-12-6 fertilizer already applied. His quality also was increased at least 50 per cent.

In 1933 eight 4-H Club boys completed the Tomato Club Project with an increase in yield of from 30 to 56 per cent in favor of a 2-8-16 fertilizer over a 2-16-8. In both cases they were used at the rate of 500 pounds per acre applied with the fertilizer attachment on a corn drill. The same year 34 farmers used 2-8-16 fertilizer on their tomato patches as a result of the experience of the 4-H Club boys the preceding two years. The best 20 growers using 2-16-8 fertilizer were checked against the best 20 using the 2-8-16. The usual amount applied was 300 pounds per acre applied with a corn drill as previously described. Those using 2-8-16 had an average increase in yield of 16 per cent over those using 2-16-8. In 1934 there were 188 farmers out of 198 contracting with the local canning factory who used 2-8-16 fertilizer. The season of 1934 was not as good as that of 1933, yet the average yield was 17 per cent higher than the average yield of all contracts in 1933.

The new rapid chemical soil tests for phosphate and potash have shown that the 2-8-16 ratio is about right in most cases. Farmers are being urged to follow these recommendations. An effort was made both in 1935 and 1936 to see if still more potash would be more profitable, using an 0-8-24 and an 0-8-32. There did not seem to be a noticeable increase in yield, but the tomatoes were darker and more solid.

This work is being continued balancing one standard fertilizer analysis against another and using varying amounts of extra potash. The picture shown gives some idea of the increase in quality of the tomatoes. Those on the left ripened a deep red evenly up to the stem with practically no cracking, while those on the right never got very red and retained a hard, green core around the stem and were very badly cracked. Those on the left were taken from a plot that received 300 pounds of 2-8-16 per acre drilled both ways with a corn drill, while those on the right received the same amount of 2-16-8. This method of applying fertilizer seems best to Jennings farmers.

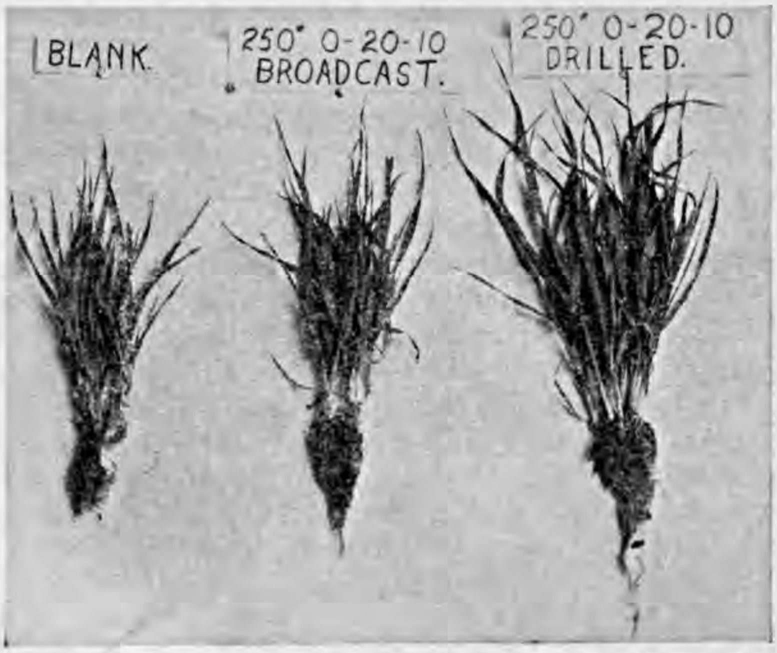
The proper amount of potash makes it possible for the farmer to pick practically all his tomatoes and he finds them marketable at the factory.

Fertilizer Response on Colby Silt Loam

(*From page* 8)

top-dressing on the first-year hay.

The distribution of the increased values among the crops grown indicates that (aside from plots No. 6 and No. 7) barley ranks first. The value of the barley increased in all cases and exceeded the fertilizer cost where soluble phosphate or phosphate-potash mixtures were used on that crop. Benefits on the hay crops, first and second year, show profitable returns particularly where potash is used with either form of phosphate. The indirect benefits on the corn crop are also important from the standpoint of financial returns.



It is important to use the right kind of fertilizer, but equally important to apply it so as to get maximum benefits. Drilling in the row gives increases in yield over broadcasting equal to 4 to 6 bushels per acre.

While this piece of work has been carried on only a relatively short time, it confirms the findings on other work in that phosphorus alone is not a well-balanced fertilizer for this soil type. Under conditions such as prevail on this field, a need for potash is indicated, and quite likely the use of some nitrogen would represent a more nearly balanced mixture for the crops grown in this rotation.

Alfalfa Athletics

(*From page* 5)

present form, being diagrammed and made legitimate at Cooperstown, N. Y., by General Abner Doubleday, who led the first artillery fire of the War Between the States at Fort Sumter. Thus the town founded by the family of the author who created that boyland hero, Leatherstocking, was destined to be the cradle of the game so full of other juvenile gods parading on the diamond as Red Sox or White Sox.

Horseshoe pitching and catch-as-catch-can wrestling were early types of sport which our forefathers indulged in when Lincoln worked at Offut's store in New Salem, and the rivers carried something from the farmer's land besides gumbo down to New Orleans.

"Quoits" has survived in royal fashion, and many a county and state fair has its rows of husky tossers busy clinking the rings against the stakes in perspiring tournaments. If a golfer thinks his is the only game where a good stance is required, let him come with me to Hunky Bodkin's hardware store at Corn Corners and have a fling under the elms with the grass-roots gang!

Rest assured there will be ample provisions made for barnyard golf in my ambitious athletic bill; and some of my cronies will be rewarded with all the nigger-hair fine-cut they can chew in a day's workout, and gold-plated shoes and platinum stakes to boot. And be it known far and wide moreover, some of the professors in agricultural colleges are no mean slouches at this engrossing game either, and hence we will not lack the distinction of a brain-trust in establishing our new bureaucracy. In fact, if we keep them busy ringing the pins the public will have no chance to criticize them for long-distance planning, nor will they disturb the repose of the supreme court by hatching up new jig-saw puzzles which must be solved each Monday morning.

That indeed will be a "great day." If anything has rested our rural mentality after tussling with international repercussions and economic enigmas, it is the making of repeated ringers in our shirt sleeves, in company with plenty of ordinary chaps and extraordinary refreshments!

How fitting it is for us to usher in this athletic innovation may be seen by casting a parallel between a good standard agricultural history and a sketchy outline of the growth of baseball, such as Mr. Spalding wrote. While one is known as the great American sport and the other is called lots of other names, these two great movements have many points in common experience.

HISTORY informs us that baseball grew slowly from two boys, a bat, and a ball into successive stages like one, two, and three old cat, as fast as new boys appeared on the lot desirous of participating. Later the group became a throng, and "town ball" was played. It is like that in agriculture. Farmers were at first scattered and unacquainted with each other. They had to learn to make room for each other and fix up rules so that all might take part.

After the game of baseball was charted and defined, the players organized leagues out of their local clubs. Here again history repeated itself in agriculture, for we finally had the Grange, the Farm Bureau, the Alliance, the Equity, and the Farmers Union. All were after the pennant.

But other improvements remained. Busted fingers in the field and bruised bellies behind the bat got sort of tiresome to both players and farmers. The players adopted the mitt, the glove, the mask, and the chest protector, while the alfalfa leaguers went to Congress and got cooperative laws and credit easements.

Football likewise will be made over for the farm participants, using the same holy rituals and accolades with which the college conferences endow the sacred game. In fact, we intend to dim the luster of the academies some considerable when the full fury of our attack is perfected. We will have mass meetings and pep celebrations, snake dances, and bonfires. If necessary we will import some of the striking actors from Hollywood and the extras for the mob scenes. The bonfire idea is especially noteworthy because there are so many ancient grudges which a rousing blaze will consume. We will take our hirelings and plaster paint and mud on the doors of our agricultural anathemas, just to keep alive the splendid spirit of alfalfa allegiance and agricultural aggressiveness.

I can almost hear our chants and hymns rising over the gridiron as we gird for battle; while our coaches will be borrowed from Joe Louis and Jimmie Braddock—one or both of whom may be willing to dispose of their services quite reasonably, late this summer. Ordinary qualifications such as college coaches possess will not suffice us. The ability to write syndicated columns or to make speeches to alumni will not be as much suited to our needs as skill at skull thumping and nose biting. We intend to make football a game again!

Yes, and track meets, too! Herein I tell you we shall have none of your steam-heated gymnasia productions, but exhibitions by hairy-chested survivors of the epoch of farm suppression, men with all the endurance and smoldering revenge of the ancient Greeks (but used to better food).

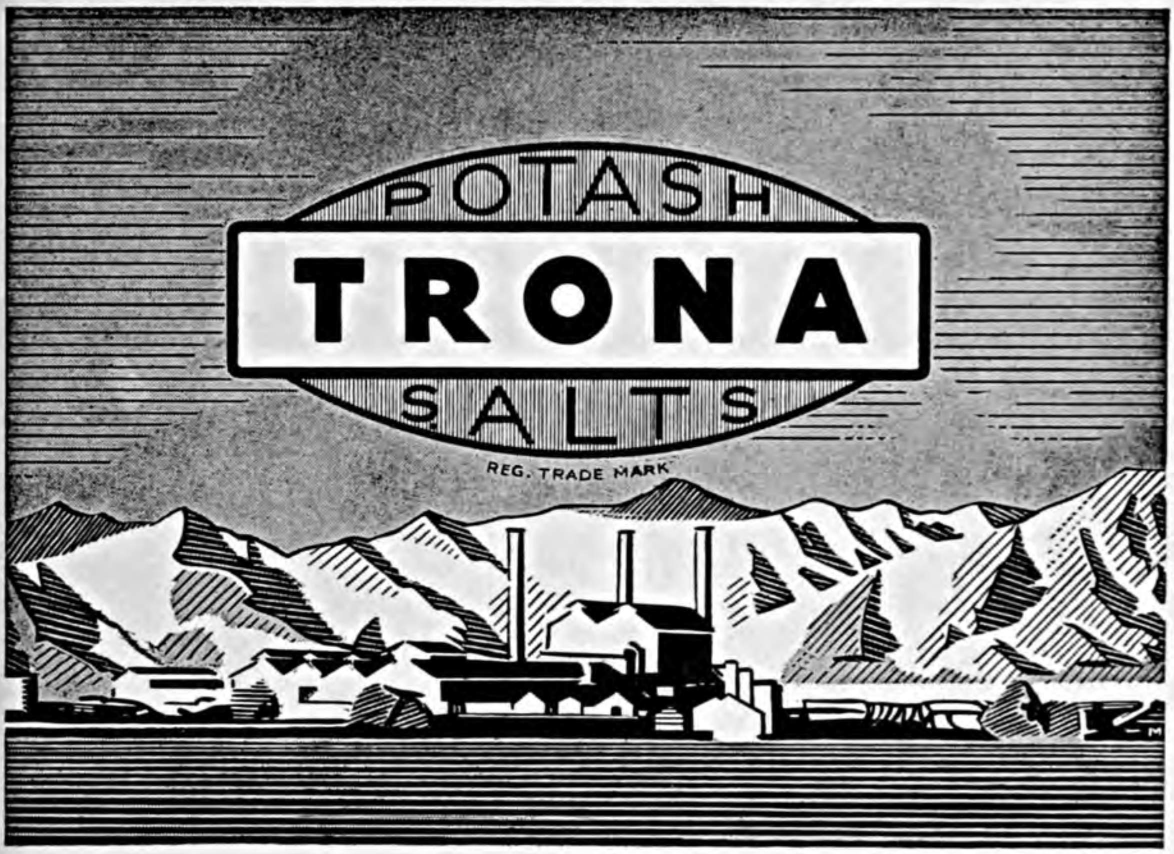
Take our hurdle racers. There we shall develop middle-aged farmers who have had much experience jumping hurdles of hard times with mortgages and taxes loaded on their backs. Pole vaulting will be done by others who have tried to lean on wobbling farm prices while leaping over the barriers of high-living-cost indices. Our broad jumpers will be men who have cleared the slough of despondency with a flock of creditors yapping at their heels. And our famous cross-country team will be selected from among those who have lost everything but their shirt-tails and are used to keeping up steam when nearly stripped and with their tongues hanging out! And the tape we use at the finish won't be ticker tape!

THIS grandiose scheme of mine expressed in verbal allegory has plenty of substance behind it nevertheless. For during the past few years we have set going a brand of *mental athletics* amongst our bucolic brotherhood, whose fruits the coming generation will pick, if we do not.

By exercising the mind and spirit together the farmers of America have learned that no matter if our coaches are wise and honest and our intentions are the noblest, we cannot win any touchdowns unless we know the rules of the game backward and forward and have a pretty good line on the tactics of the opposition.

We must surely have found out ere this that it is teamwork that makes the goals and not a few selfish independent players. We have been taught by kicks and scuffles that there is no easy road to winning, and we must perceive that not all the off-side plays and foul balls are made by the other side.

Right now it is summer, farmers are busy afield and a-touring, so we all relax and take a recess. But let us hope that the fresh air, the vitamins, and the sanity drawn into our bodies this season will bring us back in trim to stand the rigors of a hard winter.



Trona on Searles Lake, California

TRONA MURIATE of POTASH

"Potash is the *quality* element in the fertilizer mixture. It not only increases yields, but gives to fruits and vegetables the finish and keeping quality which bring best market prices. Potash improves the burning quality of tobacco, and the shape and cooking quality of potatoes. It promotes the growth of clover in pastures, and produces better stands of alfalfa."

American Potash & Chemical Corporation
70 Pine Street New York
Sales Offices
Atlanta, Ga. Baltimore, Md. Chicago, Ill.
PIONEER PRODUCERS OF MURIATE IN AMERICA

POINT OF VIEW

"Certainly I respect your legal advice, Mr. Bell, but what good is alimony on a cold night?"

Skipper: "Boy, take your thumb out of that soup."

Messman: "Dat soup ain't hot, captain."

"Constable, you'd better lock me up. I've hit my wife on the head with a coal hammer."

"Have you killed her?"

"I don't think so. That's why I want to be locked up."

MISTAKEN IDENTITY

"As I was crossing the bridge the other day," said an Irishman, "I met Pat O'Brien. 'O'Brien,' says I, 'how are you?' 'Pretty well, thank you, Brady,' says he. 'Brady!' says I, 'that's not my name.' 'Faith,' says he, 'and mine's not O'Brien.'

"With that we again looked at each other, an' sure enough it was nayther of us."

The chemist had had a scene with his wife, who finally broke down crying. Whereupon he ejaculated.

"Stop crying! Your tears have no effect on me. What are they? A small percentage of phosphorus salts, a little sodium chloride. All the rest —water. Bah!"

Our past mistakes always bother us, especially at night when we sit around wishing we were young enough to repeat some of them.

TAKE YOUR CHOICE

"Don't talk to me about lawyers, my dear. I've had so much trouble over the property that I sometimes wish my husband hadn't died!"

No clergyman being present at a recent luncheon, the host singled out a pious, solemn-looking man in a black coat and tie, with a religious appearance, and asked him to pronounce a blessing.

The gentleman after being addressed put his hand to his ear and craned forward intently.

"I can tell you're talking to me, sir," he said loudly, "but I'm so damn deaf I can't tell what in hell you're saying."

"I read in a book that Apollo was chasing a nymph and she turned into a tree."

"He was lucky. Those I chase always turn into a night club or a restaurant."

NO DOUBT ABOUT IT

Negro Parson: "Well, Deacon Jones, what does you'all think of my preaching a sermon on the widow's mite?"

Deacon: "I thinks, parson, it would be a waste of time, cuz dere is only two widows in dis yere congregation and Ah knows dey does."

Better Crops WITH PLANT FOOD

Aug.-Sept. 1937 10 Cents

The Pocket Book of Agriculture

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- Southern Tobacco Recommendations
- Grow More Corn (South)
- Fertilize Potatoes for Quality and Profits (Pacific Coast)
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AMERICAN POTASH INSTITUTE, INC.

INVESTMENT BUILDING **WASHINGTON, D. C.**

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

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THE MOST IMPORTANT STEP IN THE PROCESS OF MAKING FRIENDS.

Better Crops with PLANT FOOD

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Flowers bloom again in the—

Sand Country

Jeff McDermid

IF THERE be one thing to console me in a year of low mean temperatures and excess moisture, it is the comfortable sense of security I possess concerning the crop prospects of my old friends in the sand country. By "sand country" I do not mean the long-leaf pine barrens of Dixie nor the shifting dunes that border the great blue seas of our midlands. Instead my thoughts lie with the farmers who reside along the river valleys and on the beds of extinct glacial lakes up in the northern rye and potato belt.

One more drouth in that region would change county agents permanently into relief workers and breed more righteous radicals than Messrs. Townley and Townsend ever created. It is of course true that even in scorching seasons of dribbling rainfall some of those old buddies of mine come through with a comparative oasis in the Sahara of despair. By dint of better seed, spring plowing, culti-packing and rolling, legume culture, and proper fertilization, they find better use for their silicate surplus than in the mixing of mortar or the manufacture of glass and sandpaper; and the soil-conserving payments have provided their cows with alfalfa and their land with nitrogen. So a few of them might undergo one more dry summer siege among the sand-burs without complete loss of morale. But still old

Sol and Jupe Pluvius have a strangle hold on the majority.

It is evident to all weather-wiseacres that I am taking a long shot in the dark and perhaps counting a few turkeys before Thanksgiving, for the favorable season thus far for the go-getters on the sands may turn by September into another sizzling holocaust for hoe crops. But having consulted ground hogs, soothsayers, medical almanacs, and my own unfailing hunches, I feel as safe in rejoicing over the situation in the "quartz quarries" as any writer can be who sticks out his neck in public.

If I flop in my surmises, I flop on the side of optimism; and optimism is a trait which all farmers have but which they seldom admit or tolerate in any of their friends. My proof of this statement is simply that every dust-bowl population rises on its haunches and offers free rides on a rail to those who suggest regional abandonment. Home is always "sweet" home no matter if there happens to be more sand than sugar in the porringer.

They resist the resettlement idea vehemently on the one hand and send piteous pleas to congressional feed lobbies meanwhile. They are Americans and therefore strong for rehabilitation instead, adhering to the traditional right to stick it out with a loan rather than to desert the desert.

AND probably many of them are right. For maybe it is as sound to improve farms under the stress of human emotions as it was to exploit land resources for material expansion. At any rate our money is as safe spent on troublesome soils as it is shipped to war zones abroad. If we are bound to invest in nitrogen, let's put it into grass rather than nitroglycerin. Let's grow sod for beefsteak instead of a green mound to cover a soldier's grave!

As I was saying before I was interrupted, it looks like a bonanza year for the boys among the jack pines. I have recently been up there celebrating with them on their stock of rye—not in the cellars, but in the bins.

It doesn't take so long to get there as it used to when a team got all lathered up pulling a narrow-tired buggy hub-deep in "corn meal." Cement arteries connect the county seats and stabilized roads penetrate into the townships. They even cross the big slough where too much water created peat soils on the edges of equally unproductive areas of sieve-like, bone-dry blow sand. Fertility was leached out of the one kind and baked out of the other until the experiment stations took a hand.

WE had three kinds of experiment stations on the sands. There were the few independent fellows who brought sound ideas from "York state" or read up religiously so as to become cultured in agriculture. Then there were a few outstanding supervisors of county asylum farms, who believed that public funds might be spent on worn-out land as effectively as on broken humanity. They found that both the sick soil and the weak mind benefited thereby, the former by the labor of the inmates, and the inmates by a reasonable amount of ozone, exercise, and sunshine vitamins. In fact some asylum farms proved there was no excuse for lack of alfalfa on the sands, for even the folks with weak noodles grew big nodules. The third type of experimental farm was run by the land-grant college.

I began attending these "rotation revivals" back in the days when there was only one car for every ten persons—and they all got into it to join the "mourners" at the station farm. There were no loans to lean on without security in those times; and if there was a choice between poverty or professors, they chose the latter.

A good many farmers staved off the sheriff by what they learned from the professor, even though it was often a graphic lesson in what not to do rather than a magic key to new riches. And by the way, if we all practiced not doing the things that harm us, all

soils would be stronger and the world would be at peace. So a few negatives sometimes make a positive.

En route to the sand station one always stirred up a few Indians—or "Injuns" to be exact. Nothing whatever to be alarmed about, I assure you, as they lived in oval, canvas-covered wigwams a few rods off the road and sold willow baskets. Sales were slim because folks in those parts didn't have much to put into baskets.

WHEN the state began to settle up, the government shoved the Injuns off the clay loams and black prairie soils as fast as European colonizers arrived, which was the true American system of being extra nice to folks from abroad. The Injuns squatted on the sands or sploshed through the peat marshes hunting ducks and furs, but they never tried to do any farming. Wisely enough, they left that for the white folks, and then when some settler quit his premises after a crop failure, the tribesmen moved into the bleak shanty and kept on making more baskets. As a matter of fact, baskets were the main surplus crop of the sand area, so it was the redskins and not the white brothers who were guilty of overdoing production thereabouts.

THE advent of the auto did as much for the sand country as our scientific advancement in "cropology." The buzz-buggy brought good roads, and good roads brought the city curio hunters, tourists, and summer boarders. The newcomers with some leisure and spare cash enlivened the basket business; in fact, the conservative aborigines were forced into all manner of shrewd souvenir craftsmanship, taking a cue from the professional hounds.

Our tribesmen were mostly Winnebago Injuns, but the beadwork, headdresses, and moccasins they now contrive to sell have a decidedly un-Winnebago, mail-order aspect—more like Arapahoe, Aztec, or Navajo—with a medley of color and design truly painful to your student of Injun lore. They have gone Hollywood in everything, while baskets no longer mark the limit of their commercialism.

Moreover the promoters of wilderness settings have induced the "savages" to hold costume dances nightly at the frequent roadhouses. I never patronize these pow-wows because my own memories of Winnebago womanhood hardly associate her generous type of figure with graceful terpsichorean abandon. Yet I presume city visitors possess far finer imaginations than one bred so far upstream.

In like manner the summer visitors have injected new life into many of our own race whose despair of acquiring sudden fortunes in rye and blueberries sent them after the tourist trade. Several enterprising young men have dug through all the musty attics and dusty closets in the county, loading their plunder of ancient, smeary, and useless articles into light trucks, and then doing them over for the antique hunters.

Other weary sand-grubbers have given up the scrap with quack-grass and mustard and have gone in heavy for recreation dispensing. They put up some rustic benches and pergolas made from pine or tamarack, seed down a few square yards of spotty lawn, raise a few broilers in the spring, catch some crappies or perch in adjacent waters, spell out a frenzied farm name on a decorated board—and then wait for the first hungry crowd with a flat tire! Oh, yes, the best of them get regular customers on purpose, too, and many of them deserve a return trial.

ANOTHER, and thank heaven, a minor group, proceed on the theory that the sand country is naturally a thirsty place with a very low water-holding capacity. They are the mischief makers who have even put the Injuns to shame with liquid hell broth. At least Brother Little Skunk never mixed slough water, benzine, furfural, and peppermint juice to help tourists hit 90 miles an hour to get nowhere fast. These lousy birds have given town boards more headaches than their best customers and caused more financial loss than all the delinquent taxes ever piled up in the sand belt. No doubt their only contribution to unemployment problems has been making more jobs for highway policemen and prison guards. These bleary, rancid sink-holes of poison gas and rascality show clearly that what man does to the sand country is far meaner than any trick geology played on us—and sometimes a darn sight harder to correct.

I do not pretend that such irregularities are especially peculiar to the behavior in the light soil sections, for we have just such social sore spots in the rich belt too. But I maintain that somehow they look worse and have a more disheartening effect, just the same as when a sand-land farmer neglects his fertilizer and his livestock or lets his buildings sag and rot. It takes less to drag down a poor country than it does to tarnish the better kind. When folks cast their lot in a spot where it takes good brains, everlasting grit, and steady gumption to go places, we can't afford to get careless with chemicals. Better put them on the weeds!

We can thank our stars, however, that most of the young farm folks of these parts see the danger signals and prefer milk. This is surely mighty comforting, for if we can limit the sousing and cavorting to the old slinks who never made a nickel on the sands anyhow and encourage this 4-H club work and Future Farmer activity, our next generation of sand farmers will rise up and beat nature in more ways than one. It is this promising outlook in education and cooperation among the teen-age groups which gives me the most optimism about the long-time future of life in the sand country. Our county agents won't run so many soil tests for folks who need brain tests when that happens.

IT MAY seem strange, but I do not wonder overmuch why so many urban denizens flock in shoals up through the light soil belt. Of course, the fishing is fair if you are not too particular, but there are other points of merit.

The sand country is a place of beauty during any season from anemone time in April to golden-rod and iron-weed season in the fall. There are sun-flecked lakes with red-wing blackbirds perched on spiky cat-tail reeds. There are foaming trout brooks babbling through rough pastures. Here and there gaunt sandstone crags riven by wind and changing tempera-

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Atkinson Demonstrates That It Can Be Done

By F. J. Hurst
Editor, Agricultural Extension Service, State College, Mississippi

UNUSUAL achievement in any field usually brings its reward. Emerson once said that if you write a better book, preach a better sermon, or make a better mouse trap than anyone else, the world will beat a path to your door.

And he might have added that any farmer who could take over a neglected, run-down worn-out farm, during depression years, improve it and make money out of it, would be hailed as "a successful farmer" and farmers from far and near would visit him to see at first hand what he had done and how he had done it.

That is the story of W. S. Atkinson of Valley, Yazoo County, Miss. Ten years ago he proposed to buy a big farm near Valley. He asked some of the most successful farmers in the community what they thought about it. They advised him against it. "It broke everyone who ever owned it or tried to operate it," they told him.

Undeterred by their warning, Mr. Atkinson bought the place. It had been poorly farmed and badly man-

A rear view of the distributor showing that it cultivates the cotton as well as places the fertilizer.

W. S. Atkinson (left) shows how his tractor-drawn fertilizer distributor, which covers two rows at a time, places the fertilizer in bands about 2½ inches from the stalks.

aged. No crop rotation had been followed. No soil-improvement program had been practiced. No fertilizer was used.

As a result, crop yields were low. Previous owners had made only from one-fifth to one-sixth of a bale of cotton per acre. "Cotton will do fairly well up to July 1, and then quit," they said.

When Mr. Atkinson took charge of the plantation he immediately inaugurated a better system of farming. The land was plowed deeper. Crops were cultivated better. A definite soil-building program was mapped out and followed. Feed crops were grown. Soybeans were planted in all corn. Sufficient cowpeas and soybeans were grown to meet farm needs for hay. An additional acreage of cowpeas was planted for turning under for soil-improvement purposes. Nitrogen and phosphate fertilizers were used.

Under this system crop yields were increased. Yields of cotton, however, still were not satisfactory. So, in 1935, Mr. Atkinson arranged with the Delta Experiment Station at Stoneville to conduct fertilizer tests with cotton on his plantation. These tests revealed an acute need of potash, which when added to nitrogen and phosphate fertilizers, had a marked effect on increasing both yields and profits.

In the tests, check plots yielded 656 pounds of seed cotton per acre; the application of 100 pounds of nitrate of soda gave a yield of 725 pounds of seed cotton per acre; 100 pounds of nitrate of soda and 100 pounds of 20% phosphate produced 842.4 pounds; and 100 pounds of nitrate of soda, 100 pounds of 20% phosphate and 100 pounds of 50% muriate of potash produced 1,111.5 pounds per acre.

Why This Increase?

Mr. Atkinson gives three reasons for the increased yields resulting from the use of a complete fertilizer. First, the direct effect of potash as a plant food. His soil is deficient in this essential plant-food element and its application helps to supply this deficiency.

Second, potash had a marked effect in controlling rust. Fertilized cotton remained green and continued growing and fruiting 3 to 4 weeks longer than unfertilized cotton. On a neighbor's adjoining cotton field which received no fertilizer, cotton rusted badly and produced much lower yields.

Third, the fertilized cotton produced larger bolls.

Up to the time the tests were made, Mr. Atkinson had used only nitrogen and phosphorus fertilizers. The test showed that a complete fertilizer was needed and that the application of potash increased yields more than either nitrogen or phosphorus.

In 1936, Mr. Atkinson planted 735 acres in cotton. One-half of this acreage was fertilized with 100 pounds of nitrate of soda as a side-dressing. The other half was fertilized with a complete fertilizer composed of 100 pounds of 20% phosphate and 100 pounds of 50% muriate of potash which was applied before planting, and 100 pounds of nitrate of soda per acre applied as a side-dressing. The complete fertilizer produced an average increase of 52 per cent.

This year Mr. Atkinson has 850 acres in cotton. He used a complete fertilizer as described above on every acre planted to cotton.

In describing the results obtained from fertilizers on Mr. Atkinson's farm, it is interesting to know that his farm is located in what is known as the foothills where soil has been washed in from the adjoining hills. This area extends all the way from Vicksburg to Memphis along the edges of the delta and brown loam areas of the state. Fertilizer tests conducted on other farms in Yazoo County and in other counties in the area described have uniformly shown a need for potash.

Uses Improved Machinery

Mr. Atkinson is probably the first farmer in Mississippi to purchase one of the recently invented fertilizer distributors which applies the fertilizer in bands about 2 inches from the seed or plant and at the best depth. This year Mr. Atkinson used this machine on plowed land to form the beds, plant the cotton seed, and apply the fertilizer all at one operation. The phosphorus and potash mixture was applied at planting time with the distributor, and the nitrate of soda was applied with the same machine as a side-dressing.

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The cotton left of the stake in this test field was waist high. It was fertilized with 600 pounds of 6-8-20 per acre. On July 2 when this picture was made, it had 2½ to 3 times the growth and fruit of the check plat at the right.

Shall It Be Soil-mining Or Soil-Building?

By C. J. Chapman
Wisconsin College of Agriculture, Madison, Wisconsin

WE here in Wisconsin are hearing a lot about soil conservation these days, and we wonder when we read and hear such statements as the following: "Wisconsin farmers have been living on their fat;" "We have skimmed the cream of virgin fertility;" "We are cashing checks on our bank account, the soil;" "Practicing an exploitative system of farming;" "Wasting our substance;" and "Mining our soils." We frequently hear the statement, "The nation that destroys its soil, destroys itself." Can it be true that we are really headed for national suicide? Are our Wisconsin farms being mined of their fertility?

Yes, it certainly is true that Wisconsin farms are losing fertility at an alarming rate. The average Wisconsin dairy farm is losing phosphorus and potash at a rate equivalent to 1 ton of 20 per cent superphosphate and at least 1 ton of 50 per cent muriate of potash each year. We have piled up in the past 50 years of farming a total loss of phosphorus and potassium equivalent to at least 50 tons of 20 per cent superphosphate and 50 tons of muriate of potash. We have labored under the false impression that in the livestock system of farming, where all crops grown on the farm were fed to livestock and the manure returned to the land, we were keeping up the fertility of our soils, keeping the plant food of our farms in circulation.

Potash hunger manifests itself in the white fleckings on the margins of alfalfa leaves. Alfalfa is a heavy feeder on potash.

But what evidence have we to show that we are actually losing fertility at the rate mentioned above? The best evidence, of course, of an unbalanced state of fertility is the fact that our soils are not as productive as they used to be. Clover seedings have failed in recent years; grain yields are lower; there is more lodging of our grains. Yields of corn are not what they were in the early days. All this, in spite of improved and higher yielding varieties of corn and grain.

It is true that stable manure is a good fertilizer. Every effort should be made to save this valuable source of plant food and get it back on the land. The liquid portion is especially rich in nitrogen and potash. However, the supply of manure on the average farm is limited. There is not enough to go around. Even where every forkful of manure is saved and returned to the land, it is apparent that the level of fertility is not being maintained.

On the Wallace Landry farm, Thorpe, Wisconsin (colby silt loam), potash in the fertilizer in 1936 made a difference between almost a failure and a poor crop of barley.

Barley, 1936 (dry year):	Alfalfa, 1937, first crop (wet year):
Check plot — 1.9 bu.	1,833 lbs.
0-20-0 plot — 5.3 bu.	2,166 lbs.
0-20-10 plot—10.8 bu.	2,833 lbs.

The residual benefit to the alfalfa in 1937 made a difference of ½ ton per acre in the first cutting where the 0-20-10 was used.

Unavoidable Losses

We estimate that in Wisconsin we are producing from our 3,000,000 head of dairy cattle about 30,000,000 tons of manure each year. Valued at $3.00 a ton, this source of plant food on the basis of present prices for commercial fertilizers is worth nearly $100,000,000, yet authorities estimate that fully one-third of the plant-food constituents of manure is lost. In spite of the most careful handling of manure, there are unavoidable losses of plant food.

It would appear from the above that we are losing annually better than $30,000,000 worth of plant food from our soils, even where all crops grown on our farms are fed to livestock and manure returned to the land. And I have not included in the above the manure produced by beef cattle, hogs, sheep, or poultry, which if added would doubtless increase the net loss by $5,000,000. Wisconsin farmers are buying less than $1,500,000 worth of commercial fertilizers each year. This year, 1937, about 40,000 tons of commercial fertilizers were used on Wisconsin farms, which at $35 per ton amounts to $1,400,000.

We know that milk is rich in phosphorus. Eight thousand pounds of milk contain the equivalent of 100 pounds of 20 per cent superphosphate. A good cow will produce 8,000 pounds of milk a year; therefore, we are losing the equivalent of a 100-pound sack of 20 per cent superphosphate for each cow in our herds. If a farmer is milking 20 cows, he is losing the equivalent of 1 ton of 20 per cent superphosphate in the sale of milk.

Every 1,000 pounds of livestock sold from the farm carry the equivalent of 100 pounds of 16 per cent superphosphate. We are selling calves, hogs, poultry, and poultry products; and 2 or 3 head of cattle are sold every year. Every 40 bushels of barley or 30 bushels of wheat sold from the farm carry with them phosphorus equivalent to 100 pounds of 16 per cent superphosphate.

It is true we have offset part of our losses in the purchase of bran, oil meal, and other concentrates which are rich in phosphorus. But the amount of phosphorus added to our farms through the purchase of feed will offset not more than one-fourth of the total loss incurred in the sale of milk, livestock products, and cash crops.

Plant-Food Removal

From the foregoing we can readily see that phosphorus is being lost from our farms at an alarming rate, but it is not so easy to figure the actual loss of potash, since milk and livestock products contain relatively small amounts of it. It's true that where we sell cash crops, that is, grain, hay, potatoes, tobacco, sugar beets, canning peas, cabbage, and other truck, we do lose large amounts of potash. In fact, if we figure the pounds of plant food actually sold and lost from the farm, we note that there is a tremendous loss of available potash from our farms. To illustrate this, I have tabulated a few crops to show the actual losses of phosphoric acid and potash.

say that on many farms in this state where manure is carelessly handled, upwards of 40 per cent of this potash is lost in the feeding transaction and subsequent handling of the manure.

"Well," but you say, "I have plenty of total potassium in my soil. The soil chemists tell me that I've got from 30,000 to 40,000 pounds of elemental potassium per acre."

Yes, that's true, but you must remember that only a small percentage of this total amount is becoming available each year. Dr. Cyril G. Hopkins of Illinois used to tell us that less than ½ of 1 per cent of our total potassium was becoming available each year on the better soils. (Of course, Dr. Hopkins was never really much worried about an eventual potash shortage.) But now if we figure that we are losing 25 to 40 per cent of the available potash each year, and bear in mind the fact that this has been going on every year for the past 75 years, is it any wonder that some of even our best soil types in the state are responding to potash treatment?

Take the case of Will Renk & Sons at Sun Prairie, owners of 4 farms on one of our best soil types in this state (Carrington silt loam). The Renks are good farmers. They have limed every acre of tillable land of their farms. They manure liberally. They have grown legumes on an extensive scale. They have been outstanding

TABLE 1. LOSSES OF PLANT FOOD IN SALE OF CASH CROPS

Crop	Acre yield	Pounds of P_2O_5 lost	Pounds of K_2O lost
Potatoes (tubers)	250 bushels	18 pounds	80 pounds
Sugar beets (roots)	15 tons	23 "	111 "
Tobacco (leaves)	1,500 pounds	5.9 "	82.6 "
Cabbage (heads)	12 tons	26 "	104 "
Alfalfa hay	4 "	43 "	178 "

But even on the dairy farm, where all crops grown are fed to livestock, we are safe in saying that at least 25 per cent of the potash removed from our cultivated fields never gets back to the land. In fact some authorities

livestock farmers—great sheep feeders. They have purchased thousands of tons of feed concentrates, and yet, surprising as it may seem, their soils are responding to the use of fertilizers rich in potash. In fact, we were amazed at the response of barley to fertilizers on their farm in 1936. Tabulated below are the results of a demonstration conducted on barley in 1936.

The Renks purchased a large combination drill in 1937 and fertilized all of their barley—71 acres. They used an 0-20-10 at the rate of 200 pounds per acre. They left a few check strips here and there on some of the fields. We harvested comparable areas in order to determine the increase in yield. This has been a good year for grain, and the average yield on the fertilized barley (0-20-10 treatment) was 55 bushels per acre, as compared to 38½ bushels per acre on the check strips. Although rust did hit the fields and reduce the yields somewhat, rust hurt the unfertilized much more than it did the fertilized, due to difference in stage of maturity when the rust hit. Here's a 16½-bushel increase in yield on what has been considered land in a good state of fertility.

Will Renk and Sons, Sun Prairie, Wisconsin, are convinced that fertilizers pay. The photo shows County Agent R. V. Hurley, Will Renk, and Professor E. J. Graul, eye witnesses to this amazing response to fertilizer treatment. Yields: 0-20-10 = 60.8 bu. per acre, check = 47.7 bu. per acre.

TABLE 2. WILL RENK & SONS FARM RESPONDS TO POTASH TREATMENT

Treatment	Yield per acre	Increase
0-20-0 (200 lb.)	40.4 bu.	4.1 bu.
0-20-10 (200 lb.)	46.6 "	10.3 "
Check	36.3 "	

The more general use of fertilizers applied at the time of seeding down to alfalfa or hay and pasture mixture is being recommended. In the past Wisconsin farmers have been using considerable fertilizer on cash crops such as potatoes, sugar beets, cabbage, and canning peas. Many farmers have applied small amounts of fertilizer with an attachment on the corn planter, and have observed good results. We recommend these practices. The practice of hill dropping a small amount with an attachment on the corn planter has done much to improve the quality, increase the yield, and advance the maturity of our corn crops in Wisconsin.

But this small localized application of fertilizer to corn is not building up the fertility of our farms as a whole. More and more farmers are finding that the broadcasting of fertilizer at the time of seeding is proving a profitable investment. Not only will the fertilizer increase the yields of small grains, but the residual benefits will carry over to the second and third year. Increases of a half ton in the yield of alfalfa or clover are common. Furthermore, the use of fertilizer at the time of seeding may make the difference between a good catch of seeding and failure. Tabulated below is a summary showing average yields of grain in plot demonstrations conducted during the past 5 years.

per acre. Two hundred pounds of 20 per cent superphosphate at present prices would cost about $2.50. At 60 cents a bushel, the increase for the superphosphate treatment is $3.42, leaving a net profit of 92 cents per acre over and above the cost of phosphate fertilizer. The phosphate-potash treatment cost an average of $3.90 per acre. The value of 8.8 bushels of grain at 60 cents a bushel is $5.28, leaving a net profit, over and above cost of fertilizer, of $1.38. We have charged the full cost of the fertilizer

TABLE 3. RESULTS FROM FERTILIZER TREATMENT ON GRAIN

No. of farms	Average yield No fertilizer bushels	Average yield 0-20-0 bushels	Average yield 0-20-10 bushels
42	33.7	39.4	42.5
Average increase in yield............	...	5.7	8.8

These demonstrations were conducted on farms scattered throughout southern and central Wisconsin on the heavier silt or clay loam types of soil. The average application of fertilizer amounted to about 200 pounds against the grain crop. This is hardly fair, for we know the residual carry-over on seedings and other crops will show benefits for 2 or 3 years following.

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Thousands of acres of north-central Wisconsin silt loam soils are starving for potash, phosphates, and lime. This picture shows the response to 0-20-10 on the M. N. Rockman farm at Barron, Wisconsin. Check = 4.6 bu., 0-20-0 = 11.1 bu., 0-20-10 = 16.9 bu.

Minor Elements In Cotton Fertilizers

By R. P. Bledsoe
Georgia Experiment Station, Experiment, Georgia

THE study of fertilizers has been chiefly concerned with the needs of soils and crops for nitrogen, phosphorus, and potassium. Plant physiologists have known for more than 50 years that at least four other elements from the soil are needed for normal plant growth; namely, calcium, sulphur, magnesium, and iron. Recent research in plant physiology has shown that other elements are needed by at least some plants.

This newer group, called "trace" elements because of their effectiveness in minute amounts, consists of manganese, boron, copper, and possibly zinc. Experimenters have tried to prove that other elements are needed by plants, but proof of this is still lacking. Georgia soils contain such an abundance of iron that the probability that it will ever be needed in cotton fertilizer mixtures is very remote. Therefore, this element may be omitted from this discussion.

Higher Analysis Trend

Since the retail cost of plant food is much lower in the more concentrated fertilizers, economic considerations have brought about a trend toward the higher analysis mixtures. These can be and are prepared from the common standard materials, such as superphosphate (a mixture of mono-calcium phosphate and calcium sulphate), ammonium sulphate, nitrate of soda, cottonseed meal, tankage, etc., supplying an abundance of calcium and sulphur and small quantities of magnesium.

The more concentrated materials now available for even higher and more economic plant-food analyses include ammonium nitrate, ammonium phosphate, potassium nitrate, urea, etc., which may contain no more than traces of calcium, magnesium, and sulphur. Experiments in Georgia, North Carolina, and Virginia in cooperation with the U. S. Department of Agriculture showed that acid-forming, concentrated fertilizers prepared from the latter group without additional materials were not as efficient as single-strength fertilizers for cotton on most cotton soils.

Since the major plant-food elements—that is, phosphorus, nitrogen, and potash—can be sold much cheaper in the concentrated form than any other way, it has become a matter of enormous economic importance to determine why concentrated fertilizers gave poorer results with cotton than single-strength fertilizers. Consideration of the problem seemed to indicate that the difference was due in part at least to the equivalent acidity of the sources of nitrogen. However, the content of the minor plant-food elements appeared to be a possible factor calling for further investigation. Therefore a series of experiments was started to determine the value of the minor elements, calcium, sulphur, and magnesium, and the trace elements manganese, boron, copper, and zinc in cotton fertilizers. The results of these experiments showed that good results can be obtained from concentrated fertilizers provided enough limestone is added to the mixture to correct the equivalent acidity. The results obtained from the addition of the minor plant-food elements will be discussed in this paper.

It should be noted that it is impossible to plan a fertilizer experiment so as to eliminate all secondary effects. The chemical reactions in the soil are very complex, and the beneficial effects produced by adding an element to the soil do not in any way mean that that element is needed as a plant food. The reaction of the fertilizer with the soil may produce a condition beneficial to plant growth. For example calcium carbonate is commonly added to soils, not to supply calcium but to raise the pH of the soil. Nitrate of soda on some soils gives better results than other sources of nitrogen, apparently due to the liberation of potash.

In the following experiments some of the benefits noted from the addition of minor elements to the soil may have been due to such secondary effects rather than to the use of the element as a plant food. Also, the fertilizer used may have contained minute quantities of zinc, boron, copper, or manganese which could not be detected by ordinary analysis.

Calcium Proves Beneficial

The experiment to test the value of calcium sulphate in cotton fertilizers has been run for 3 years at 10 locations. The basic fertilizer was made from mono-calcium phosphate, nitrate of soda, and potassium chloride. Such a fertilizer would contain some calcium but not as much as is found in ordinary fertilizers, and no sulphur.

When 50 pounds of calcium sulphate were added to the above fertilizers, the yield of cotton was increased 81 pounds of seed cotton per acre. The increase was five times the experimental error, so that the results were highly significant.

When potassium sulphate was used in the above fertilizer in place of potassium chloride, the yield of cotton was increased 20 pounds. This increase was too small to be very significant.

The above experiment seems to indicate that cotton fertilizers should contain a fairly large amount of calcium and possibly some sulphur. However, a possible explanation of the increase obtained in this experiment is that the sulphate content of the fertilizers increased the availability of the magnesium in the soil and therefore increased yields.

In other experiments calcium carbonate was added to acid concentrated fertilizer. Most of the increases obtained from the limestone were undoubtedly due to correcting the acidity of the fertilizer, but some may have been due to the value of the calcium as a plant food.

Results From Magnesium

Results from three experiments with magnesium are available. In the first of these experiments located at the station, 50 pounds of magnesium sulphate were added to a concentrated fertilizer made from ammo-phos, urea, and potassium phosphate. A 7-year average of the results shows that the magnesium sulphate increased the yield of cotton 172 pounds.

In another experiment 50 pounds of magnesium sulphate were applied as a top-dressing on cotton fertilized by the farmer. The farmer's fertilizer may have contained magnesium in some cases. The experiment was run at seven locations over a period of two years. At one location the magnesium produced a decrease both years. At the other six locations the magnesium produced an increase of 41 pounds of seed cotton per acre.

In the third experiment calcic limestone was compared with dolomitic

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A typical example of lodging in a field of winter wheat.

High Potash Fertilizers For Fall Use

By G. J. Callister
American Potash Institute, Inc., Washington, D. C.

THE practice of applying phosphate and potash in the fall is increasing. Such fertilizers as the 0-12-15, 0-12-10, and variations of these analyses—no nitrogen and relatively high percentages of phosphate and potash—are on the market, offering profitable opportunities for use in the fall. Three such possibilities are briefly noted here, namely, on fall wheat, alfalfa and other legume hay crops, and orchard cover crops.

Fall Wheat: As farmers have observed, fertilizers applied to fall wheat often favorably influence the catch of clover and grasses following the wheat. In fact, the residual effect on succeeding crops is often as important as the effect on the wheat to which the fertilizer is applied. Too, as pointed out by the Advisory Fertilizer Board of Ontario, "The use of the proper type of fertilizer offers substantial insurance against winter-killing of fall wheat and clovers."

One of the risks of growing winter wheat is winter-killing, which frequently causes heavy losses. Winter wheat should be sown sufficiently early in the fall to insure a good root development and a top dense enough to hold the snow which serves as protection.

Another risk is the lodging of the crop. This may be due to different causes, but prominent among them is a low mineral level in the soil, resulting in weak straw.

The third risk is the ever-present rust for which there seems to be no preventive other than the breeding of good rust-resistant strains and hastening the maturity of the crop.

Such risks may, however, be reduced by the use of the right fertilizers. High phosphate and high potash will tend to hasten maturity, strengthen the straw, and increase disease resistance. According to Van Slyke, a 40-bushel crop of wheat and

2 tons of clover hay remove 113.2 pounds of potash from the soil. Whether there is enough available potash in the soil is, therefore, an important question. The condition of the crop should be studied. Lodging of the straw, yellowing of the tip of the leaf which later extends along the leaf margin, poorly filled kernels, meager growth, and poor stooling in wheat are evidences that a higher potash fertilizer should be used.

No one analysis will suit all conditions. Whether the land is heavy, whether it has been well manured, or whether the winter wheat follows clover has to be taken into consideration. It is necessary to add nitrogen to phosphates and potash under certain conditions, especially on lighter soils and where no manure has been used.

On the lighter soils the 0-12-10, 2-12-10, 2-8-10, 0-10-10, and 0-12-15, or other high potash analyses should be used. On heavier soils the 2-12-6 or 0-12-6 may be suitable. The rate of application varies, ranging from 200-500 pounds per acre in different wheat-growing sections.

The important thing to remember is that enough fertilizer should be applied to the wheat not only to meet the requirements of the wheat but to benefit the clover following. The average amount of fertilizer applied to wheat in many cases barely takes care of the amounts of phosphate and potash removed by the wheat crop. The clover is therefore on a marginal basis right from the start. If symptoms of starvation are shown by the leaves of the legume, additional fertilizer should be applied to the legume hay.

Alfalfa and Other Legumes: Legumes demand plenty of potash if they are to make a good growth. Minerals can be profitably applied early in the fall as well as early in the spring. On heavy soils the 0-12-6 and on lighter soils the 0-12-10, 0-12-15, or other high phosphate and potash analyses can be profitably used. At least 250 pounds per acre are recommended, and larger amounts should be used if the mineral content of the soil is low.

Straw like this can carry a heavy crop without lodging.

With normal methods of fertilization, it is difficult to provide enough of the minerals, lime, phosphate, and potash, for a longer period than 2 or 3 years. Experimental work and experience of practical alfalfa growers, for example, indicate definitely that by making larger initial applications of the min-

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Growing Herbs In The Family Garden

By E. N. Bressman
United States Department of Agriculture

HERBS are plants that are utilized for culinary and medicinal purposes. They are among our oldest cultivated plants, yet little of a scientific nature is known of the best methods of production and use. Doubtless, the greatest use for herbs grown in the ordinary farm garden would be culinary. At any rate a few of these interesting plants will delight the eye and add "spice" to home cooking.

Many growers have had in the past, and there is no reason why they should not have in the future, a keen interest in medicinal herbs; however, this discussion will be confined chiefly to those herbs that can be used in the farm kitchen. The plants should form a part of the practical rather than the aesthetic type of garden. On many farms, and rightfully, the garden does not remain on one spot of ground year after year. Still, as a rule, there is a patch of ground, possibly close to the grapes or berries, where asparagus, dill, and similar plants are grown. This might be the place to grow a few of the practical culinary herbal plants.

Numerous Varieties

There is no set number of herbs that should be grown in the farm garden. The number of different kinds runs into the hundreds. Some herb enthusiasts feel that it is necessary to grow some half-hundred different sorts in order to qualify as an herbalist. The ordinary farm garden, however, would include anywhere from 6 to 20 different species of herbal plants.

Much detail has been written about just the right amount of sun, shade, moisture, and soil ingredients for herbs. It is true that there are optimum conditions for each and every species. For example, it is claimed that sweet marjoram prefers sandy soil and sweet basil a heavier, richer type. But it is a good guess that farm garden conditions are satisfactory for most herbs. In many gardens the lack of moisture and facilities for supplying moisture daily will be limiting factors. There is no need for going to a lot of trouble making compost, mixing sand and loam, etc. Such procedures look good on paper, but do not fit in with either the farmer's or his wife's busy day.

Keep Under Control

Right here, it might be desirable to point out the possibilities of some herbs becoming weed pests. This is true of various parslies, fennels, and similar types. Under certain climatic conditions these herbs produce large amounts of seeds which might be scattered about the farm. This, however, is a chance one takes in growing any plant outside of the ordinary group of field crops. Ordinary care is the herbalist's best safeguard.

Possibly dill is the most useful herb that the farm garden might include. Its widespread use in the making of pickles puts it in constant demand.

Dill is usually started in flats from seed, but may be planted directly in drill rows in the garden. The seed germinates well, and the plants grow with little difficulty. At harvest the seed heads are stored in bunches for ready use when pickles are made. Their chief function, of course, is to add flavor.

One of the most common herbal plants is mint. There are numerous kinds of mint, but the "common, everyday, garden variety" is spearmint. Its principal use is for flavoring cold drinks, such as iced tea. Another common use of course, is in the making of mint jelly. Mint is an easily grown plant. It is invariably propagated by runners. Ordinarily the plant produces great quantities of runners, and it is never difficult to get a supply for propagating. In some areas it is a commercial crop, and fairly large acreages are to be found on muck soil in the Pacific Northwest, southern Michigan, and northern Indiana. In addition to spearmint there are several other well-known members of the mint family, all characterized by square stems. These include thyme, rosemary, lavender, marjoram, and many others.

A few plants of basil, a small annual that is used primarily for seasoning, would be of value in any herb garden. These are easily started in the field and will grow with ordinary care. The plants are usually harvested when they are in bloom and then dried for use, in the same way as dill and similar seasoning plants.

Sage is one of the most common seasonings used in the kitchen. There are a large number of species of this plant, but the common sage is the one used for culinary purposes. It is propagated either from seed or cuttings. As is well known, the leaves are harvested, dried, and crushed for seasoning purposes. Tarragon is another herbal member of the sage (Artemesia) family.

An herb plant that requires conditions a little different from those usually found in the farm garden is water cress. As its name implies, it requires moist conditions. This plant is more sensitive to lime requirements than most and needs a large amount of lime for satisfactory growth. It is used primarily in salads and for garnishing meats. Often it is kept over winter in a handy spring.

Parsley is a common herb that needs no introduction to farm families. What is of interest, however, is the large number of varieties of this well-known herb. All of them are rather easily grown from seed. Anyone not familiar with the coarser types of parsley that are used in soups would find a pleasant surprise in their aromatic flavor. Of course, there are a large number of herbal plants, both common and rare, that belong to the parsley family. Some that should be included in the farm herb garden are coriander, anise, fennel, and chevril. Many prefer chevril to parsley and use it as a substitute for the latter.

Borage is the family name of several valuable herbs. The best-known culinary herb in this group is called borage. It is an annual that makes a delightful addition to salad because of its cucumber scent.

Unusual Types of Herbs

There is a group of plants, ordinarily classed as vegetables, that may be included with the herbs. This group includes celery, chives, artichokes, garlic, and cucumbers. Celery is sometimes used primarily for its flavor, and the seed may be ground to make what is called "celery salt." Chives and garlic, as is well known, are closely related to the onion, and impart to soups and salads a mild onion flavor. They are propagated through the division of the clumps of small bulbs.

There are many unusual plants that are grown for herbs. Some of these are usually considered weeds and other

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Fertilize to Control Cotton-belt Erosion

By G. A. Hale
Forrest City, Arkansas

EROSION control is largely a problem in the proper use of row-crop land, and the rapid revegetation of all land not in clean-tilled crops. Research in methods of preventing excessive run-off and soil losses shows that a luxuriant growth of vegetation offers ideal protection from erosion. A thick cover of plants on fertile land is a natural condition. Eroded land is usually poor land and sparse vegetation is generally found on washed fields.

Choosing and using the quickest and most economical methods of establishing an erosion-resisting plant cover on washed land comprise one of the big problems of the soil conservationist. Surveys show that most of the topsoil has been eroded from millions of acres now used for cultivated crops. With this topsoil has gone practically all the original organic matter and available nutrients for plant growth. The only way to restore these acres to where they will produce crops economically within a reasonable length of time, is by the use of commercial fertilizers. By fertilizing erosion-resisting crops, accelerated erosion can often be stopped during the first year after planting.

Southeastern farmers have demonstrated that profitable crops can be grown, with the aid of commercial fertilizers, on eroded land. It is true that they have used chemicals as a sort of stimulant for erosion-sick soils

A fall fertilized and seeded meadow waterway with a good vegetative cover in mid-winter.

without adopting soil conservation practices to anything like the extent needed to conserve their valuable topsoil, and much of it has been impoverished beyond repair for growing field crops.

Farmers in the eroded hill sections west of the "fertilizer belt," especially in Arkansas and Louisiana, are overlooking a very good practice to not only help control erosion but also increase acre yields by not using commercial fertilizer along with more erosion-resisting crops. Thousands of acres of comparatively new farm lands in the Southwest are rapidly losing fertility by erosion and excessive cropping, because farmers are not putting back any of the minerals removed by these destructive forces.

Many of the fertilizer experiments to find out what kind to use for most profit in the South have been conducted on the less severely eroded fields and with erosive crops such as corn and cotton. Most of these trials and experiences of farmers indicate that a complete fertilizer containing nitrogen, phosphate, and potash is the most profitable for cotton on hill land. Since cotton, of all common field crops, will usually return the greatest profit per dollar invested for fertilizer, it is a frequent practice to use all the fertilizer in a crop rotation under it.

Legumes Utilize Residue

Where cotton is well fertilized, winter legume cover crops like vetch, crimson clover, and Austrian peas will make satisfactory growth by feeding on the fertilizer residue when planted in the cotton middles. Putting the fertilizer under cotton and following it with legumes is the most practical way to fertilize vetch, lespedeza, and other legumes. It is a waste of seed and labor to plant winter cover crops on badly washed land without fertilizing the preceding crop or applying fertilizer directly to the winter crop.

All legumes are heavy feeders on phosphates, potash, and lime. From 200 to 400 pounds of superphosphate or basic slag per acre are often necessary to make a luxuriant growth of vetch or other legumes for adequate erosion control, when they are well inoculated so they can get required nitrogen from the air. Potash needs of legumes are more variable than phosphate requirements. As a rule, where cotton rusts and on sandy land, applications of from 25 to 50 pounds of muriate of potash will pay under legumes, but as already stated this fertilizer can usually be applied to best advantage to the cotton preceding the legume crop. The lime requirements of southern legume crops, except red clover, sweet clover, and alfalfa, can often be satisfied by the calcium contained in other basic materials, such as superphosphate, when these are used at recommended rates.

Feed the Grasses

Members of the grass family, such as oats, wheat, sorghum, Sudan, Bermuda, and other grasses so valuable in erosion control, are heavy feeders on nitrate of soda, sulphate of ammonia, manure, or other applied nitrogen carriers. Nitrogen is usually the first plant food to become a limiting factor in plant growth on eroded fields. "Grow your nitrogen by planting legumes," has been advocated for many years and is a very commendable recommendation. The sooner the inadequacy of the procedure as now practiced is admitted, the sooner cotton farmers will be induced to arrest the rapid loss of soil nitrogen by supplementing the insufficient amount now gathered by well-inoculated legumes with adequate amounts of commercial nitrogen.

Where grains and grasses are grown in a rotation with cash crops, fertilized with a complete fertilizer, an application of from 100 to 200 pounds of nitrogen fertilizer applied as a top-dressing is usually sufficient for good acre yields. On some fields a nitrogen-potash mixture may be used profitably on grain.

Newly sodded or seeded pastures on

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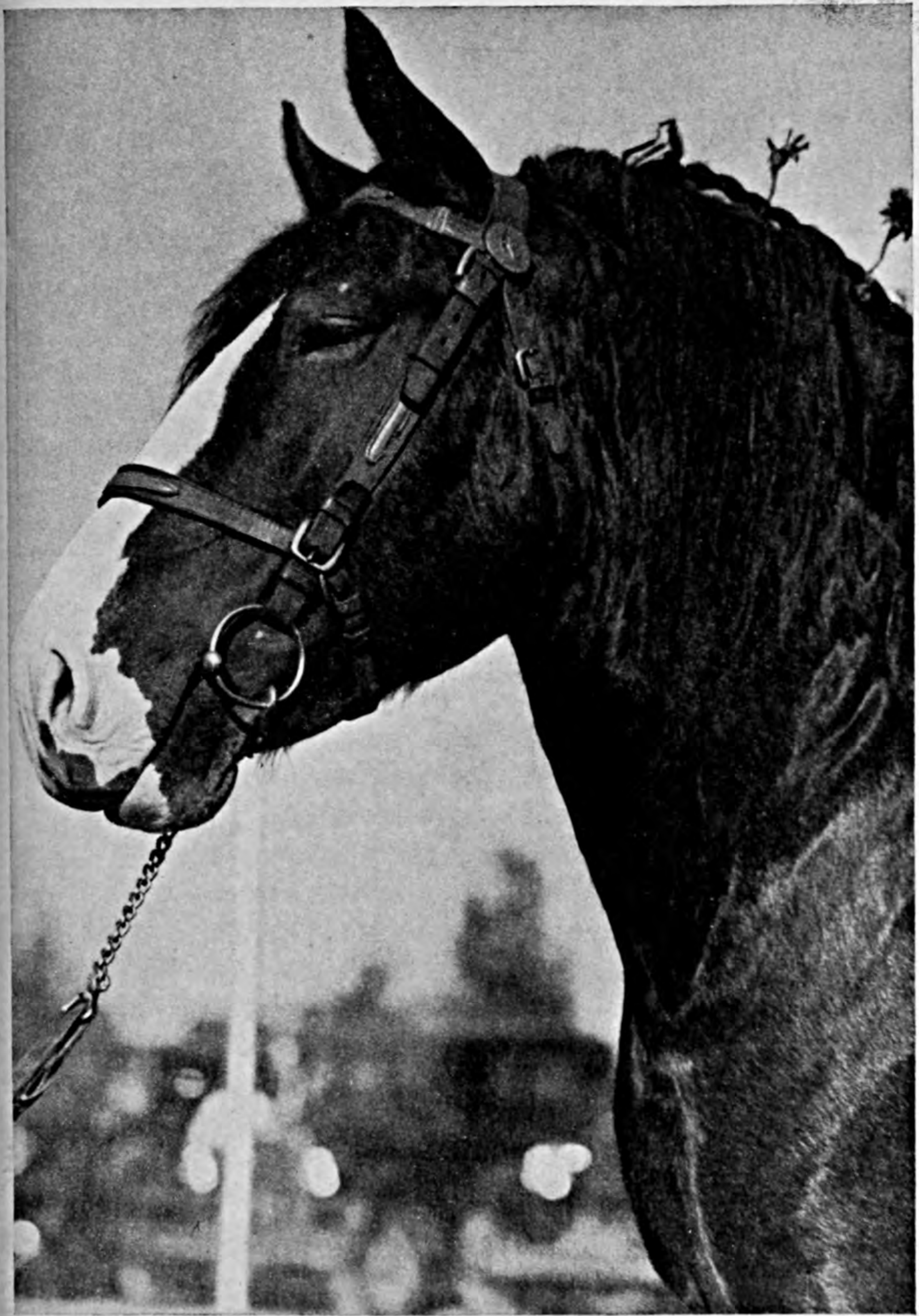
PICTORIAL



THE CONFIDENT AIR OF A PRIZE-WINNER.

PLANS FULFILLED.

HOPES THWARTED.

Left: A pony express serving agriculture.

Below: State fairs engender stiff necks.

The Editors Talk

Beyond Line Fences

Of the hundreds of conventions and other types of meetings held during the summer, notable as to purpose was the joint meeting of Iowa Farmers and the Agricultural Committee of the National Association of Manufacturers held at Iowa State College, June 10-11. The event, unique in agricultural-industrial relationships, was sponsored by officials of the college and brought together a group of representative farmers and executives of several large companies for the purpose of giving manufacturers at first hand a better understanding of the agricultural viewpoint and situation.

Forewarned that the manufacturers had no "farm plan" and did not expect to develop one, the farmers found the committee interested listeners and participants in discussions on subjects ranging from farm tenancy, soil erosion and conservation, and foreign markets for farm produce, to price parity and price determination, farm capitalization and credit, and stabilization of farm income. "Business men now know that agriculture and industry—as the two great producers of the national wealth—have a great many problems in common," Warren W. Shoemaker, Vice President and General Sales Manager of Armour & Company, had told the group at the opening of the conference. "Our interests lie along the same lines. When agriculture is prosperous and happy, statistics show that industry is enjoying its best years. When agriculture is depressed and sick, so is industry. Together, agriculture and industry account for one-half of the total gainfully employed in the United States. . . . Cooperation between industry and agriculture is necessary to our national welfare."

As the discussions proceeded, the farmers evidenced a great interest in the problems of industry, many of which they found to parallel their own problems. This interest culminated at the end of the conference in a proposal by Fred Nelson, Nevada County farmer, on behalf of his fellow farmers that a new attitude toward industry be adopted. "If this committee of manufacturers is going to spread a better understanding of farmers among the business men of the nation, then I think we farmers should spread a better understanding of industry among our fellow farmers," he said. "This educational program must be carried on from both ends. Personally, I am greatly impressed by the sincerity of approach and the interest which industry is showing in the farmer through this committee. I have gained a new impression of business men in this conference and I think we farmers should let the other farmers know what we have learned here."

In closing the meeting, Dr. Charles E. Friley, President of Iowa State College, expressed the opinion that "there is no problem in the world that cannot be solved in the light of a better understanding. I think the significant accomplishment of this meeting is the better understanding that has resulted between industry and agriculture from the candid, sincere discussions that have taken place in such a spirit of mutual helpfulness and respect."

It is always good to go "beyond line fences." There is inspiration in finding common ground. Misunderstanding has no place in progress, and it is to be hoped that conferences of similar nature will be held in the future to further the realization of the interdependence of agriculture and industry.

Potash and Frost

Among the many functions which potash fulfills in the plant, an important one is protection against frost injury. It is not possible, of course, to guarantee that a plant well supplied with potash will not suffer damage by frost or cold weather. There is a limit to the protective action in this respect. However, numerous observations and experiments have indicated that plants well supplied with potash can withstand a lower temperature without injury than can plants lacking potash. The critical one or two degrees extra coldness that potash-fed plants can withstand may mean the difference between a successful crop and a total failure.

The way in which potash acts in reducing frost injury is not fully understood. Part of it is supposed to be due to the lowering of the freezing point of the cell sap, due to the increased salt concentration provided by the potash fertilization. This action is comparable to the effect produced by spreading table salt on an icy pavement to prevent freezing. It would appear very reasonable to expect that at least part of the protective action of potash is due to this effect of lowering the freezing point. Many investigators, however, have believed that this is not the whole story and J. Stoklasa and B. Havlinove, Czecho-Slovakia, recently summarized 50 years of observation of plants growing in the field and greenhouse with copious and deficient supplies of potash. The summary of this work appearing in the Experiment Station Record for January, 1937, confirms that when soils are deficient in available potassium and phosphorus, root dying and freezing injury are much more pronounced with favorable weather. They found that barley, wheat, rye, sugar beets, and potatoes grown in soils fertilized with potassium, phosphorus, and sodium were not so readily frozen as when these crops were grown in soils deficient in these elements. The authors believe that when these three elements are lacking the plant cannot breathe or carry on its respiratory functions normally. This results in a reduced physiological combustion which probably reduces the amount of heat generated in the plant and therefore permits it to freeze.

In any case, the proper use of potash provides an added factor of safety in permitting the plant to withstand unfavorable weather conditions. This, added to its other important functions, makes potash cheap insurance.

Soil Testing Marches On

The practice of testing the fertility of soils by means of rapid chemical methods is becoming more general. Service laboratories for soil testing on a large scale are being provided by Agricultural Experiment Stations. Many agricultural teachers and county agents are making extensive use of the tests. Private laboratories are being set up for soil testing on a commercial basis. A number of fertilizer companies have provided central laboratories, and many fertilizer salesmen are making use of the tests in the field.

Further indication of the importance being accorded this phase of soil management is seen in the amount of time devoted to it at 94th Meeting of American Chemical Society recently held at Rochester, N. Y. One entire afternoon of the program of the Division of Fertilizer Chemistry was given over to papers and discussions by scientists doing research on the subject. It is in such meetings, combined with the increasing practical application of the various methods, that any current difficulties and criticisms will be straightened out.

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

North Carolina Experiment Station Bulletin 308, entitled "Influence of 'Rust' on Quality and Yield of Cotton and the Relation of Potash Applications to Control," contains much instructive information resulting from studies of the effect on quality, yield, and rust damage of cotton from applications of potash salts in areas of North Carolina where cotton and peanuts are grown in rotation. J. H. Moore and W. H. Rankin, the authors, think that the type of cotton rust injury observed in this section is usually associated with a shorter staple length, a weaker fiber, and a smaller yield. The common fertilizer and cropping practices do not correct the condition. Controlled tests covering a period of 2 years where additional applications of potash ranging from 25 to 50 pounds per acre were used on fields subject to rust produced significantly larger yields of cotton, heavier seed, heavier bolls, a higher lint index, a better grade, a longer staple length, a stronger fiber, and a lower percentage of thin-walled fibers than the check plots which did not receive additional potash after planting. Where low percentages of potash are used in fertilizer mixtures applied to cotton at planting time in the peanut section of the State, especially in cases where rust has caused considerable loss in yield and damage to quality of the fiber, the publication suggests that a supplemental application of potash be made soon after chopping. Judging from field observation and interviews with a number of farmers whose cotton was severely damaged in recent years, it is generally believed that this damage is more prevalent on farms that have been limed heavily, have poor drainage, or have had a number of legume crops removed. The authors conclude that while additional applications of potash appear to offer the most practical method of decreasing rust damage, further studies of the soil conditions associated with rust damage in this area will perhaps reveal other causes and supplementary means of control.

From Mississippi, L. E. Miles, of the agricultural experiment station, stresses the value of potash to control wilt on cotton in Technical Bulletin 23, entitled "Effect of Potash Fertilizers on Cotton Wilt." The experiments reported extended from 1928 through 1934, some for shorter periods and others practically throughout the entire time. From the results, it is concluded that fairly high potash applications in proper combination nitrogen and phosphorus-containing salts have given definitely beneficial results in control of cotton wilt on the soils of south Mississippi, of north-central Mississippi, and of the border area of the Yazoo-Mississippi Delta. Under decidedly adverse conditions and with an extremely susceptible variety of cotton on soil severely infested with the wilt organism, potash, even when combined in adequate amounts with other necessary fertilizer elements, cannot be depended upon for wilt control. On severely infested soils a variety of cotton at least relatively resistant to wilt should be used as well. The author concludes that the best solution for cotton wilt now available would seem to be the use of a suitably adapted wilt-resistant variety of cotton together with the judicious use of fertilizer containing potash in adequate amounts and in proper balance with other necessary fertilizer elements.

Following an extensive investigation in the development of improved methods for the commercial production of fertilizer materials, U. S. Department of Agriculture Technical Bulletin 543, entitled "Blast Furnace Processes for the Production of Phosphatic and Potassic Fertilizer Materials," describes the technical feasibility and commercial practicability of producing phosphatic and potassic fertilizer materials by the blast-furnace smelting of phosphate rock and potash-bearing silicates. The authors conclude from these preliminary results that savings may be expected by the simultaneous production of phosphorus and potash in a single furnace over their production in separate furnaces. This process would enable the producer to ship potassium phosphates, materials containing from 85 to 100 per cent plant food, which can be applied directly to the soil. According to results obtained from the experimental blast furnace plant described in this bulletin, the authors point out that, while the blast furnace processes in the production of phosphatic and potassic fertilizer materials appear to have commercial possibilities, further investigation on the pilot-plant scale must be conducted before final conclusions can be drawn.

"Fertilizing Illinois Wheat," Agr. Ext. Serv., Urbana, Ill., Mimeo., May 1937, L. B. Miller and F. C. Bauer.

"Speed and Accuracy in Determination of Total Nitrogen," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 261, May 1937, A. E. Murneek and P. H. Heinze.

"Manure, a Profitable By-product," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 198, Feb. 1937, Jay L. Haddock.

"Chemical Nitrogen—A Survey of Processes, Organization, and International Trade, Stressing Factors Essential to Tariff Consideration," U. S. Tariff Commission, Washington, D. C., Report No. 114, Second Series.

Soils

Realizing the great importance of curbing the effects of soil erosion so prevalent on a majority of our soils in this country, there frequently appear under this department brief citations from the many valuable publications devoted to this subject. We list in the following a few touching the high points of soil conservation as contained in the more recent publications from experiment stations, extension services, and the U. S. Department of Agriculture.

"Soil Erosion in Michigan Orchards," Circular Bulletin 162 of the Michigan Agricultural Experiment Station, by N. L. Partridge, brings together some of the more pertinent observation records and discusses the practicability of various methods dealing with erosion problems in fruit orchards. The use of annual cover crops is pointed out to be helpful in maintaining control. Complete permanent sod cover is the cheapest effective method for controlling erosion on moderately steep slopes when the kind of fruit plant set will tolerate that type of cover on the particular soil. When it is necessary to cultivate a portion of the orchard, protective strips of sod may be kept in each tree row or the cultivation may be confined to the space between alternate pairs of tree rows, which will usually give sufficient protection on gently rolling sites. The first and most important step in erosion control is the setting of the trees on sites where excessive erosion has not already removed the surface soil, and then the simpler. cheaper methods of control will be sufficient to retain the productivity of the soil in nearly every instance.

An array of fundamental principles relating to soil conservation is outlined for the 4-H clubs in Michigan Club Bulletin No. 33, "Soil Conservation Program," by James A. Porter. The information given in this interesting bulletin is offered mainly for Michigan farm youths so that they may study for themselves the numerous erosion problems. A considerable portion of the subject matter pertains to farm mapping projects.

"Conserving Soil by Strip Cropping," by W. R. Tascher and Marion W. Clark, is the title of the Missouri Agricultural Extension Service Circular 368. Strip cropping is a simple, economical, and effective soil conservation method that may be used with crop rotation and soil treatments to check erosion on many Missouri farms. Among the subjects discussed are: rotation strip cropping, procedure for laying out fields for rotation strip cropping, field stripping, buffer stripping, and suggestions for laying out buffer strips and how they may be used preparatory to terracing.

In "Safeguard the Gains of Soil Conservation," North Carolina Extension Circular 216, the extension service reports that during the past few years the people in North Carolina have made great gains in combating soil erosion. A warning is given, however, that erosion once under control will not remain so without continued care. Terraces once built will eventually cease to function if not properly maintained; woodlands must be protected from fire and grazing; and a good rotation, once established, must be continued indefinitely. To safeguard these gains made at the cost of much time, thought, labor, and money, should be the concern of every land-owner who has launched upon a program of soil conservation. Among the practices advocated are to follow the farming and forestry practices recommended by county agents and to repair promptly all damage that has been done by erosion.

U. S. Department of Agriculture Farmer's Bulletin 1776, "Strip Cropping for Soil Conservation," by Walter V. Kell and Grover F. Brown, gives a broad description of how this practice has been successfully employed in many localities for years as one of the practical measures to conserve soils. Detailed explanations of the three types, contour, field, and wind strip cropping, are outlined in this bulletin. The information presented is the result of a careful study of this means of erosion control throughout the United States and includes the latest developments in this field of work.

Regional Information Series WR-Leaflet No. 103, "Conservation of the Western Range," gives an outline of the 1937 program for western range land. There are numerous factors that interfere periodically with the average range operator's plan. Weather records show an average of 1 to 4 years of drought out of every 10 years. These weather changes bring wide variations in the amount of forage produced on the range, and these fluctuations in forage production make up one of the principal problems of stockmen. Practices which aid water conservation on range land can increase appreciably the amount of forage produced. Among these are: developing springs and seeps, constructing earthen pits and reservoirs, digging or drilling wells, contouring, and water spreading.

Information of much value to many Virginia farmers is given in Virginia Truck Experiment Station Bulletin 94, entitled "Truck Crop Investigations," by J. B. Hester and Florence A. Shelton. The investigations reported deal with soil organic matter of coastal plain soils. There have arisen many conflicting problems as a result of the cropping systems practiced in this, one of the oldest farming regions of the Middle Atlantic States. Such practices have failed to provide for soil fertility maintenance. These soils respond to most soil amendments, and owing to their low organic matter content, they also respond to the turning under of green manure and cover crops. Because the high state of fertility of the soil must be kept up for successful production of vegetable crops, it is evident that the well-drained soil having the highest organic matter produces the best crops. The use of soil improvement crops appears, therefore, to be an economical method of maintaining soil fertility.

"The Relation of Nitrogen and Soil Moisture to Growth and Fruitfulness of Apple Trees Under Different Systems of Soil Management," Agr. Exp. Sta., Lafayette, Ind., Bul. 414, Nov. 1936, Clarence E. Baker.

"Electric Soil Heating for Hotbeds," Agr. Exp. Sta., Lafayette, Ind., Cir. 226, Nov. 1936, T. E. Hienton and J. H. MacGillivray.

"The Reaction of Greenhouse Plants to Gas in the Atmosphere and Soil," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 285, May 1937, Paul R. Krone.

"The Utilization of Wabash Clay (Gumbo) Soils in Crop Production," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 254, May 1937, B. M. King.

"Behavior of Legume Bacteria (Rhizobium) in Relation to Exchangeable Calcium and Hydrogen Ion Concentration of the Colloidal Fraction of the Soil," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 256, May 1937, Thomas M. McCalla.

"Irrigation Experiments with the Early Grano Onion," Agr. Exp. Sta., State College, N. Mex., Bul. 245, Feb. 1937, A. S. Curry.

"Soil Survey of Winston County, Alabama," U. S. D. A., Washington, D. C., Series 1932, No. 12, M. E. Swann, M. E. Stevens, M. C. Croft, and W. E. Tharp.

"Soil Survey of Cass County, Texas," U. S. D. A., Washington, D. C., Series 1933, No. 3, M. W. Beck, Howard William Higbee, and R. M. Marshall.

"Soil Survey (Reconnaissance) of Vermont," U. S. D. A., Washington, D. C., Series 1930, No. 43, W. J. Latimer, S. O. Perkins, F. R. Lesh, L. R. Smith, and K. V. Goodman.

Crops

We have received a large number of most excellent and very instructive publications which we classify under this heading.

Many celery growers will profit from the information contained in Florida Agricultural Experiment Station Bulletin 307, "Cracked Stem of Celery Caused by a Boron Deficiency in the Soil," by E. R. Purvis and R. W. Ruprecht. Cracked stem, the disease which occurs more frequently on light, sandy soils and usually appears first on high, dry spots of the field, often causes a loss of as much as 50 per cent of the celery crop. This disturbance is not restricted to the poorer soils, but frequently occurs on even the better soils. The text explains that cracked stem of celery has become quite common in practically every celery-growing area in the eastern part of the United States and Canada, which indicates that the celery plant is a gross boron feeder. The depletion of the element from such a wide variety of soils can hardly be explained otherwise, the author states. Once the deficiency has been established, the use of usual fertilizer mixtures, even those containing crude materials, will hardly supply enough of this element to produce normal plant growth. The disturbance is prevented by the application of commercial borax at the rate of 10 pounds per acre applied to the soil in close proximity to the base of the plant, approximately two weeks after the plants are set in the field. The authors believe the simplest and best way to supply such small amounts of borax is in solution, and good results have been obtained by using spray machines. An application of borax not only prevents the appearance of cracked stem, but it also produces a decided increase in yield of marketable celery on soils deficient in boron. More than 10 pounds per acre are not advised because of the danger of toxic conditions developing.

Circular 227, Indiana Agricultural Experiment Station, entitled "Mint Culture in Northern Indiana," by N. Kent Ellis, reveals many of the secrets of success in growing mint. Owing to the very favorable soil and climate for mint in northern Indiana and the southern half of Michigan, the world's production is now centered in this area. Mint can be grown on a wide range of soils and does well on alkaline soils that are unadapted for growing onions, potatoes, and other vegetables requiring a slightly to medium acid soil. The soil should be in good tilth and as free of weeds as possible. If the crop is planted early on new soil, 200 to 400 pounds of 2-8-16 fertilizer per acre should be used. This may be applied either broadcast or with a combination grain and fertilizer drill before the plants or roots are set, or applied in bands on either side of the row by means of a fertilizer attachment on a cultivator, after the rows are established. If the plants are set late, from 200 to 400 pounds of 0-8-24 fertilizer would prove more economical, the author explains. On established plantations an early spring application of 250 to 500 pounds of 2-8-16 fertilizer may be applied with a disk drill or broadcast and harrowed in. For fall fertilizer applications, the 0-8-24 fertilizer should be used. On soils which produce too heavy growth of mint hay, it has been found that 200 to 300 pounds of 0-20-20 give better results. Other information pertaining to mint production discussed in this circular includes descriptions of mint varieties, methods of propagation, cultivation, harvesting, distillation, and the control of insects and diseases.

"Report of the Director for the Year Ending June 30, 1936," Agr. Exp. Sta., Storrs, Conn., Bul. 214, Jan. 1937, William L. Slate, Director.

"Report of the Director for the Year Ending October 31, 1936," Agr. Exp. Sta., New Haven, Conn., Bul. 393, Feb. 1937, William L. Slate, Director.

"Forest Lysimeter Studies Under Red Pine," Agr. Exp. Sta., New Haven, Conn., Bul. 394, June 1937, Herbert A. Lunt.

"1936 Report Cooperative Extension Work in Agriculture and Home Economics," Agr. Ext. Serv., Gainesville, Fla., Wilmon Newell, Director.

"Herbaceous Perennials for Florida," Agr. Ext. Serv., Gainesville, Fla., Bul. 89, May 1937, J. V. Watkins.

"Experiments for the Control of Phoma Rot of Tomatoes," Agr. Exp. Sta., Gainesville, Fla., Bul. 308, Mar. 1937, W. B. Tisdale and Stacy O. Hawkins.

"Papaya Culture," Agr. Exp. Sta., Gainesville, Fla., Pr. Bul. 502, June 1937, H. S. Wolfe.

"Collecting Deer Tongue Leaves," Agr. Exp. Sta., Gainesville, Fla., Pr. Bul. 501, June 1937, J. Francis Cooper.

"Forty-ninth Annual Report of the Director for the Year Ending June 30, 1936," Agr. Exp. Sta., Lafayette, Ind., John H. Skinner, Director.

"Report on Agricultural Research for the Year Ending June 30, 1936. Part I. Project Reports, Publications, Staff, Financial Statement. Part II. Iowa Corn Research Institute First Annual Report," Agr. Exp. Sta., Ames, Iowa, R. E. Buchanan, Director.

"The Effect of Electric Current on Certain Crop Plants," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 210, Mar. 1937, Charles S. Dorchester.

"Home Vegetable Gardening in Kansas," Agr. Exp. Sta., Manhattan, Kans., Cir. 181, Jan. 1937, Walter B. Balch.

"Annual Report for the Fiscal Year Ending November 30, 1936," Agr. Exp. Sta., Amherst, Mass., Bul. 339, Mar. 1937, Fred J. Sievers, Director.

"Seventy-fifth Annual Report of the Secretary of the State Board of Agriculture and Forty-ninth Annual Report of the Experiment Station," Agr. Exp. Sta., East Lansing, Mich., John A. Hannah and V. R. Gardner.

"Soybean Production in Michigan," Agr. Exp. Sta., East Lansing, Mich., Cir. Bul. 161, June 1937, C. R. Megee.

"4-H Garden Club Suggestions," Agr. Ext. Serv., East Lansing, Mich., Club Bul. 34, May 1937, P. G. Lundin.

"Evergreens," Agr. Ext. Serv., East Lansing, Mich., Bul. 178, May 1937, Charles W. Barr.

"Agricultural Research Through Fifty Years," Agr. Exp. Sta., University Farm, St. Paul, Minn.

"Forty-third Annual Report, July 1, 1935, to June 30, 1936," Agr. Exp. Sta., University Farm, St. Paul, Minn., Andrew Boss, Vice Director.

"Duluth Potato Crops Through Three Seasons (1934-36, Inclusive)," Agr. Exp. Sta., University Farm, St. Paul, Minn., Mimeo. Northeast Exp. Sta., M. J. Thompson, Supt.

"The Cloquet Forest," Agr. Exp. Sta., University Farm, St. Paul, Minn., Tech. Bul. 112, Jan. 1936, T. S. Hansen, J. H. Allison, R. M. Brown, E. G. Cheyney, and Henry Schmitz.

"A Study of the Relative Adaptation of Certain Varieties of Soybeans," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 255, May 1937, J. M. Poehlman.

"An All-Year Pasture System for Missouri," Agr. Exp. Sta., Columbia, Mo., Cir. 193, Feb.

1937, W. C. Etheridge, C. A. Helm, and E. Marion Brown.

"Blooming and Ripening Dates with Yields of 360 Varieties of Apples Grown at Mountain Grove, Missouri," St. Fruit Exp. Sta., Mountain Grove, Mo., Cir. 25, Mar. 1937, Paul H. Shepard.

"Blooming and Ripening Dates with Yields of 167 Varieties of Grapes Grown at Mountain Grove, Missouri," St. Fruit Exp. Sta., Mountain Grove, Mo., Cir. 27, May 1937, Paul H. Shepard.

"Crop Regions in Montana as Related to Environmental Factors," Agr. Exp. Sta., Bozeman, Mont., Bul. 340, May 1937, L. P. Reitz.

"Serving New Hampshire Farms and Homes, Annual Report of Director for 1936," Agr. Ext. Serv., Durham, N. H., Ext. Bul. 51, Apr. 1937, J. C. Kendall, Director.

"Adjusting Feed Practices to Reduced Milk Incomes," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 195, Jan. 1937, E. F. Eastman.

"Conservation Practices for Farm Woodlands," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 196, Jan. 1937.

"Better Hay Practices," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 197, Feb. 1937.

"Conservation Program on Fruit and Vegetable Farms," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 200, Feb. 1937.

"Solving Early Garden Problems," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 202, Mar. 1937, J. R. Hepler.

"Fifty-seventh Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-ninth Annual Report of the New Jersey Agricultural College Experiment Station for the Year Ending June 30, 1936," Agr. Exp. Sta., New Brunswick, N. J., J. G. Lipman.

"Soils in Relation to Fruit Growing in New York. Part X. Susceptibility of Various New York Orchard Soils to Reduction Upon Waterlogging," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 667, Mar. 1937, Michael Peech and Damon Boynton.

"Producing Quality Burley Tobacco in North Carolina," Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 214, Apr. 1937, E. Y. Floyd.

"Cultural Systems for the Apple in Ohio," Agr. Exp. Sta., Wooster, Ohio, Bul. 580, May 1937, C. W. Ellenwood and J. H. Gourley.

"Peach Production in Ohio," Agr. Exp. Sta., Wooster, Ohio, Bul. 581, May 1937, Leon Havis and J. H. Gourley.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXII, No. 186, May-June 1937.

"Permanent Pastures for South Carolina," Agr. Ext. Serv., Clemson, S. C., Bul. 99, Mar. 1937.

"Abstracts of Bulletins 523-538, Circulars 77-78, and Other Publications During 1936," Agr. Exp. Sta., College Station, Tex., Cir. 79, Mar. 1937, A. D. Jackson.

"Small Grain and Rye Grass for Winter Pasture," Agr. Exp. Sta., College Station, Tex., Bul. 539, Apr. 1937, R. H. Stansel, P. B. Dunkle, and D. L. Jones.

"Factors Affecting the Amount of Puffing in Tomatoes," Agr. Exp. Sta., College Station, Tex., Bul. 541, Apr. 1937, S. H. Yarnell, W. H. Friend, and J. F. Wood.

"The 4-H Garden in Vermont," Agr. Ext. Serv., Burlington, Vt., Cir. 89, June 1936, Paul R. Miller.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 349, June 1937, and Bul. 350, July 1937.

"Reed Canary Grass Good for Hay and Pasture," Agr. Ext. Serv., Madison, Wis., Sp. Cir., Mar. 1936, E. D. Holden.

"Better Yields on Central Wisconsin Soils," Agr. Ext. Serv., Madison, Wis., Sp. Cir., Feb. 1937, F. L. Musbach and C. J. Chapman.

"Tobacco Culture," U. S. D. A., Washington, D. C., Farmers' Bul. 571, Rev. Sept. 1936, W. W. Garner.

"Growing Black Locust Trees," U. S. D. A., Washington, D. C., Farmers' Bul. 1628, Rev. May 1937, Wilbur R. Mattoon.

"Effect of Method and Rate of Grazing on Beef Production and Plant Population of Pastures at Beltsville, Maryland," U. S. D. A., Washington, D. C., Tech. Bul. 538, Jan. 1937, M. A. Hein and A. C. Cook.

"Workers in Subjects Pertaining to Agriculture in Land-Grant Colleges and Experiment Stations," U. S. D. A., Washington, D. C., Misc. Pub. 254, Mar. 1937, Mary A. Agnew.

Economics

The status of the potato enterprise in northern Indiana counties is summarized in Bulletin No. 412, Purdue University Agricultural Experiment Station at Lafayette, Ind., "Economic Analysis of Potato Production in Northern Indiana," by Lynn Robertson.

While Indiana is not generally considered an important potato-producing state, the bulletin points out that on many farms in the northern counties of Indiana the potato enterprise constitutes a rather important source of cash income. The soil and growing conditions are more suitable to the crop in this section of the state, and practically all of the counties in the northern half of Indiana have shown an upward trend in potato acreage, while the counties in the southern half of the state have decreased their acreage. One reason for the better adaptability of the northern counties to potato production is the fact that the soils average coarser in texture than farther south in the state. Many of the upland soils are fairly productive, even though some are deficient in fertility, organic matter, and water-holding capacity. Also within this 22-county area, there are approximately 300,000 acres of muck soil, most of which, when adequately drained, is very well suited to potato production. Another important soil type is the comparatively large acreage of fertile, dark sandy lowland soils on which potatoes may be grown at an advantage.

The average yield per acre of potatoes over the 10-year period from 1921 to 1930 is considerably lower than in some of the important states, such as Maine, but Indiana yields as a whole compare quite favorably with other potato-producing states in the Midwest, such as Michigan, Wisconsin, and Minnesota.

Another reason for the growing importance of the potato crop in northern Indiana is the relatively large urban area within the district and in the immediate surrounding territory, constituting a very good market for potato crops.

The early potatoes grown in northern Indiana are usually put on the market about the first of July, thus giving an advantage of several weeks over the early potatoes from Minnesota, Wisconsin, and Michigan. Even though the location helps, the late potatoes have relatively less advantage than the early potatoes. Because of the comparatively favorable location, prices received for potatoes by farmers in Indiana are usually higher than prices received in a number of the most important surplus potato-producing states.

In the summer of 1934, cost of production records were kept on 56 farms where late muck potatoes were grown, on 18 farms with late upland potatoes, 15 farms with early muck potatoes, and 15 farms with early upland potatoes. A summary of these cost of production records furnishes an average unit requirement and cost of producing an acre of potatoes on each of the respective soil types. In that year, the total growing cost on the late muck farms was $54.07 an acre, on the upland farms $42.54, and on the early muck farms $58.98, and on the early upland farms $51.48. Even though the acre cost was higher on the late muck farms, the unit cost was less, due to the higher yield, yields being 197 for the muck farms, and 143.2 bushels per acre for the upland farms, and the growing costs per bushel, 27 cents and 30 cents, respectively. In the case of early potatoes, the reverse was true, the yield being low on the muck farms—91.4 and 107.5 bushels, respectively—with a growing cost of 65 cents for the muck farms, and 48 cents for the upland farms.

The records disclose that each class of potatoes made a profit above all costs, with the exception of the early muck potatoes which cost more per acre to produce than the other classes, largely because of higher charges for fertilizer, seed treatment, and spray material. However, it was pointed out that in view of the limited number of records in this particular group, as well as in the early upland potatoes, the figures could not be accepted necessarily as giving a representative figure of the whole northern Indiana potato-producing area. For other years the cost of production of potatoes in this area could be estimated by substituting the physical factors of production at the current costs.

A most important factor affecting cost was the yield per acre. This appeared to have more influence than any other single factor. Among the most important factors which seem to have the greatest influence on yield were the kind and amount of seed used, thoroughness of seed-bed preparation, amount and kind of fertilizer used, the amount of tillage of land before inter-row cultivation. Other factors which had less influence were not as easily measurable from the records. It was found that according to these records the fertilization was a very important factor in lowering production cost. On 17 late muck farms where no commercial fertilizer was used on potatoes, the average yield per acre was only 159 bushels, as compared to an average of 220 bushels on farms on which potatoes received 300 pounds of fertilizer per acre. And the fields receiving applications of 100 to 299 pounds of fertilizer per acre gave an average yield of 163 bushels. The mixture which seemed to be very well adapted to late muck potatoes is an 0-8-24. Eighteen of the 40 growers who fertilized used this mixture, or very similar analyses. Barnyard manure did not seem to be particularly beneficial to potatoes grown on muck soil. According to the Bulletin, the potential market outlet for the northern Indiana potatoes can be effectively developed through uniform grading practices, using new and attractive sacks, and through effective advertising.

"Cost of Producing Apples in Berrien County, Michigan, 1935" is the title of Michigan's Special Bulletin 286. The bulletin reports the results of a study by K. T. Wright of the Farm Management Department, and W. R. O'Brien of the Horticultural Department of the College of Agriculture. Some interesting features of the development of the apple industry in Michigan are noted in the introduction. In the past 30 years there has been a 50 per cent reduction in the number of bearing apple trees in the state, while in the whole United States the total of bearing apple trees has decreased about 55 per cent. Of further significance is the fact that there has been a shifting of the location of the apple-producing area in Michigan. Decreases have occurred in the number of orchards in the counties of the central and southeastern portions of the state, with moderate increases along Lake Michigan from Oceana north to Emmet. In Berrien County, where the study was conducted, the number of apple trees decreased from 466,000 in 1890 to 273,000 in 1910, but increased to 435,000 between 1910 and 1930.

Even though the changes in the numbers of trees from year to year are very small, wide fluctuations in production occur. The average yearly production of apples in Michigan between 1930 and 1934 was 7,327,000 bushels, which places the state sixth in the production of apples.

The objects of the study were: first, to determine the cost of producing, harvesting, marketing, and overhead items in a Michigan county of importance in apple production; second, to determine the amount of labor and materials used in production in order that current prices could be applied to these amounts to obtain average costs at any later date; third, to make a farm management study of some economic phases of apple production; and fourth, to study the relationship between the conditions of management practices and the efficiency of apple production and net returns.

The data for the study were secured through record books kept by cooperating farmers. A complete record was kept on all of the items pertinent to the production of the apple crop. To insure accuracy and completeness, each farmer was called upon about every two weeks through the 1935 season and given assistance with his records. In the fall, after the marketing season, the records were collected and summarized at the college. Jonathan, Delicious, and Wealthy were the three leading varieties grown by the Berrien County producers.

The most important items of cost in the production of apples in this section of Michigan were labor, power, and machinery, which made up more than 32 per cent of the total. The next most important was packaging and marketing, which constituted about 22 per cent of the total cost. This was followed by interest on trees and land, representing 21 per cent. Spraying material accounted for 11.3 per cent; and other items, for 13.7 per cent.

For purposes of comparison between high- and low-cost orchards, the records were grouped in two classes: the 15 most profitable, and the 15 least profitable. In 1935, the most profitable farms produced the highest yield and the greatest percentage of No. 1 apples—290 bushels total per acre. A total yield of 107 bushels per acre was obtained on the low-profit farms. In 1934, the average yield was 197 and 156 bushels, respectively, and in 1933, 254 and 107 bushels. The high-profit farms used considerably more spray on the average than the low-profit farms. The production costs per acre were higher on the high-profit farms, but the cost per bushel was much lower. The total cost per bushel on the high-profit farms was 47 cents in 1935, and on the low-cost farms it was 84 cents, which made a difference between the profit of $43.32 per acre on the high-profit farms as contrasted to a loss of $36.83 on the low-profit farms. The most profitable farm was carefully analyzed from the standpoint of practices which might have resulted in placing it in this position relative to the others.

The orchards were further divided on the basis of the age of the trees, and the cost per acre by age of bearing trees was also calculated. The yield factor was an important one in determining the unit cost, and in general it was discovered that a 100 per cent increase in production cost usually resulted in a 600 per cent increase in yield, as compared to different orchards under less efficient management.

"1936 Orange County Lemon Production Cost Analysis. Eleventh Year Summary 1926-1936," Agr. Ext. Serv., Berkeley, Calif., Harold E. Wahlberg.

"1936 Orange County Valencia Production Cost Analysis. Eleven-Year Summary 1926-1936," Agr. Ext. Serv., Berkeley, Calif., Harold E. Wahlberg.

"Commercial Fertilizers and Agricultural Minerals, 1936," St. Dept. of Agr., Sacramento, Calif., Sp. Pub. 146, A. A. Brock, Director.

"Florida Citrus Costs and Returns," Agr. Ext. Serv., Gainesville, Fla., Citrus AT 6, June 1937, R. H. Howard.

"Economy in Buying Fertilizers," Agr. Exp. Sta., Experiment, Ga., Pr. Bul. 448, May 18, 1937, R. P. Bledsoe.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 24 and 25, May and June 1937.

"Indiana Crops and Livestock — Annual Crop Summary 1936," Dept. of Agr. Statistics, West Lafayette, Ind., No. 135, Dec. 1936.

"Indiana Crops and Livestock—Assessors' Enumeration of 1935 Crops," Dept. of Agr. Statistics, West Lafayette, Ind., No. 136, Jan. 1937.

"Indiana Crops and Livestock," Dept. of Agr. Statistics, West Lafayette, Ind., No. 138, Mar. 1, 1937; No. 139, Apr. 1, 1937; No. 140, May 1, 1937; and No. 141, June 1, 1937.

"A Study of Grades, Price Trends, and Sales on the Indianapolis Producers' Market," Agr. Exp. Sta., Lafayette, Ind., Bul. 411, July 1936, K. I. Fawcett and Fay C. Gaylord.

"Farm Tenure in Iowa. III. The National Farm Institute Symposium on Land Tenure," Agr. Exp. Sta., Ames, Iowa, Bul. 357, Apr. 1937.

"An Economic Study of Dairy Farms in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 405, Oct. 1936, S. H. DeVault and A. B. Hamilton.

"Registration, Labeling, and Inspection of Commercial Fertilizers; 1936," Agr. Exp. Sta., Columbia, Mo., Bul. 381, Apr. 1937, L. D. Haigh and E. W. Cowan.

"Agriculture on the Huntley Project," Agr. Exp. Sta., Bozeman, Mont., Bul. 342, June 1937, P. L. Slagsvold.

"Analyses of Commercial Fertilizers and Ground Bone; Analyses of Agricultural Lime, 1936," Agr. Exp. Sta., New Brunswick, N. J., Bul. 622, Mar. 1937, Charles S. Cathcart.

"Farm Economics," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., No. 101, May 1937, and No. 102, June 1937.

"Recent Changes in the Social and Economic Status of Farm Families in North Carolina," Agr. Exp. Sta., Raleigh, N. C., Bul. 309, May 1937, C. Horace Hamilton.

"Analyses of Commercial Fertilizers and Cottonseed Meals, Spring Season 1936," St. Dept. of Agr., Raleigh, N. C., Dec. 1936.

"Analyses of Commercial Fertilizers and Cottonseed Meals, Fall Season 1936," St. Dept. of Agr., Raleigh, N. C., Mar. 1937 (Supplement.)

"Willamette Valley Land Adaptability," Agr. Exp. Sta., Corvallis, Oreg., Sta. Cir. 120, Mar. 1937, H. E. Selby and Leland Fryer.

"Department of Agriculture of Oregon Bulletin," St. Dept. of Agr., Salem, Oreg., No. 65, May 1937.

"Farm Business. What Can We Expect from a Cooperative or a Federal Order?" Agr. Ext. Serv., Burlington, Vt., Vol. 4, No. 3, June 1937.

"The Farmer Looks Ahead," U. S. D. A., Washington, D. C., Farmers' Bul. 1774, May 1937.

"Marketing Onions," U. S. D. A., Washington, D. C., Tech. Bul. 555, Apr. 1937, J. W. Park.

"A Graphic Summary of Physical Features and Land Utilization in the United States," U. S. D. A., Washington, D. C., Misc. Pub. 260, May 1937, O. E. Baker.

"Nonagricultural Income as a Measure of Domestic Demand," U. S. D. A., Washington, D. C., June 1937, L. H. Bean, P. H. Bollinger, and O. V. Wells.

"Why United States Wheat Farmers and Consumers Need a Stabilized Wheat Industry," U. S. D. A., Washington, D. C., G-69, May 1937.

"Agricultural Stability and Business Stability," U. S. D. A., Washington, D. C., G-70, May 1937, H. R. Tolley.

"Cotton Utilization and New Industrial Uses," U. S. D. A., Washington, D. C., June 1937, R. J. Cheatham.

"A Survey of the Agricultural Trade Between the United States and Canada, 1935 to 1937," U. S. D. A., Washington, D. C., F.S.-69, July 1937.

"Agricultural Imports Classified on the Basis of Their Competitive Nature and Tariff Status," U. S. D. A., Washington, D. C., June 1937, C. F. Wells.

"Uses and Products Made of Corn Abstracts and References," U. S. D. A., Washington, D. C., USGSA-G1-31 (Rev.), Mar. 1937, C. Louise Phillips Corbett and E. G. Boerner.

"Cost of Production of Potatoes," U.S.D.A., Washington, D. C., May 1937, R. P. Matteson and H. W. Hawthorne.

Fertilization of Bulb Plants

BULB plants, such as tulips, hyacinths, narcissi, and crocuses require fertilizers high in potash, according to the experiments of Dutch growers. Bulbs originally were grown in Holland on sandy soils very low in organic matter or humus. Later, the industry spread to the clay soils and even to the peats and mucks, but results were not satisfactory in these cases. At the present time, bulb growing is restricted largely to the sandy soils. From this it will be seen that there is comparatively little natural fertility in the soils used for this crop. The nutrients, therefore, must be supplied almost entirely by commercial fertilizers.

Fertilizer containing about 100 pounds nitrogen, 100 pounds phosphoric acid, and 300 pounds of potash (a 1-1-3 ratio) per acre is recommended in Holland. This would correspond to a 5-5-15 fertilizer at the rate of 1 ton per acre. This may sound rather odd to some agronomists in this country, but it is interesting to note that this ratio is similar to that found to be most favorable for sweet potatoes by the Norfolk Truck Experiment Station. Sweet potatoes, so far as fertilizer requirements are concerned, tend to correspond to bulb plants, and the soil at Norfolk, Virginia, probably as much as any in this country, corresponds to that in Holland. It would therefore appear as though the 5-5-15 fertilizer analysis would also be quite satisfactory here. In case a 5-5-15 cannot be obtained, a 4-8-12 tobacco fertilizer probably would give quite satisfactory results.

The materials preferred by the Dutch growers are dried blood and sulphate of ammonia for nitrogen, Thomas Meal (basic slag) or superphosphate for phosphoric acid, and sulphate of potash-magnesia or sulphate of potash for potash. Some growers use nitrate of soda and muriate of potash also. A satisfactory formula for bulb fertilizer might be 300 pounds of 12 per cent blood, 320 pounds of sulphate of ammonia, 570 pounds of 18 per cent superphosphate, 60 pounds ground limestone, 440 pounds sulphate of potash-magnesia, and 310 pounds 95 per cent muriate of potash. On heavy soils the phosphoric acid probably should be higher, in which case 100 pounds of ammophos 11-48 or similar material might be substituted for 100 pounds of blood. The fertilizer should be applied at the rate of about 1 ton to the acre or 45 pounds per 1,000 square feet, in the fall or early spring.

Individual varieties of bulb plants are not exactly equal in their demand for lime. Hyacinths, for example, prefer a soil that is neutral with a pH of about 7. Many narcissi grow better in a more or less sour soil. Golden Spur, for example, and Dubb. v. Sion prefer a pH of 5 to 6 and grow poorly at pH 7.5. Tulips grow as well on acid as sweet soils.

Potash Pays on Prunes and Apricots

THE need for potash and other fertilizers on prunes and apricots can be determined by examination of the trees and fruit as well as by testing the soil. Careful observations and field trials have shown that the trees really speak a language which, when correctly understood and acted upon, enables the orchardist to increase his profits through improved yield and quality of his fruit.

A fruit grower in the Campbell district of California was greatly worried over the poor quality of the prunes his trees were producing. The quality of the fruit had been steadily deteriorating for several years and, as the grower stated, "the more fertilizer I used, the poorer was the quality of my prunes." It developed that he had used only sulphate of ammonia and he was being urged to use more of it. The prunes told their story very definitely by their heavy shrinkage on drying, lack of sugar and almost worthless quality, all running to small undesirable sizes.

The grower was advised to apply 2 pounds of actual potash to each tree as soon as possible, and he acted upon this advice without delay. The following summer he reported a visible improvement in the appearance of his orchard and fruit. In the fall he stated that his prunes were two to three times as large as they had been in the past and the quality was unexcelled. Neighbors would not believe the story of this improvement until they examined the orchard themselves. So striking were the results obtained that many of these doubters decided that they also should use potash on their trees.

The effect of potash on this man's apricots also was marked, especially in improving the shipping quality of the fresh fruit. In previous years, as he expressed it, "apricots, falling on the ground, smashed, forming a pancake and consequently were worthless." This year the fruit, falling to the ground, was so firm and maintained its shape so well, that it was all usable. This meant that all the crop could be sold which represented a considerable increase of income from this factor alone. In addition to this, all the fruit was larger in size with better color and with improved shipping quality.

New, Better Vegetables is Aim of Plant Breeder

Tastes and preferences in vegetables are highly localized, both in this country and in other countries, says the United States Department of Agriculture 1937 Yearbook, part of which is devoted to the breeding of new and better vegetables. Many vegetables commonly eaten in Asia are unknown in the United States. In some countries American sweet corn is not considered fit for human food.

Although the Division of Plant Exploration and Introduction draws on the whole world for new plants, these are used mostly to breed specific characteristics into vegetables that already are favorites, in order to improve them in disease resistance, quality, or other characteristics.

Systematic vegetable breeding, carefully and scientifically planned by public agencies in this country, is comparatively new, says the yearbook, but individuals and commercial firms for many years have produced better vegetables, largely by what is known as mass selection, though there has been some by hybridization.

The new Federal station at Charleston, S. C., is devoted exclusively to breeding better vegetables. It is concerned with vegetable problems in the Southeast. At Cheyenne, Wyo., the Great Plains Horticultural Field Station is engaged in a breeding program to extend the meager list of vegetables now adapted to trying conditions of the Plains.

85 Per Cent of Soybean Crop Is Used by Industry

At present 85 per cent of the Illinois 5-year average soybean crop of 9,660,000 bushels is utilized commercially, whereas 10 years ago only 15 per cent of the crop went into industrial uses, according to J. C. Hackleman, crops extension specialist, Illinois College of Agriculture.

In his office Professor Hackleman has 50 different products all made from soybeans and all commercially available. It is the further refinement of the two primary products, oil and meal, that makes the many useful products available.

Among the edible products made at present from the whole bean are roasted beans, coffee substitutes, soysauce, soybean milk and cheese. Soybean meal is used for stock feed, fertilizer, and for such human food products as flour, sausage flour, macaroni and spaghetti, breakfast foods, infant and diabetic crackers, cakes, bread, and muffins. Other edible products from the soybean are salad oils and lard and butter substitutes.

Although the development of industrial products from soybeans has just started, Professor Hackleman has samples of products now commercially available in which soybeans have been used successfully in the manufacture of paint, enamel, varnish, glycerine, explosives, linoleum, water-proof goods, celluloid, rubber substitutes, printer's ink, lighting oil, lubricating oil, and soaps.

Besides playing an increasingly important part in industry, the soybean, a legume, has a place in any soil conservation program. Thousands of acres of soybeans were plowed under as green manure this year as a result of the emphasis placed on this practice by the new farm program."

Crop Rotations a Simple Way to Control Disease

Crop rotation is a simple way to keep plant diseases under control, but one of the best, according to United States Department of Agriculture crop specialists.

Rotating a wilt-resistant variety of flax with small grains and corn is one example. Flax, although grown like a small grain crop, belongs to a family of plants widely separated from the grass family to which wheat, oats, barley, rye, and corn belong, and is not attacked by the same diseases that injure grains. Flax has its own diseases such as rust, wilt, and leaf spot, but these in turn do not attack small grains. A variety of flax susceptible to wilt, however, must be grown on clean land, as ordinary rotations do not destroy the wilt organism in flax-sick soil.

Many diseases of cotton are checked by growing other crops. In cotton fields in Texas, where root rot is serious, losses may be reduced by rotating with grain crops and by deep tillage. Cotton wilt is one disease, however, which has not been successfully checked by changing crops, though rotation with soil building crops is an important supplemental factor in decreasing wilt damage and increasing yields. Wilt has been found in cotton in a field that had not been in cotton for several years.

Root knot of tobacco is checked by rotating with peanuts, croatalaria, oats, or a natural weed fallow. Granville wilt of tobacco is controlled by growing corn, cotton, or sweet potatoes. Department men have found that a 4-year rotation with ordinary field crops checks black shank of tobacco in western North Carolina. This rotation does not work in Florida, however.

Disease specialists say that the very simplicity of rotations often cause them to be overlooked as a method of checking plant disease. Many farmers keep on with a particular crop, the infection increasing year by year.

Cranberry Jumps Barrier to Show Good Condition

Before a cranberry is shipped it must prove its vitality and fitness for market by bouncing over a barrier. This is the way the berries are graded. Those that have decayed or otherwise deteriorated will not bounce when they are allowed to drop a short distance. All grading is done by machinery and the berries are given about four chances to bounce over the barrier. The problem that scientists of the United States Department of Agriculture are attempting to solve is how to retain this quality bounce in the cranberry after it has been in storage from 2 to 4 months. As it is one of the most costly crops to produce, it is important to the grower to market as large a percentage of the crop as possible after the long storage period.

Harvest of the crop generally starts in the late summer or early fall, depending on the variety and the locality in which the berries are grown. The best consumer demand, however, comes around Thanksgiving and Christmas and for this reason a large part of the crop must be stored. Heavy losses from decay while in storage are often experienced.

After testing a large number of samples, at temperature ranges from 30 degrees F. to 70 degrees F. scientists have concluded that holding the berries at 36 degrees F. reduced decay and breakdown to a minimum. Berries held at this temperature also retained the most attractive color.

Most storage houses are now insulated and equipped with proper ventilation, but few have refrigeration. In recent years, however, consumer demand has gradually lengthened the marketing period, which now continues long after the holiday season. To take care of this consumer demand, the growers wanted to know about storage temperatures and conditions.

The test showed that when the temperature was held at 36 degrees from 65 to 73 per cent of the berries were in good condition at the end of 4 months. Over 90 per cent were rotten when held at a temperature of 70 degrees. As a result the consumer may obtain "bouncing" berries all through the winter months.

Minor Elements in Cotton Fertilizers

(*From page 16*)

limestone as a filler to correct the equivalent acidity of a fertilizer. The experiment was located at 11 points in the state and has been run for 3 years. Calcic limestone increased the yield of cotton only 26 pounds per acre, while dolomitic limestone increased it 94 pounds per acre.

In all three of these experiments there are possible secondary effects which may account for all or part of the increase noted. Where magnesium sulphate was used, the sulphur may have increased yields. The poor results obtained with calcic limestone compared with dolomitic limestone may have been due to the reversion of some of the phosphate in the fertilizer to a less available form. However, considering the results from all three tests it seems probable the magnesium is a needed element in cotton fertilizers on most soils.

Ten pounds of borax were applied to cotton as a side-dressing at five locations. There was a small increase on one location but not enough to be significant. At the other locations there was a decrease.

Six pounds of copper sulphate were applied to cotton at seven locations in the state over a 2-year period. No beneficial results were noticed.

Only one experiment has been run with manganese and zinc, but this has been over a 7-year period. A small increase was obtained from manganese when used with limestone. No increase was obtained where limestone was not used. The experiment will have to be repeated in other locations to make sure of these results.

Minute quantities of zinc have been found to cure rosette in pecans around Albany, Georgia. It is not known as yet whether cotton needs zinc. In the one experiment in which this element was used no beneficial effects were noticed.

As far as these experiments go, the results indicate that cotton fertilizers should contain a fairly large amount of calcium and magnesium on some soils, and possibly a small amount of sulphur. While these three elements are often supplied in ample quantities in commercial fertilizers at the present time, one or more of them are often omitted, especially when concentrated fertilizers are used. While our knowledge of the needs of these three elements in cotton fertilizers is admittedly meager, the above experiments indicate that it would be safest to include them. Fortunately, they can be included without increasing the cost of the fertilizer.

There is as yet no evidence to show that boron, copper, manganese or zinc is needed on the average cotton soil. It is possible that where heavy applications of limestone are made manganese and some of the other minor elements may be beneficial.

High Potash Fertilizers for Fall Use

(*From page* 18)

eral elements at seeding time, a longer period of production of this crop can be maintained.

Orchard Cover Crops: Plenty of organic matter in the soil is an important factor in maintaining soil fertility and healthy trees. Fruit growers generally recognize a lack of nitrogen in their trees. Less often do we hear of them complaining of a lack of phosphate or potash, but we often hear of reduced yields, spindly and weak wood growth, poor shapes, poor keeping qualities, cracking of the fruit, water core, fruit pit, cork or drought spot, die back, and top and root injuries during the winter. According to research workers these are often the result of a soil fertility that is out of balance. It may be that too much nitrogen has been used, which practice sooner or later exhausts the reserves of the mineral elements potash, phosphate, and lime. Then the trouble starts. The lack of the mineral elements in turn limits the growth of cover crops, especially the legumes so necessary for the maintenance of organic matter in the soil and proper water-holding capacity.

Increase Organic Matter

On light soils and in older orchards on the heavier soils, especially where no particular attention has been given to building up the supply of organic matter, the immediate problem most likely is growing a cover crop to increase the supply of organic matter. To procure a satisfactory growth of cover crops under conditions found in many old orchards will probably require liberal applications not only of nitrogen but of phosphate, potash, and possibly lime in addition.

The excellent work of the Pennsylvania State College published in Bulletin 294 and similar work at the Virginia Experiment Station published in Bulletin 279 emphasize the importance of proper fertilization involving the minerals necessary for a good growth of cover crops. HofMann of Virginia notes that "generally cover crop responses are the first to be observed as benefits from complete fertilizer application."

Consider the Legume

If a sweet clover, alfalfa, or other legume cover crop is used, the mineral requirements of these crops must be considered very carefully. Legumes require large amounts of phosphate, potash, and lime for best growth. Before seeding in the late summer or early fall, if it has been difficult to obtain a good stand of legumes, a phosphate-potash mixture should be applied. This will help in stimulating the growth of the green manure crop. When plowed under, the decomposition of the cover crop will make the minerals available in the soil at a lower depth than if fertilizer is applied only to the surface. If potash deficiency has shown itself in the trees, enough fertilizer should be applied per tree to supply at least a pound of actual potash to each tree.

Field surveys of the mineral content of different soil areas where orchards are located have shown that the available mineral level is often lower than it should be for profitable crop production. If an orchard is in this class then it may be necessary to apply extra amounts of minerals until the proper level of available fertility is restored. Using phosphate-potash mixtures on fall wheat, legume hay, and orchard cover crops are practical methods of bringing the mineral level of soils up to a point where profitable crop production is possible.

Shall It Be Soil-mining or Soil-building?

(*From page* 14)

Tabulated below are data to show average benefit the first year following the application of fertilizer on the hay crops. Average increases for 22 of the same farms included in Table 3 are shown.

TABLE 4. FIRST-YEAR RESIDUAL BENEFIT TO HAY CROP

No. of farms	Increased yield 2 cuttings 0-20-0	Increased yield 2 cuttings 0-20-10
22	543 lb.	917 lb.

It will be observed that there has been an average increase for 20 per cent superphosphate of 543 pounds. Where potash was added to the phosphate, an increase of 917 pounds resulted. With hay valued at $12 per ton, the increased yield resulting from phosphate treatment would be $3.25. In the case of the phosphate-potash treatment, a value of $5.50 was obtained. This really is pure gain, since the fertilizer more than paid for itself the year previous in increased yields of grain.

Combat Soil Depletion

Our soils are being rapidly depleted of organic matter and becoming more and more acid in character. They have lost their humus through the growing of soil-depleting crops, such as corn, small grains, and cash crops. Unless immediate steps are taken to stop these losses, unless we shift more of our land from soil-depleting to soil-conserving crops, unless we resort to the use of more fertilizers and lime in maintaining a balanced state of fertility, the future prosperity of farmers in Wisconsin is in real jeopardy.

By liming we are laying the foundation for more productive soils. Lime not only corrects acidity but also supplies available calcium to our lime-loving crops. It is also helpful in making other plant foods available, especially phosphorus. Liming acid soils stimulates bacterial life, thereby helping to make the plant food contained in organic matter available to growing crops. The liming of our soils will improve their texture; will produce a more friable, granular soil.

Acid Land Needs Lime

During the past 3 years something better than 2,000,000 tons of lime have been produced and applied to Wisconsin farms under our State and Federal lime production program, but this amount is sufficient to cover not more than 10 per cent of the acid soils in the state. It is estimated that less than 20 per cent of the farm lands in Wisconsin have been limed. There are still better than 6,000,000 acres of acid, lime-deficient soils in the state. Repeating the application even at the rate of 1,000,000 tons per year, we would be just barely maintaining a lime balance in our soils. Even when we have covered every acre of acid land on our farms, it will be found desirable to start right in again and relime most of our soils.

While it is true that liming is a basic step in a soil-building program, yet by reason of the stimulating effect that lime has on most acid soils, we are really pumping the soils harder and harder. In fact, the liberal use of lime will make the need for phosphate and potash greater. And right here permit me to observe that the liming of our soils, the growing of more alfalfa (a heavy potash feeder) will reduce the amount of purchased feeds and thus further accentuate the need for more commercial plant foods. Already this situation exists. The acreage of alfalfa in Wisconsin has doubled during the past 3 years. We harvested better than 1,000,000 acres of this great crop in 1936 and again in 1937. And this all means heavier demands on the mineral resources of our soils.

The Federal Government is now engaged in a gigantic program of soil conservation. A program for the control of wind and water erosion has been set up in every part of the United States. Large scale erosion control demonstration projects are being established. Hundreds of engineers and agriculturists have been hired to supervise this work. Our CCC boys are doing much of the physical work in remodeling farms and watersheds, building terraces and dams, and planting trees for shelter-belt protection as a means of controlling wind and water erosion.

Our soil conservation and crop control program (successor to the AAA) is just another approach to conservation. It is true farmers are being paid to shift acreage from soil-depleting to soil-conserving crops, being paid to seed down their land to pasture and hay crops, and being paid to use lime and fertilizers in a constructive soil-building program.

Most farmers right now have signed up on this program primarily because they can earn in benefit payments $40, $50, or $100. But really these better soil-management practices are justifiable on the basis of added income and long-time productiveness of their soils.

The Federal Government is really playing the role of a benevolent and provident parent who sees danger and possible destruction ahead if his wilful children continue in the way they have been going. But rather than let its children suffer the consequences of their wrong-doing, the Government is now nurturing, feeding, and guiding them in right habits of soil building, which is laying the foundation for future prosperity.

Practices Proving Sound

It is indeed gratifying to me, a soil specialist, who for years has been talking lime, fertilizers, more alfalfa, and better yields of grain and corn, to see my feeble voice caught and amplified on a wave of 10,000 loud speakers which are broadcasting the story of soil fertility to every county in the State of Wisconsin. And I now sit back with a feeling of comfortable satisfaction and know that the results from these new practices for which farmers are being paid will prove them fundamentally sound, and that even after Federal subsidy has been withdrawn farmers will continue these better soil-management practices, because they pay.

Atkinson Demonstrates That It Can Be Done

(From page 9)

The purchase and use of the new fertilizer distributor by Mr. Atkinson was in line with his policy to utilize the proved results of research and to get the best possible return from the application of fertilizer.

Five great institutions, the National Joint Committee on Fertilizer Application, the National Fertilizer Association, the Farm Equipment Institute, State Agricultural Experiment Stations, and the U. S. Department of Agriculture have cooperated in research to find the best way to place fertilizer.

The U. S. Department of Agriculture reported that the investigators got the best results with cotton under average conditions when the fertilizer was placed in a narrow band about

2½ inches to the side of the row and 2 inches deeper than the seed. Fertilizer on one side of the cotton row proved to be as good as fertilizer on both sides of the row.

Potatoes yielded about 30 to 35 bushels more per acre when the fertilizer was placed at each side of the row compared to placements under the seed or mixed with the soil around the seed. The fertilizer was placed in a band 2 inches to each side of the seed piece and a little deeper than the seed piece.

The Department reported that with tobacco, the research in certain southeastern experiments showed an indicated increase of $55 to $70 in the per acre value of the crop when the fertilizer was placed at each side of the row instead of under the tobacco plants or mixed with the soil around the plant roots. The best results were obtained when the fertilizer was placed in a band 2½ inches to each side of the tobacco plant and one inch below the root crown.

In their work with row crops, the side placement of the fertilizer gave the best results when the crop got little rain during germination of the seed. The advantage of side placement was not always noticeable when the fertilizer application was small, when considerable rain fell after planting, or when the crop was planted on heavy soil.

Fertilize to Control Cotton-belt Erosion

(*From page* 22)

eroded land also respond well to nitrate top-dressings. Experiments show large and very profitable increases and excellent erosion control from the use of phosphates on pastures with a Bermuda grass base. Phosphate increases the winter cover of white, hop, and bur clover and lengthens the grazing period of Bermuda pasture. No doubt adding lime and potash to phosphated pastures would pay, as a complete fertilizer has been profitable on several Bermuda and winter legume pastures.

In the past, the value of commercial fertilizers has been determined solely

Farmers inspecting a luxuriant growth of hop, bur, and white clover on a fertilized Bermuda grass pasture at the Cotton Branch Experiment Station, Marianna, Arkansas, April 16, 1937. Per-acre gains in weight of beef cattle have averaged 592 lbs. on this pasture for the last three seasons, or 154 lbs. more than on an adjoining unfertilized pasture.

on the basis of increases in crop yields and quality from the use of these materials. In the future, commercial fertilizer is destined to assume a new role, that of maintaining present crop yields by increasing vegetal cover for holding topsoil in place and keeping fertility at present and higher levels. Fertilizer for cotton belt erosion control can be made a powerful weapon against the ravage of this most destructive enemy of our greatest asset, topsoil. Its use will be as one of many other good Soil Conservation practices rather than as a substitute for these practices.

Growing Herbs in the Family Garden

(*From page* 20)

flowers. For example, the various purslanes, or Portulacaceae, because of their fleshy red stems are relished in salads. They are colorful but somewhat neutral in taste. Salad burnet is another delightfully scented herb with a mild cucumber flavor that might be included in salads. The petals of the common marigold are claimed to be an interesting addition to a salad. Nasturtiums also are used by some in salads. The blue-flowered rampion is another herb that is used in salads. It is used both as a vegetable and as seasoning.

Any garden, regardless of its size or condition, that includes most of the herbs mentioned herein could rightfully be classed as an herb garden. Many growers interested enough to include a majority of these herbs would find themselves becoming herb enthusiasts after a few years, and would probably wish to increase the number of these interesting plants.

Much has been written in regard to herb gardens, but a large part of the discussion concerning them has been in a romantic vein—a very unscientific approach, to say the least. There is nothing that the ordinary gardener cannot understand about growing herbs. They grow like other plants. Possibly there may be some wizardry involved in their utilization in a medicinal way, but this article is not concerned with "simples," the name often attached to medicinal herbs. It is hoped that it will serve to arouse a genuine interest in herbs for kitchen use, both because of the joy to be found in growing these unusual and attractive plants, and their genuine usefulness in relieving the salt-and-pepper flavor common to so many present-day American foods.

Sand Country

(*From page* 6)

tures into fantastic turrets and minarets, shading from dull brown to coppery red, peer up in grim silence over border plots of juniper and pine. These were admired by the vagrant French voyageurs of Injun trading days, who graced them with fancy Gallic names.

The open fields are colorful, too, tinted with meager, gray, sand grasses, blued with wild pea-vine tangles, and rosy-toned with spreading clumps of sorrel. In early June, I last traversed the zone, and my eyes could hardly keep the road for the attractiveness on either side.

Flaming clusters of squaw paintbrush, or hoary puccoon; rank, bluestemmed, sticky liverwort; dainty wild phlox; gorgeous purple lupines on tall spikes; and ranks of white flowered locust trees and snowy thornapple branches scent the drowsy air. The distant coo-coo of the mourning dove and the squeak of the gopher alike brought memories of barefoot times long gone.

Now maybe it wasn't so tough on the Injuns after all, to be shifted by the government, like a soil-depleting crop, over into these silent, flowery, and forgotten places. Sands too have their compensations.

They say that plants in sand must sink in their roots pretty deep, and that you can't transplant some sand herbage and make it thrive elsewhere. Perhaps it's that way too with us folks who come of a sand-land heritage.

MY PARENTS and their folks came west from New York and New England, passed calmly over some of the fine, black loam soils of the prairies, and finally squatted in the best spot of building sand known to the architects. Wood and water were the cravings of raw pioneers, and these were found in abundance then in the light soil areas.

Here they were raised with the jackrabbits and the Injuns, and the only difference was that the government expected my folks to pay taxes, allowing the redskins all the sand and peat they wanted just for keeping quiet. And in that way somehow we all absorbed the nature of the place and got sand and solitude into our systems.

I suppose for one thing, though we didn't know any better, we sort of appreciated living in such a pretty place and enjoying the few things we had. This concept of farm life is outmoded, naturally, and people nowadays believe that laws and organizations will protect them in their battle with nature and their own ignorance. Likewise they don't usually take as much pride and comfort over sitting down to a meal of "home products," and they depend on the bakery and the butcher shop for more staples than we were wont to do.

WHILE I am not arguing for a return of primitive and uneconomic situations, I am certain that the possession of a simple home in a meager land meant more to us than the luxuries accepted as commonplace justice by masses of folks today. Living that kind of a life surely stocks up your fund of patience anyhow.

Consequently, I feel as cheerful as a fly on a bald head when cool and rainy seasons arrive post-paid from the Weather Bureau. I know that the drainage is par-excellent on the sand farms and that the light soils will catch and retain what solar warmth and energy there is. I know that my old chums will get a little gravy along with their grits for one season anyhow.

I climb a scrub oak knoll where my parents sleep among the sand-land sedge and cedars, and I gaze across their homeland valleys at "time and the river." Stern modern economics decides that their lives were wasted on neglected submarginal soils. Science has since opened new vistas and old errors fade as trained youth enriches the land of our patient fathers.

Yet knowing all these to be signs of a better day, a broader life, and a surer hope, I still believe that no chemistry, no laws, and no labor can prepare an abiding place of more lasting spiritual security than our humble home-makers established in that land of drouth and nubbins.

The real harvest of the sands cannot be weighed at the bins. Devoted memory takes the measure.

NO CONSIDERATION

Two gangsters were escorting a member of a rival gang across a lonely field on a dark and rainy night.

"What rats you are," grumbled the doomed one, "making me walk through a rain like this."

"How about us?" growled one of the escorts, "We've got to walk back."

Father: "Isn't it wonderful how little chicks get out of their shells?"

Son: "What gets me is how they get in."

An American staying in a London hotel was introduced to an Aberdonian, who asked him: "And what country do you belong tae?"

"The greatest country in the world!" replied the American.

"Man! So dae I," replied Sandy, "but you dinna speak like a Scotsman."

Bluenose: "Pardon me, young lady, but in the matter of your dress, don't you think you could show a little more discretion?"

Flapper: "Migosh, some of you guys ain't never satisfied!"

Teacher in geography class: "Where is Detroit?"

Young Ike: "In Chicago playing the White Sox."

Doctor: "You must avoid all kinds of excitement."

Male Patient: "But doctor, can't I even look at them on the streets?"

Most women would be cured of jealousy if they would only take one good, steady, and impartial look at their husbands.

Little Bobby, aged seven, came into the house looking somewhat puzzled.

"Mother," he said, "why is it some people are so rich and we're so poor?"

"I guess it's just God's will," she replied.

Bobby pondered a moment and then asked: "Why weren't we mentioned in God's will, mother?"

ADEQUATE REVENGE

"Ye say ye blackened his eye, Pat?"

"Thot's whot O'i did. Sure, O'i got a fish bone stuck in me throat, an' not contented with seein' me suffer thot much, he commences beatin' me back."

PITY THE GROOM

"What does the bride think when she walks into the church?"

"Aisle, Altar, Hymn."

A mountain man who rarely, if ever, visited a town of any size, came to a city with his son, traveling in a rattletrap car.

Climbing out on one of the main streets, the old man appeared fascinated by the pavement. He scraped his feet on the hard surface, and, turning to his son, remarked:

"Well, I don't blame 'em for building a town here. The ground is too darn hard to plow, anyhow."

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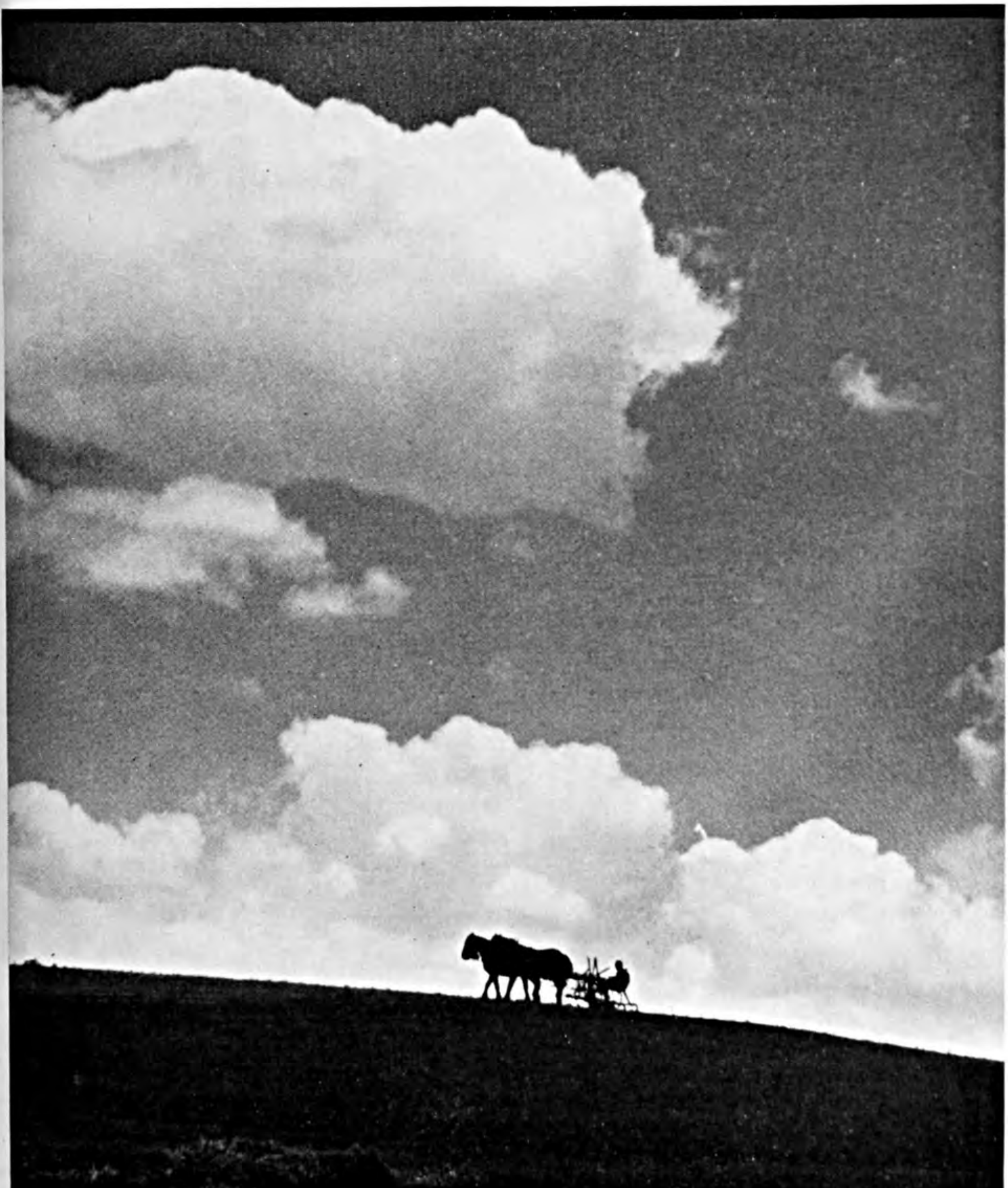

The Pocket Book of Agriculture

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The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

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American Potash Institute, Inc.

Investment Building, Washington, D. C.

J. W. TURRENTINE, *President and Treasurer*

G. J. CALLISTER, *Vice-President and Secretary*

SIDES ARE TAKEN AND MANY ARGUMENTS SETTLED ON THE WAY HOME FROM SCHOOL.

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., OCTOBER 1937 No. 10

Jeff contemplates on more than--

Just a Milk Shake

Jeff McDermid

AS the butter-consuming season waxes and the ice cream season wanes, I feel it incumbent upon myself to churn about a bit in the topic most familiar to my dear but stubborn friends. That topic concerns what the dairy industry can do to obtain for itself a slice of that security which corn-hogs and cotton are always seeking without much luck in the face of grasshoppers, hot winds, politicians, and the cost-price ratio.

While milk is produced in driblets in every farming community which is not too lazy to pull teats, a flood of it occurs only in six or seven major dairy States, whose leaders naturally think they speak for the whole industry. In those States long association with the temperamental-natured dairy cow has given a goodly degree of both temper and temperament to the fellows who lean their brows against the pulsating flanks of bovines night and morning, seven hundred and thirty times a year.

To be sure, a few of their hasty critics point out that considerable "bull" has been transfused simultaneously, but I shall not beller about that for the present. For that vagary involves itself in oleomargarin jitters and foreign import bogies and blues—both of which, I maintain, only keep the dairymen in good gymnastic trim through shadow-boxing. The more important considerations are the only ones worthy of a noble intellect, like mine.

One of the first confusing points to clear up once and for all (or at least until Congress re-convenes) is the nature of the relationship of industrial conditions to the dairy situation. During the depression I heard it squawked hundreds of times that there was a large surplus of milk and manufactured dairy products because of a very low consumption.

IN THE case of fluid milk and cream, and ice cream too, this statement was probably true, but with manufactured dairy items which carry the bulk of the industry's output, this was a gross and a careless error. Although possessing all the exact official estimates of what happened, my intentions are kindly, and I shall not bore you like a buttermaker uses his trier, by declaiming all the digits.

But should you wish me to act as guide along the mazes of that cyclorama of erudition installed in the BAE building in Washington, I can show you a figure wizard or two who offer evidence in cold storage vaults to upset all that clatter about overproduction. They will tell you that from 1931 to 1934 the actual consumption of butter, cheese, and evaporated milk in this country was very much greater than it was in the period before the panic.

Each year of the times when dairymen were in a dilemma, the good people on the consuming end gobbled up more of those manufactured milk products than they did from 1925 to 1929—but that's not the whole story! During that interval of depression, consumers took 32 per cent *more* evaporated milk at 10 per cent less expenditure; 11 per cent *more* butter at 40 per cent *less* expenditure; and 5 per cent *more* cheese for 32 per cent *less* expenditure.

This left the cow man stranded between debts and drought, and all he had left was his trusty right! No wonder he wanted to punch somebody for awhile.

Thus we have something clearly established as our first anchor in the turbulent sea of milk. First, the dairy industry has risen in its popularity as a caterer to ordinary appetites. Second, there is hardly any direct connection between the volume of industrial production and the amount of dairy manufactured products consumed. Third, there is a direct relation between the wages paid, or the income of industry, and the prices received, or the income of the dairymen.

I trust you see the difference, but I won't blame you if you get lost a bit; for I did many times while groping around, a trifle groggy from many statistics, seeking to find the exit from the BAE annex.

SO YOU'D better just remember that chief benefit to the dairy industry lies in a high rate of domestic employment, at good wages; and that a whole lot of this guff about a fluctuating per capita production and consumption of dairy products is mostly banana oil. The dairy industry is not only the greatest single avenue of farm income in America, but its production and consumption are more uniform than those of any other staple farm commodity. By and large, the dairymen have a domestic puzzle on their hands, with only a distant, indirect relationship to the volume of export trade in agricultural goods. Having set down the first guide-post, that of good wages for the masses, we have another point to make closely related to this, and the solution of which would remove the occasional, temporary, so-called surplus of dairy products—which creates a dubious, jittery price curve for the producers.

Speaking then of good wages, and assuming that 1929 is regarded as a period of good wages, the facts are that eight million non-farm families were then in such low income groups that adequate diets were impossible for them to provide. Even now as we talk of returned prosperity, I find

that in the metropolis of a leading dairy State there are hosts of poor families unable to buy milk, dairy products, eggs, and fruits sufficient to raise healthy, normal children. The "border line" cases, or those where parents earn meager wages, are worse off than the families under public relief supplies.

HENCE getting folks back to work does not tell the story until we know what their earnings are above the subsistence level—and it is right in this class where the dairy industry can get in its mutual welfare work. I say "mutual" welfare because by aid to undernourished mothers and children in low income groups you are not "subsidizing" folks able to earn money; and moreover, by distributing milk and dairy products to such persons wisely under Government subsidy, you ease the pressure of the so-called surplus—or wipe it out completely—and create good will and good food habits at the same time.

How do we get the mazuma? A natural question this, as Congres tightens the reins. Have no fear, as I have it all thought out as usual. We either take a straight Federal grant outright, or we approach it by asking for an amendment to an existing Federal law. This law provides for the removal of 30 per cent of the annual customs receipts of the Government for use by agriculture in handling or diverting or otherwise settling the surplus question.

TO DATE the dairy industry has secured less than half of one per cent of this allocated sum annually. Its rightful share, if we assess it according to the dairy industry's proportion of the total farm income, would be at least twenty per cent; and twenty per cent of thirty per cent is six per cent. Which means, as I have discovered by another knock at the door of erudition in Washington, amounts to fully thirty million smackers per annum. And part of that sum would be derived from duties on imported dairy products too.

Say we "ear-mark" thirty million dollars in a sort of surplus-reserve fund, by act of Congress in 1938, dedicated to maternal and child welfare via the dairy route. Pretend that Congressmen were agreeable to it, and we also provided that instead of the sum being doled out by bureaucrats and measured in red tape, we put it under bond in the hands of competent and responsible cooperative dairy-farm organizations to spend solely for bringing the foster mother of the human race to the doors of the poor and needy. I have enough respect for the purveyors of dairy products who are not farmers to assume they would slice off a little of their velvet if the producers put their surplus milk into such a pool at manufactured milk prices.

Subsidized consumption rather than restricted production is the plan I propose. Long association with dairymen east and west, north and south,

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Raising Quality Fruit On a Large Scale

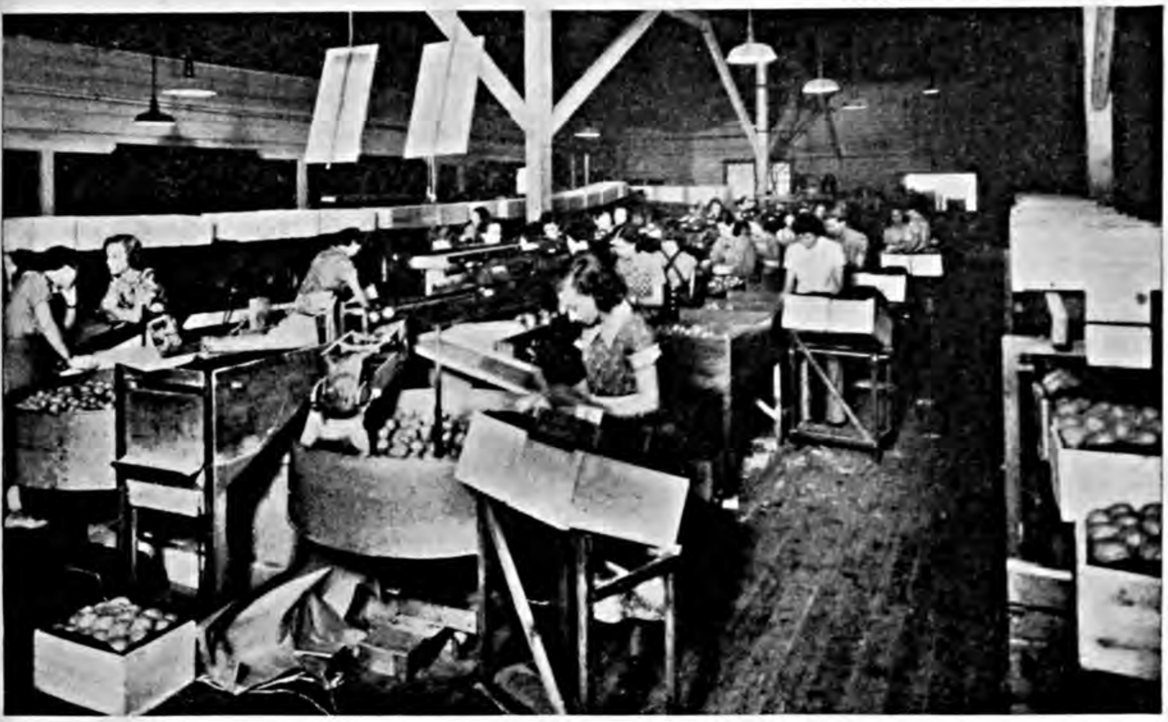
By Clay A. Whybark
Puyallup, Washington

SUCCESS with apples depends on many factors, some of which are not fully appreciated by the commercial grower. One of these important factors is proper fertilization of the orchard. The grower should realize that for every ton of apples that he removes from his acreage he is taking 2.6 pounds of nitrogen, 0.2 pounds of phosphoric acid, and 3.8 pounds of potash from his orchard soils. These figures do not include the amounts necessary for growth and renewal in the trees. This additional requirement for plant food is appreciable. Many commercial orchardists have realized this requirement and actual loss of minerals and are now taking steps to overcome this drain on their soils.

The Congdon Orchard located near Yakima, Washington, is an example of a commercial orchard where definite results have been obtained from the proper balance of mineral plant foods in the fertilizers used. This orchard has approximately 419 acres of bearing fruit and during the past 8 years has used 1,687 tons of mixed fertilizer. The production manager studies the condition of the trees and either increases or decreases the ratio of the different elements in the fertilizer mixture, thus making a varied program.

The entire orchard is divided into tracts, and a record is kept of the fer-

There are numerous tracks of well-fertilized apple trees in the Congdon Orchard.



One of the three washing units used in packing pears at the Congdon Orchards.

tilizer application and crop yield for each tract. To give the reader a better understanding of the fertilizer practices on this orchard it would be well to give the program for some of these tracts.

The following (with application at per acre rates) was used on the pear orchard:

1. Fall of 1929 for 1930 crop, 750 pounds of 3-10-10 mixed fertilizer plus 750 pounds of 1-10-10 mixed fertilizer, with an addition of 1,000 pounds of gypsum.

2. Fall of 1930 for 1931 crop, 1,500 pounds of 3-10-10 mixed fertilizer.

3. Fall of 1931 for 1932 crop, 1,500 pounds of 3-10-10 mixed fertilizer.

4. No fertilizer for 1933 crop.

5. Spring of 1934 for 1934 crop, 1,870 pounds of 8-5-12 mixed fertilizer.

6. Spring of 1935 for 1935 crop, the northern half of the orchard was fertilized with 489 pounds of 6-8-6 mixed fertilizer per acre. The southern half was fertilized with 1,291 pounds of 8-5-12 mixed fertilizer per acre.

7. Spring of 1936 for the 1936 crop, the northern half of the orchard was fertilized with 941 pounds of 6-8-6 mixed fertilizer per acre, and the southern half with 1,592 pounds of 8-6-8 mixed fertilizer per acre. The yield record on this 22-acre pear orchard is given in the following table:

Year	Boxes of Pears
1930	694
1931	674
1932	678
1933	728
1934	821
1935	830
1936	794

Before the fertility problems on this orchard were studied and its plant-food requirements met, the planting produced around 500 boxes per acre of poor quality pears. The fertilizer program has produced an average yield (over 7 years) of 745.6 boxes of pears per acre, and they are of the best quality. This is an increase of 245.6 boxes per acre, due to proper fertilization.

The lack of a fertilizer application for the 1933 crop had no effect upon the yield for that year, showing that there evidently is some carry-over from one year to the next in this pear orchard. The high level of productivity was maintained in 1934 by an extra heavy application of mixed fertilizer.

The following program (with application at per acre rates) was used on one of the apple tracts:

1. Fall of 1929 for 1930 crop, 1,000 pounds of 3-10-10 mixed fertilizer plus 1,000 pounds of gypsum.
2. Fall of 1930 for 1931 crop, 1,000 pounds of 3-10-10 mixed fertilizer.

Winesap apple tree well fertilized for the past 8 years with a complete fertilizer high in potash.

3. Fall of 1931 for 1932 crop, 1,000 pounds of 3-10-10 mixed fertilizer.
4. No fertilizer for 1933 crop.
5. Spring of 1934 for 1934 crop, 918 pounds of 3-10-20 mixed fertilizer.
6. Spring of 1935 for 1935 crop, 880 pounds of potash plus 880 pounds of bone meal (4-15-0).
7. Spring of 1936 for 1936 crop, 530 pounds of potash, plus 530 pounds of bone meal (4-15-0), plus 161 pounds of 3-10-10 mixed fertilizer.

It is interesting to note that in 1933 when no fertilizer was applied, the yield dropped to 462 boxes per acre. Evidently in this tract the carry-over of fertility has not been great enough to maintain high production.

The yield for this 33-acre apple tract is given in the following table:

Year	Boxes of Apples
1930	805
1931	734
1932	774
1933	462
1934	814
1935	582*
1936	856

* In 1935 due to a very early freeze, several thousand boxes of apples on this tract were not picked.

The value of a good fertility program is clearly shown by studying the yield records before fertilizer was used and after it had been used over a period of years. A 3-year average before the fertilizer program was started shows an average yield per acre of 499 boxes. A 5-year average (not including the year no fertilizer was applied and the year of the early freeze) after the fertilizer program had been started, shows an average yield per acre of 796.6 boxes, or an increase of 297.6 boxes per acre. This increase is due to the proper use of mixed fertilizer.

A good fertilizer program not only increases the yield per acre but im-

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Winesap apple tree fertilized twice with sulfate of ammonia and once with manure during the past 8 years.

Type of terrace constructed. The raw ditches make the fields look ragged, and many visitors say, "they take up one-third the land." But they have halted erosion.

We Do Some Terracing

By F. H. Jeter

North Carolina State College of Agriculture

JERRY HENRY is partially responsible for the idea. Last fall, I met him in Charlotte for the purpose of coordinating our Extension Service and Soil Conservation Service radio programs, and in the course of our discussions he inquired if I had ever had my farm terraced. Jerry, by the way, was at that time head of the editorial division of the Soil Conservation Service regional office at Spartanburg, South Carolina. He knew, therefore, something of the ravages of erosion throughout the upper part of that state, especially in Union County where my acres are located.

I told him that Robert, the tenant, had some fairly good terraces on the place, but that these had been laid out mainly by the eye, and in times of heavy rainfall they frequently broke, allowing water to run unobstructed across the most fertile soil and washing to the creek much valuable plant food. Naturally, when one pays out hard-earned money for fertilizer and then top-dresses his cotton and corn with nitrate of soda and potash to give the crops that extra push they need so badly on average southern soils, he hates to stand by and see water laden with these fertilizing elements and precious topsoil go wending its way to foreign places.

Robert and I had discussed his terraces several times as we walked about over the place. Every winter and early spring Robert had placed brush in the broken places and had "plowed up" the terraces with a turn plow. Usually if a bad break occurred at some point Robert would drop the terraces a foot or two down the hill in an effort to overcome the strain at that particular point. But this did not solve the problem. Then, too, the old-fashioned, narrow terrace is a place for the multiplication of weed seed, which makes cultivation more arduous than it should be.

So we had discussed the whole matter at considerable length. Since we had been operating the farm, we had determined to build it up. Our program called for the adoption of a definite crop rotation, the use of improved seed, the planting of lespedeza on the small grain, the seeding of soybeans and cowpeas on small grain stubble where there was no lespedeza, and careful work to control those gullies already formed. Robert had built some stone dams in the larger of two gullies and had followed my suggestions about brush dams held in place with stakes. We had planted honeysuckle vines at the head of the gullies and kudzu on the banks lower down. We had changed the fertilizer formula, bought new seed supplies, and done other needful things as the farm income would permit.

Last winter we covered some outhouses that needed new roofing and purchased a new combination fertilizer distributor, planter, and stalk cutter. We figured that was about enough spending for this season, but those who recall weather conditions in the Southeast last winter will remember that it rained hard and almost incessantly. Robert and I walked over the place one morning in late winter and saw places where the topsoil was completely washed away. That decided us, so I wrote Jerry at once asking him to give me the procedure for having modern terraces built. He explained how and we made our plans.

Getting Under Way

First we joined the Union County Soil Conservation Association, paid our dues for 1937, and signed an agreement with the Association that we would attempt to follow its program. To our consternation, however, we found that the local CCC camp could not cooperate with the county terracing unit to handle our particular farm because it happened to be just outside of the territory assigned to that camp. By some means, however, the bright

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Robert and his boys have promise of a good crop, though somewhat late, because we waited until the terraces were built. This cotton was fertilized with 300 lbs. of a 4-8-4 per acre and top-dressed with 100 lbs. of nitrate of soda and 50 lbs. of muriate of potash per acre.

The Use of Soil Tests In Conservation

By Ford S. Prince
Agronomist, New Hampshire College of Agriculture, Durham, New Hampshire

THE Agricultural Conservation program is designed to encourage a farmer to make more effort to maintain the fertility of his soil than he has been in the habit of doing. It seems likely that permanent and eager participation in the program will be closely allied with immediate returns to the farmer himself.

In making this statement we are not unmindful of the fact that the community at large must benefit from the program, else the use of public moneys would not be justified. At the same time, even though the farmer contributes the lesser part of the funds in most cases, he expects to be able to see the fruits of his labor and expenditures just as though he had made the entire contribution himself.

It has been unfortunate from our point of view in New Hampshire that some sections of the country have emphasized the need for lime and superphosphate so strongly as to exclude the idea that potash and nitrogen are necessary for soil improvement. The idea even got abroad in certain communities somehow during the past spring that farmers there could spend all their Conservation allotments for lime.

Admittedly, our soils are practically all acid and are becoming more so. But we are not willing to admit that if a soil is within the reaction range of optimum red clover it will pay to buy lime to grow the crop, especially if phosphorus or potash or some other factor is lacking to produce a satisfactory yield. Clover will not grow on our New Hampshire soils with lime alone. A proper nutrient balance must be maintained for its success. This has been demonstrated and proved by experimental work at many points over the State.

If in this instance lime is applied where it is not really needed and the clover fails, the farmer becomes discouraged and is not likely to be eager to participate in the future. Furthermore, before that lime is actually needed to produce a good clover crop much of it will probably have dissolved and leached away by normal soil processes, and part of the effort will have been wasted. Clover and lime have been coupled together in this instance merely as a concrete case to illustrate the point, not that we doubt the efficacy of lime on clover or its necessity for the crop on many soils.

Indicates Fertility Needs

We have rather turned to the quick soil test as a guide to help keep the program running straight and smooth in this State. During the year more than 2,000 samples of soils have been tested, and recommendations have been sent to farmers based on these tests. By far the greater number of soils were tested as a result of the conservation effort, the result of the desire of farmers to find out how best to direct their expenditures.

A rapid soil test is the simplest guide to the fertility needs of a soil. It has its limitations and sources of error. Drainage or lack of it, weather, and perhaps the farmer himself limit its usefulness. Faulty handling after sampling or failure to cover all the variations in the field when sampling are sources of error. Even the chemist might make a mistake in the test by an error in reading, by using poor chemicals, or something of that sort. But with all these possible limiting factors, good results have usually followed the carrying out of recommendations so far as we have had a chance to observe.

Before using the tests as bases on which to make recommendations in New Hampshire, our chemists first tried methods developed by various workers and chose the ones which seemed best fitted to the soils of the State. These tests were then applied to soils of plots with known productivity from various experimental fields to formulate a basis for recommendations. With this as a foundation we have felt a little more confident about making recommendations for fertilizer and lime usage.

In order to find out where we stood with respect to lime needs and to the available plant-food resources of the State, we picked 1,000 samples at random from those which were tested during the past 12 months and summarized them. Not that a summary like this means much to the individual farmer, but to the chemist and especially to a person making recommendations the data are not only interesting but useful as well.

The following summary shows how the samples tested for pH value:

pH range	*No. of samples*
pH 6.0+	137
pH 5.5-pH 6.0	278
pH 5.0-pH 5.5	468
pH 5.0—	117

In our experimental work we have not found it advisable or practical to lime for alfalfa to more than pH 6.0, or for red clover to more than pH 5.6. In other words, 415 samples or 41.5% of the soils will grow good red clover provided other fertility nutrients are satisfactory, while 13.7% may be expected to produce good alfalfa crops, without lime applications.

Almost half of the samples, 46.8%, need lime in moderate amounts, say from 1 to 1½ tons per acre for red clover and from 2 to 2½ tons for alfalfa, depending upon the texture of the soil in question as well as its organic content. The other 117 samples, or 11.7%, need lime in greater

Many plants show easily recognized signs of plant-food starvation. White clover indicates an acute lack of potash by white spotting around the leaf edges.

amounts for clover and alfalfa and, in fact, should be limed at some point in the rotation no matter what crop is to be grown.

In a State such as ours where potatoes are extensively grown, care must be taken with lime recommendations on farms where this crop is included in the rotation, to avoid potato scab. For potato farms the following recommendations have been adhered to:

On soil with pH 5.3 or above, no lime should be used.

On soil with pH 5.0-5.2 use not more than 500 pounds of lime.

On soil with pH below 5.0 use not more than 1,000 pounds of lime.

Never use more than 1,000 pounds of lime at one application, no matter how acid the soil.

Lime after potatoes have been grown, when seeding down, and never just before planting the crop.

The recommendations given are for ground limestone. Our liming recommendations are probably not so high as many other workers might make. This refers not to potato rotations, but to recommendations in general. We have found in practice, that the law of diminishing returns applies to lime as to anything else. In fact, we say in N. H. Station Circular 44, "Considering the matter of liming from the practical point of view, it seems wise for a farmer to use minimum rather than maximum amounts of lime. This method is easier on the purse, prevents undue losses by leaching where large quantities are applied, and assures a higher rate of interest on the money invested." This is the procedure we have followed in making lime recommendations, feeling that if a farmer limes his soil to the reaction at which the crop may be expected to thrive and then applies all the other things necessary to produce a satisfactory crop, he will come off better than if he uses all his money for liming in excess of immediate crop needs and then neglects other important limiting factors.

Legumes, like the clover in this picture, need all-round fertilization on New Hampshire farms.

The need for magnesium on the soils of the State is indicated by the fact that 399 samples, or practically 40%, tested extremely low for this element. At this point crops that are sensitive to a lack of magnesium are apt to show magnesium hunger. An application of manure may take care of this need on most crops, but potatoes and other crops on which little manure is normally applied should receive magnesium in the fertilizer or in the form of magnesium limestone.

Dairy farmers have not yet felt the need for much magnesium in either fertilizer or limestone. Potato growers and sweet corn growers who do not have much manure to apply are

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Study Starvation Signs On Tobacco and Cotton

By C. B. Williams

Agronomist, North Carolina State College of Agriculture, Raleigh, North Carolina

DURING the past summer, field observations were made on many fields of tobacco in different parts of North Carolina. These observations have developed the fact that there are large numbers of fields (especially those on the sandier soils) on which the tobacco was suffering from more or less severe symptoms of potash and magnesia deficiency either alone or in combination. In a large number of cases, the deficiencies of the crop were so pronounced as to be materially interfering with the growth of the crop and greatly injuring the quality of the leaves for which the crop is grown. In some cases, the value of the crop was cut at least in half or more.

These conditions can easily be prevented another year by putting enough soluble potash and magnesia in the fertilizer mixtures to fully meet the needs of the crop for a normal, healthy growth. Had these nutrients been applied in sufficient amounts in the early growth of the crop last spring, the deficiencies of the soil, and hence those of the crop, could have been met and the crop made to produce a normal crop, providing no other unfavorable factors had intervened.

Treatment for Tobacco

After the crop is far advanced in growth little can be done in most cases to remedy the deficiencies, yet this is the proper time to study the crop and decide upon the weaknesses in the fertilizers used and what had best be used another year. This is particularly true if tobacco is to be grown on the same fields or on similar soils on the farms the following year. If tobacco is suffering from potash hun-

Sand drown or magnesia deficiency of tobacco—the leaves are arranged from left to right from the top to the bottom of the plant.

ger, certainly more potash must be provided in the fertilizer mixtures. If the tobacco is suffering from sand-drown (magnesia deficiency), then more soluble magnesia should be provided in the fertilizer mixtures for the next year, if this deficiency is to be met and a normal growth of the highest quality tobacco is to be made.

Neither the highest yields nor best quality of tobacco can be produced on any soil that does not, after fertilization, provide sufficient amounts of these constituents in forms available for the needs of normal crop growth. In the case of both of these deficiencies, the symptoms first appear on the lower leaves of the plants and progress upwards as the plants develop. With potash deficiency, the first appearance is at the tips of the lower leaves, evidenced by yellow colored spots and a strong tendency of the leaves to tuck under at the tips. In severe cases, yellow spots change to brown and a complete breaking down of the affected areas of the leaves follows, giving the leaves a ragged appearance. In the case of magnesia deficiency the lower leaves first become light green in color but later they become almost white between the chief veins. As affected leaves fail to function properly and in extreme cases cease almost entirely, if not entirely, the growth of the crop is materially retarded, and the quality of the crop is materially reduced.

Where growers are in doubt about what is the trouble with their tobacco, they should consult their agricultural experiment station, county agent, or vocational teacher.

Treatment for Cotton

Observations made also on cotton grown on the sandier soils of eastern North Carolina have revealed that sand-drown (magnesia deficiency) is quite prevalent. This deficiency of magnesia in available form, particularly on the sandy soils of the Coastal Plain region, causes the affected cotton crop to cease growing normally, and thereby causes a reduction in yield under what would have been secured had soluble magnesia been supplied in the fertilizer mixtures at planting time in amounts adequate for the normal growth of the crop.

It matters not how adequately the amounts of phosphoric acid, potash, and nitrogen in available forms were supplied in the fertilizer mixtures, this

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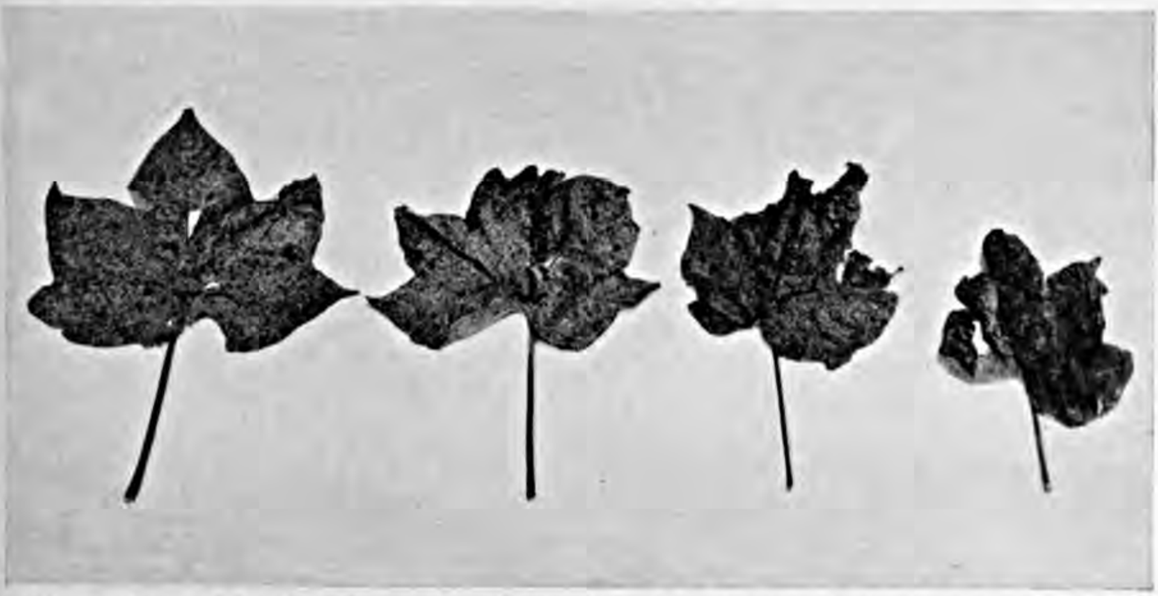

Cotton rust is potash starvation. These leaves show typical cotton rust on plants grown with insufficient potash.

Why Not Ask the Soil What It Wants?

By E. K. Hampson
Hamilton, Ontario

HAPPILY, scientific discovery recognizes no international boundaries, and there is no tariff on ideas. So when a friend of mine in Indiana told me of a plan for soil improvement they were working on in that State, we imported the idea duty free and attempted to work it out in Ontario.

It is so simple and so logical—as most new ideas are—that we wondered why no one had thought of it before. Briefly, you ask the soil what it wants, and then you give it the required diet, dose, or prescription.

The answer of the soil is given by the short route in chemical tests. Relatively accurate levels of available potash, phosphorus and lime are easily and quickly determined by color comparisons with standard charts. Then additions of phosphorus, potash, or lime sufficient to bring these plant-food levels up to a specified base line are made.

In the tests described this base line was arbitrarily taken as 60 parts per million of P_2O_5 and 80 of K_2O. In no case did lime appear to be necessary. In some respects this concept is the same as that of livestock men when they use the term "maintenance ration." But if they want their animals to increase in weight or give quantities of milk, they feed them additional nutrients according to what the animals are expected to produce. Similarly with crops, the base line is supposed to represent a maintenance ration only; but to produce satisfactory yields, the fertilizer diet must be increased.

So we proceeded to secure representative samples of soil from the fields under observation. These were tested by Professor Ruhnke of the Ontario Agricultural College, who prescribed the treatment to be given each field.

Results of Experiments

The first farm was that of Stanley Martin, Melancthon in Dufferin County. Mr. Martin is a well-known and very successful potato grower. His soil varies somewhat but is for the most part a sandy loam, slightly acid in reaction. His soil samples showed a moderate level of phosphorus but the potash was very low. Professor Ruhnke suggested a pre-application of 400 pounds of muriate of potash, to be thoroughly disked in, and 750 pounds of 4-8-10 fertilizer per acre applied at planting time with the fertilizer attachment on the potato planter.

Mr. Martin followed these instructions carefully. During the growing season, which was unusually dry, the "built-up" plot obviously withstood these conditions better than the remainder of the field which had 4-8-10 alone. The lighter color of the foliage was also noticeable.

The photograph tells the story of the final results at digging time. A few rows were left without fertilizer. These yielded at the rate of 107½ bushels per acre; the 4-8-10 alone, which was the main crop, yielded 147½ bushels; while the "built-up"

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Conserving the Benefits Of Soil Conservation

By H. E. Cotton
Wautoma, Wisconsin

FROM the records thus far studied, one outstanding conclusion is that fertilizers, and particularly potash, play an important part in intensifying, multiplying, and making more lasting the results of soil conservation work.

Testimony to this effect has been received from the committee in charge of the program in Waushara county, Wisconsin, and from County Agent E. A. Jorgensen, under whose general supervision the committee's work was done.

The summer of 1936 was a season of severe drought in most parts of Wisconsin. Corn blossoms were burned to a crisp, pastures were bare and brown, and hay was very short. It was certain that federal feed relief would be needed in many localities.

But exceptions were noted, especially on farms where alfalfa seedings had been established. And there were many such farms in Waushara county where alfalfa culture had been a subject of intensive study for some 10 or 12 years under direction of Professor A. R. Albert, director of the Wisconsin Experiment Station branch at Hancock, and County Agent Jorgensen.

Emil A. Jorgensen, County Agricultural Agent, Waushara County, Wisconsin.

The Role of Potash

For instance, in this county there is the 2,200-acre farm of Edward O'Connor, one of the state's "Master Farmers," where large acreages of alfalfa have been a feature for nearly a generation. Mr. O'Connor attributes his success with this queen of forage crops to the persistent use of potash fertilizers, in conjunction with lime and barnyard manure.

Frank Attoe, in the town of Springwater, keeps 12 fine dairy cows on his 80-acre farm and has alfalfa hay to sell. He has been doing farming of the soil-conserving type on his own hook for many years and considers potash an indispensable part of his working material.

The usual method in Waushara county is to apply muriate of potash and treble superphosphate in a 2-1 mix, 125 to 200 pounds to the acre, at the time of seeding.

One more instance to show the possibilities of alfalfa in this county. George Hoeft, in the town of Poy

Dairy cows thrive on well-fertilized alfalfa pasture.

Sippi, has 22 acres of alfalfa from which he took an excellent crop of hay early in the season. He then let it stand until seed ripened, when he took off 76 bushels of high grade seed, worth upwards of $1,200. He plans to keep this field in production with timely applications of potash.

Many more similar instances could be cited. Hence, in the light of past experience, alfalfa was the No. 1 choice of the county's farmers for "soil-conserving" purposes. Lime in several forms was readily available at low cost.

Resisted Bad Weather

Of course, results varied widely, from outstanding success to 100 per cent failure. But the records of the committee show the reasons for such variations. The history of each farm and field records what crops and fertilizers have been applied for several years past.

So, while failures were superficially attributed to drought, Dan Davies, Wild Rose, farmer and a member of the committee, points out that the drought was not limited to the seedings that failed. Drought and heat acted just as severely upon the fruitful fields as upon the others but didn't hurt them.

A check-up of his records proves that where alfalfa seedings and other soil-conserving crops lived through that dry, hot summer, fertilizers of some kind, containing potash, had been applied either at the time of seeding or on crops grown there in former years.

He further estimates that more than 75 per cent of all failures with these crops was traceably due to the lack of plant food in the soil, not merely to drought. Poor methods of handling, seed lacking in vitality, or some accidental condition might account for some of the failures, but he points out that well-nourished seedings are known from experience to resist and survive abuse and adverse conditions to a very great extent.

"Failure to use potash is the outstanding reason for loss of alfalfa seedings," Mr. Davies declares. "Even last summer's drought couldn't whip the plants that had plenty of plant food available."

Typical of successful work with soil conservation is the experience of Edgar Evans of the town of Rose. To add to his acreage of soil-conserving crops, he selected a field of 18 acres where he had raised corn and potatoes in 1935. It is light, sandy soil, pretty well worn out.

Mr. Evans first applied 19 tons of

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C. T. Ames' Camp Proves a Success

By E. B. Ferris

Superintendent, Holly Springs Branch Experiment Station, Holly Springs, Mississippi

THE late C. T. Ames, Superintendent of the Holly Springs Branch Experiment Station for thirty odd years, has left his impress on Mississippi agriculture as few other men have done. His mental processes were unique, and while a good writer and the most entertaining speaker on farm subjects the State has ever produced, he always felt that despite bulletins, reports, and numerous talks before hundreds of gatherings of Mississippi farmers, he was not getting the work of his station to the farmers and their families in the best way possible. So for years he visioned some better way of reaching farm families, especially the boys and girls, by injecting the element of entertainment and recreation into the more serious one of giving them agricultural instruction.

A Dream Comes True

Having no funds from which he might provide facilities for holding recreational meetings on the experiment station grounds, he was able to do little before the time came during the height of the depression when Government projects for providing work for the idle made such a thing seem possible. Quickly he grasped the opportunity and all but begged the materials and labor for making the start. It took the form of a Club camp, built in almost the exact center of a 200-acre tract of land and in a grove that furnishes ideal surroundings.

The camp house consists of a well-equipped kitchen, dining room, reception room, and sleeping quarters, all built in camp style. A deep well and electric light plant, together with the necessary piping and wiring, furnish water and lights to buildings and grounds. In a rough assembly hall picture shows and all sorts of gatherings for lectures can be held. A large pond covering several acres makes it possible for the boys and girls to enjoy

The late C. T. Ames on the left and M. M. Bedenbaugh on the right, as they stood ready to welcome Club boys and girls.

C. T. Ames in the foreground explaining to a squad of Club boys the effects of different fertilizers in evidence on the test plots.

boating and swimming. While camping parties have used the grounds for a year or more, they were only finished in 1937 and just a few days before the death of Mr. Ames. Doubtless some of the strenuous manual labor connected with getting things ready for the first camp of the season brought about his untimely passing from heart failure last April.

Everyone Welcome

As Mr. Ames' successor as superintendent of the Holly Springs Station, it is most pleasing to note the success of this camp for the first summer after its completion. Thousands of boys and girls and men and women have used it for recreation and study during the season just closing. They came from practically every North Mississippi county and engaged in such pleasures as swimming, boating, baseball, and tennis, besides the things of a more serious nature that in the main prompted their coming.

As a rule the Club boys and girls spend 2 days and nights, and as they retire others come to take their places. Not the least instructive feature of every meeting is visits to the field experiments surrounding the camp where crops growing on the thousands of test plots are shown and the purposes of the experiments are explained. These visitors are by no means confined to boys and girls, but include various organizations of men and women who wish to take advantage of the camp's facilities for a day or overnight gathering. The expense amounts to almost nothing, for such parties of young or older people usually bring their own food and assist in its preparation and serving.

While the camp is used principally by North Mississippi counties, it is not restricted to them. It has been repeatedly used during the past summer by County and Home Demonstration Agents from more distant parts of the State, usually serving them as sleeping and eating quarters while on State-wide tours, which are becoming more and more common as a means of studying the State's agriculture and visiting outstanding results wherever they are to be found. In fact, just recently this camp was used by a party of some twenty-five farmers from South Carolina, being piloted by their teacher of vocational agriculture on a tour that embraced many States. Sunday schools, churches, day schools, and other organizations of so many

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Take the Guesswork Out of Wheat-growing

By John E. Shearer
Indianapolis, Indiana

THERE are certain fundamental principles to follow to be successful in producing a crop of wheat as well as producing any other crop.

This year has been very unusual in many respects. Following a year of drought, this year has had an abundance of moisture with temperatures in most sections below normal and the nights have been cool. These weather conditions have been ideal for the spread of fungus diseases. The prevailing winds from the south made it ideal for the spread of rust, and rust, both red and black, had very damaging effects this year in most of the wheat sections. But the farmer who applied an ample supply of available phosphate and potash in the right proportions to balance the deficiency of these plant foods in the soil came through the ravages of the rust in good shape.

The first essential for a wheat crop is good seed, acclimated and adapted to the section in which you farm. There is no such thing as "seed wheat running out." I have been practicing general farming for 30 years, growing wheat in my farm rotations each year. Every year I clean and grade my seed wheat. I am sowing the same variety that has been grown on this farm for more than 40 years.

The next essential is a good seed-bed—a solid bed with a fine mulch on top.

The third and very important essential is an abundance of available balanced plant food. To find the

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The use of a combine is only one of the efficient practices to be considered in growing wheat.

When Do Our Soils Need Potash?

By H. F. Murphy

Agronomist, Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma

SOIL fertility and its maintenance is being stressed in this country today more than it has ever been before. Maximum production, or at least greater efficiency in production per unit of soil area involved, is receiving more than just mere comment. This has forcefully brought the question of plant food and fertilizers before the public, until today many farmers are realizing that they cannot expect maximum or even a paying production of crops on much of their land without the use of some kind of fertilizer. Farmers and communities are rightfully becoming "soil minded" and are anxious to know just what they can do to save what soil they have and how they may increase its productiveness. Different agencies are busy helping them solve their soil problems, and a closer relationship between the research worker and the farmer is in evidence. It is the dawn of a new agriculture.

Advanced Methods

While soil and fertilizer usage studies have been made for some time, it has only been during the last 20 years that rapid methods of analysis have made their appearance. The correlation of these data with field data and with the older "complete analysis" data is a decided step forward in our agricultural program. Today, many of the plant-food needs of a soil can be determined rather definitely (if not exactly quantitatively) in a few minutes or at most in a few hours' time. It is not an unusual thing today for the Agricultural Experiment Station and the Extension Division of the state to test many thousand soil samples each year for farmers by some of these so-called quick methods, and to make recommendations accordingly.

Limiting Factors

Various methods are being employed to determine soil deficiencies and the proper kind of fertilizer to use under different conditions. Particularly has the question of phosphorus availability or solubility been studied, and many methods have been published setting forth limits for this important plant-food element. Not as many procedures are available for potash limitation studies, but this does not mean that potash is any less a necessity for good crops. While it is true that many soils are very deficient in active phosphorus, it is also true that potash is limiting crop production in many cases as well. Studies made on Oklahoma soils indicate that where a potash deficiency exists in our soils, a phosphorus deficiency also exists, and that both potash and phosphorus must be supplied in order to get best results. The deficiency in both cases is especially prevalent in the eastern part of the state. In some localities extreme deficiencies occur.

To obtain rather accurate data on potash deficiency, the neutral, normal, ammonium acetate replacement meth-

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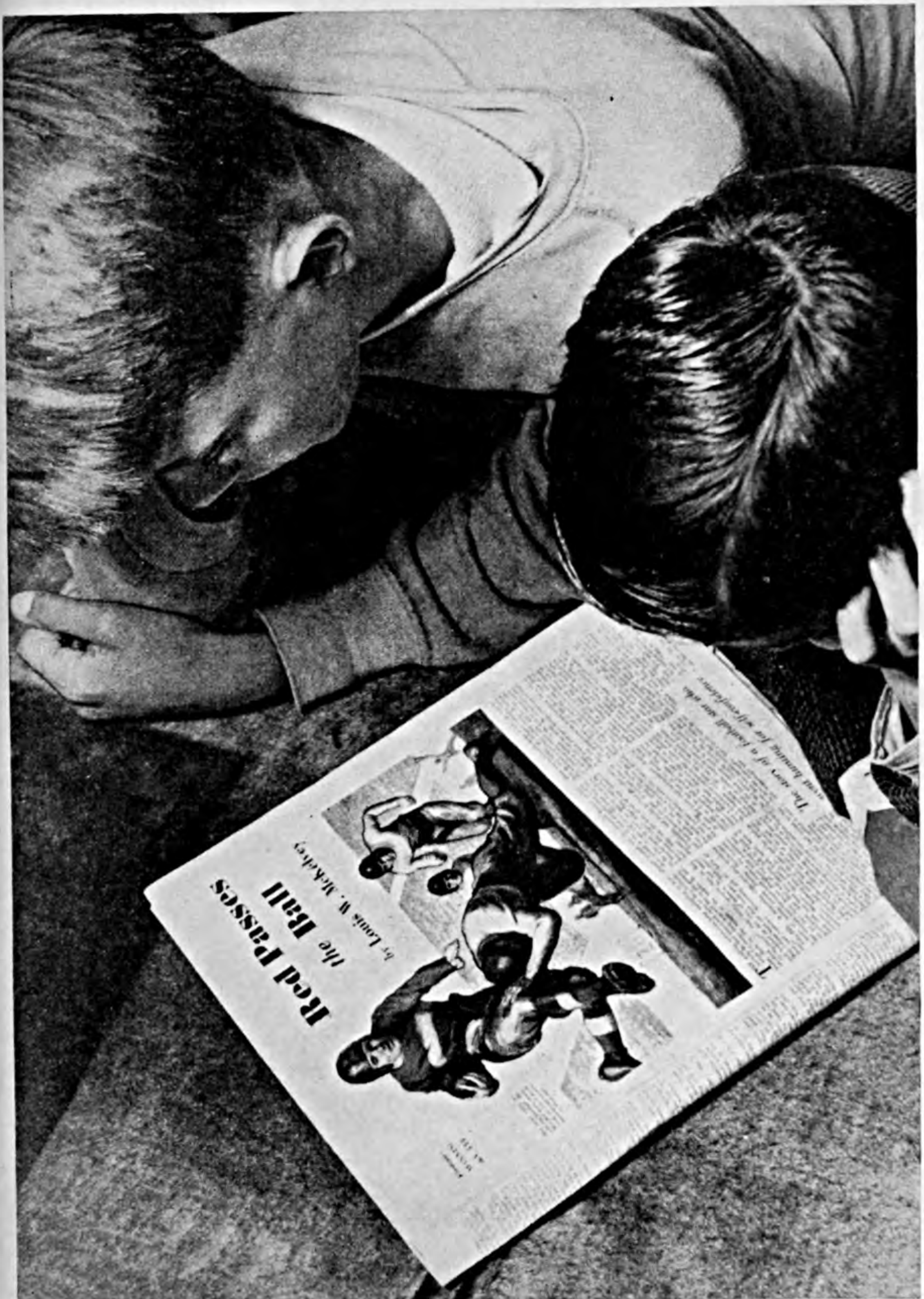
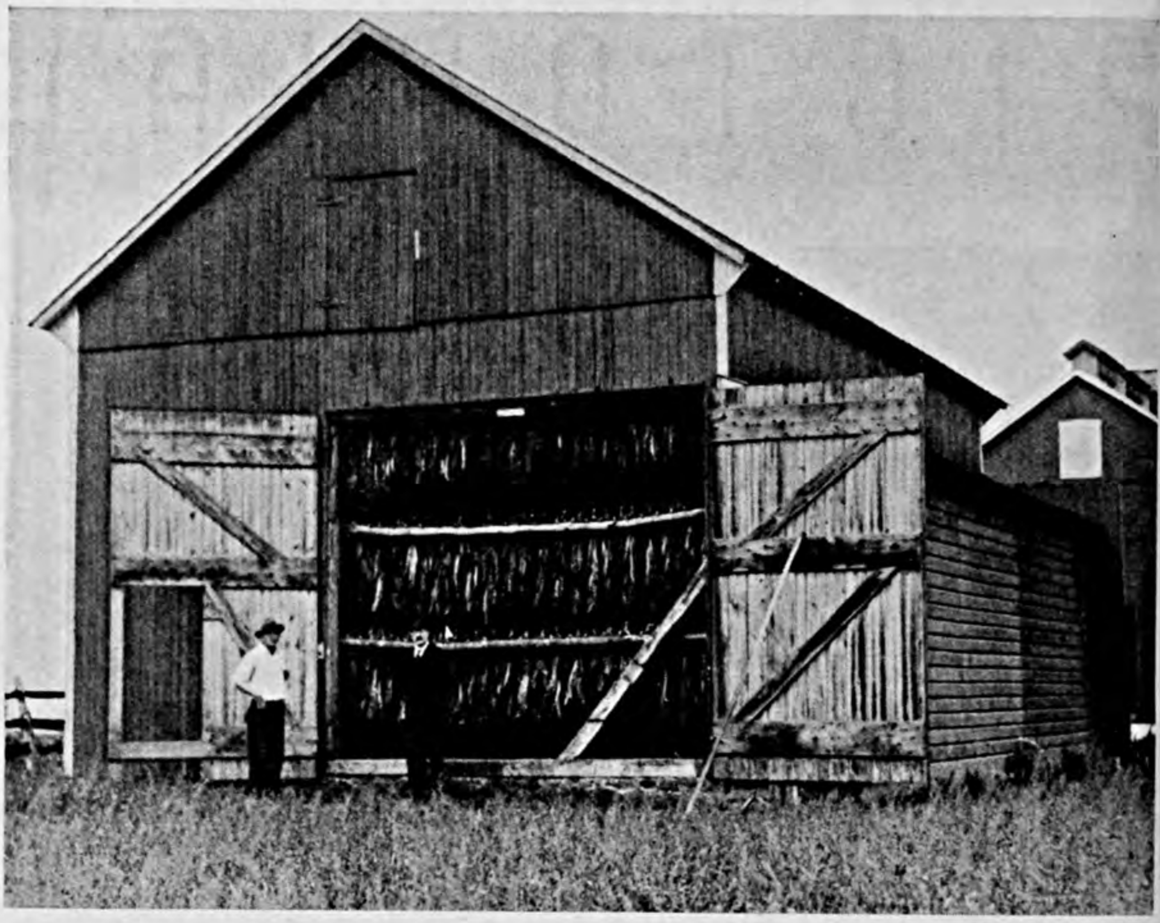
PICTORIAL



THE WORLD IS FULL OF HEROES.



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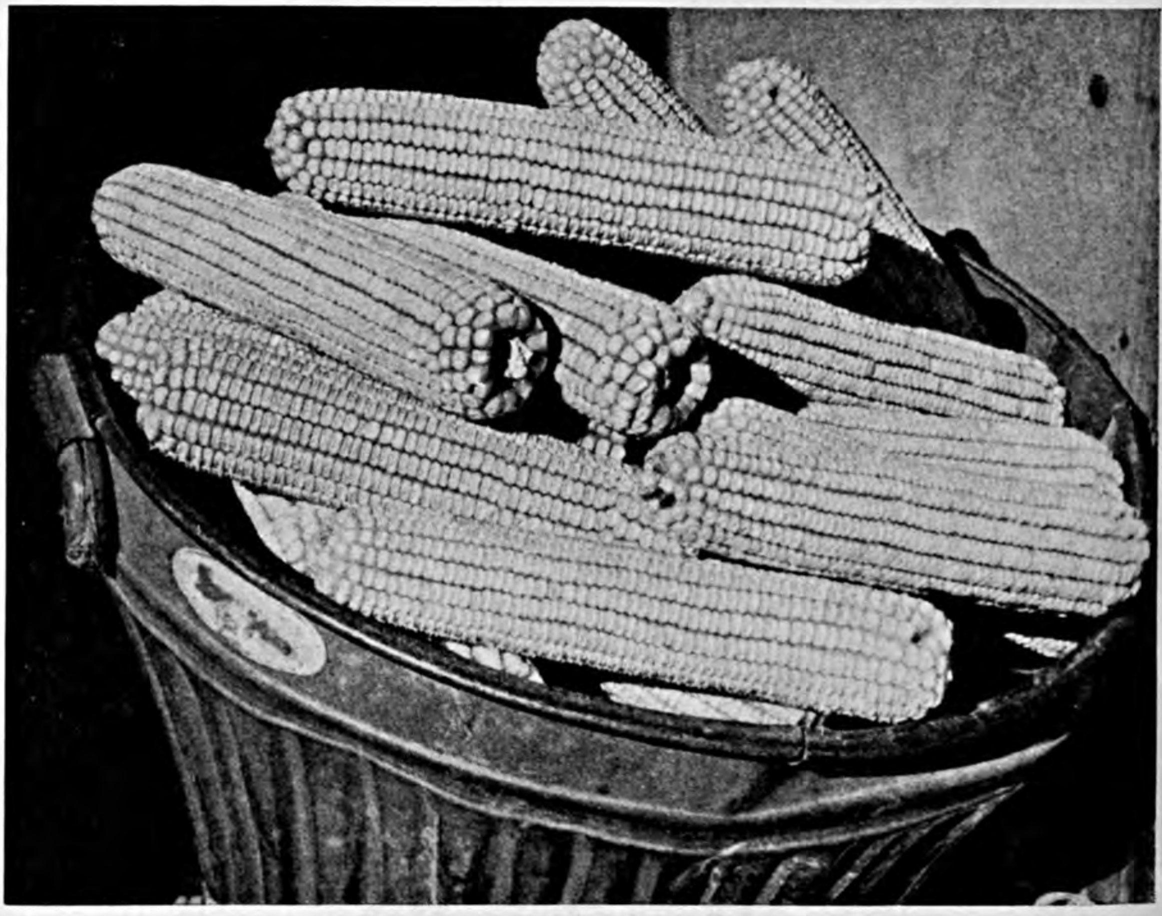
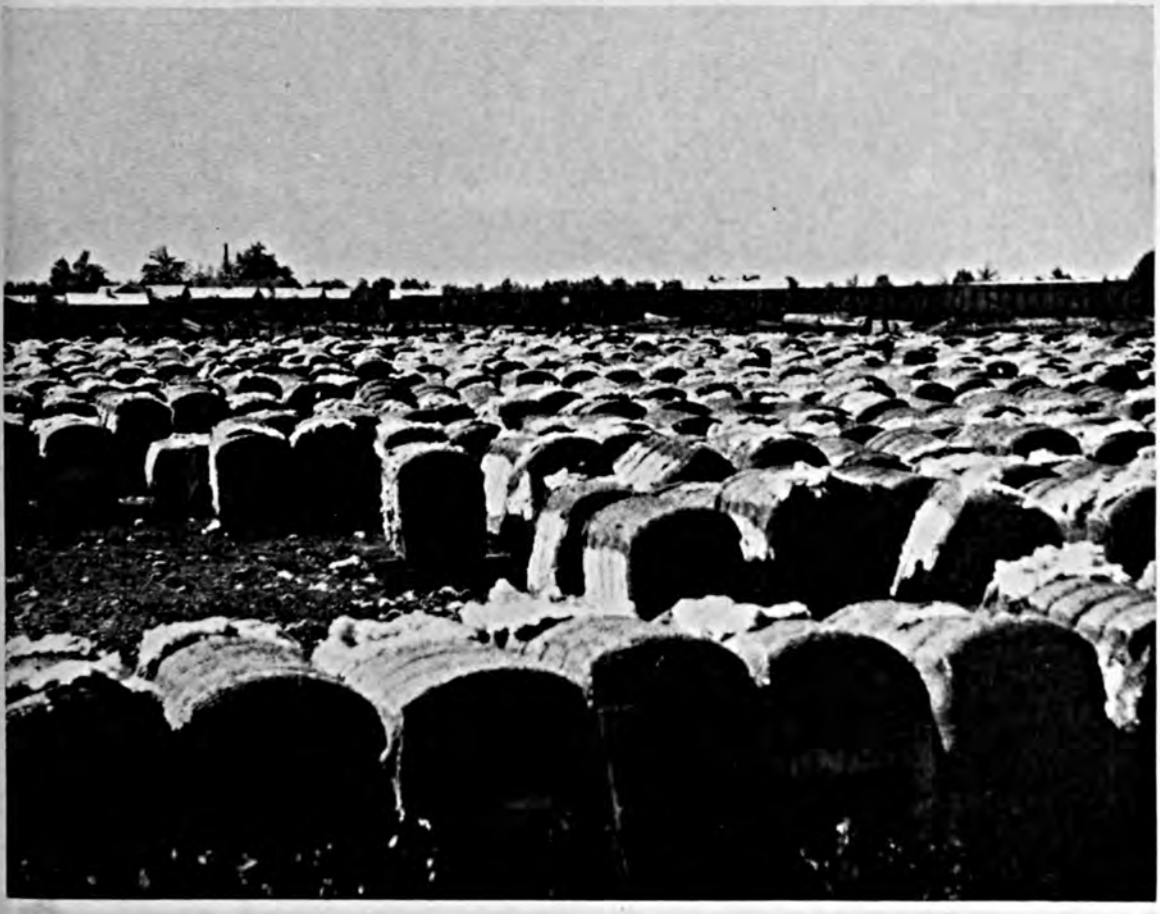


THE BASKET, THE BALE.



The season of long shots and tall stories.

The Editors Talk

Fewer Fertilizer Grades

In the interest of simplification and economy, agricultural advisory groups and fertilizer manufacturers long have advocated a reduction in the number of different fertilizer grades on the market. Some progress has been made, as shown by Vial in 1930 in his study of complete fertilizers sold in Pennsylvania during the period 1900-1928. During the years 1910-1914, except for the year 1912, there were about 200 different complete analyses on the market each year. For the period 1924-1928 this number had been reduced to 85, with many low grades eliminated. The disappearance of fractional analyses in many States has been a step forward. More progress is seen in the growing tendency of States to prohibit mixed goods containing between 0 and 2 per cent of a plant-food element.

Much work is yet to be done, however. For example, Mehring and Smalley in their survey in 1934 report 1,291 different analyses having been sold that year in the United States. While this number includes, as separate analyses, similar grades on N and NH_3 basis, eliminating these would probably leave close to 1,000 different grades on the market. Yet 19 of these grades were used in 20 or more States. There thus would appear to be no necessity for having a completely different set of fertilizer grades merely because a State line is crossed.

In view of this situation, it is encouraging to see the efforts being made to rationalize the situation. A meeting of the representatives of the experiment stations of five Mid-Atlantic States was recently held under the auspices of the National Fertilizer Association. After surveying the fertilizer needs of the soils and crops of their respective States, these representatives agreed on 26 grades that would satisfy practically all requirements. Not all grades are needed in any one State. Four grades are common to all five States and ten common to three or more of the States. Previously, no one grade was recommended in all the States. Twelve grades previously recommended have been eliminated. When the great diversity of soils and crops existing in States ranging from Delaware over to West Virginia is considered, it may be counted somewhat of an achievement that agriculturists in these States have been able to agree on such a relatively few grades.

This, of course, will not necessarily eliminate the great diversity of grades put out by manufacturers, but distinct progress is being made when agricultural officials agree to recommend fewer different analyses and increased stress is placed on the fewer grades agreed upon.

Similar movements are occurring in other parts of the country. Officials and fertilizer manufacturers in the South Central States have been meeting and agreeing on standard analyses for several years. This has resulted in a materially lower number of grades on the market in this region compared to other areas in the South. The "Standard Nine" of New England, adopted in 1924, are well known in fertilizer circles, and this possibly represents the first interstate cooperative effort at reduction in number of grades. A number of States, especially in the Midwest, have standard analyses which they stress. However, cooperative action including agricultural officials and the fertilizer trade among several States will be likely to produce the most effective results.

In deciding on fertilizer analyses to recommend, it is well to keep in mind that the spread in ratios should be wide enough to cover the diverse soil and cropping conditions that occur in practically all fertilizer-using parts of the country. At times in the past, the ratios were not wide enough to meet all conditions, and the effort toward simplification tended to defeat itself. In some sections new grades of wider ratios actually must be added. Officials and manufacturers have recognized this need and up to the present have wisely refrained from "freezing" the list of grades. The elimination of low analysis fertilizers and small differences between grades is what is sorely needed.

Potash Deficiency Symptoms

One of the most easily understood and recognizable means of gauging the fertility of soils is the symptom of starvation for a particular plant-food element which various plants will show when that plant food is deficient in the soil. While attention to proper maintenance of fertility for profitable production should be given long before starvation symptoms appear, to those growers who have been negligent in this respect, the starvation signs serve as dire warnings of what will follow if steps are not taken to correct the condition.

A new Publication, *Potash Deficiency Symptoms*, just appearing in this country contains a compilation of available information on the occurrence of signs of starvation for this plant food as recorded by 45 of the most important cultivated crops. The book was prepared by Eckstein, Bruno, and Turrentine; was published in Germany; and the text is in German, French, and English. The 55 plates in four colors and the 41 excellent figures in black and white provide an accurate guide for observing the availability of potash in our soils. These illustrations, with a concise explanation of each, take the book out of the scientific library class into the practical hand-book type, and anyone interested in the problems of plant nutrition and fertilizer usage will find much valuable information in it.

"Seeing is believing" is an old adage. In these times with an increasing dissemination of scientific work of importance to individuals crowding their attention, illustrations assume an added value. American agriculture should have more books of the type of the above.

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

An interesting discussion of some soil fertility experiments is to be found in the 1936 Annual Report, Bulletin 296, New Hampshire Experiment Station, entitled "Science in New Hampshire Agriculture." The largest amount of hay harvested from the neglected haylands test resulted when an application of nitrogen, phosphoric acid, and potash was used. The legume test on similar lands indicated that the continued use of 150 pounds muriate of potash per acre increases the yield slightly more than one-half ton of cured hay per acre, regardless of whether it is used alone or in combination with other fertilizer substances. The report concludes that part, if not all, of this increase is due to the influence of potash on the longevity of the crop and more alfalfa persisting where potash is applied. A continuation of the top-dressing of the old pasture experiment near Greenland shows that the application of superphosphate and potash appears to be stimulating growth more than during the first three years of the test. Practically no clover appears on the nitrogen alone treatment, but the application of phosphoric acid and potash definitely brings in clover only a few weeks after it has been applied.

In a three-year top-dressing experiment on grass hays near Durham, a spring treatment with either nitrogen or complete fertilizer considerably out-yielded fall treatment, with the exception of cyanamid, where little difference was registered. The report also describes interesting results from the study of potato mosaic. In this work it was observed that potato mosaic was masked by favorable growing conditions. When the plants were grown at a temperature of 15° C., mosaic symptoms appeared, and the yields were lower than in the plants grown at 20° C. The degree of masking was not only affected by the temperature but by the fertility of the soil and type of fertilizer material used. It was found that mosaic tubers grown at 20° C. in a composted soil containing abundant plant-food elements produced plants that had mosaic markings, while in a poor soil to which fertilizer at the rate of 1,000 pounds of an 8-8-16 fertilizer per acre had been added, the plants possessed good healthy dark green foliage without recognizable mosaic symptoms.

Up-to-date methods on fertilizing the southern tobacco crop are prescribed by the fertilizer committee representing this territory in the mimeographed circular, "Recommendations with Reference to the Fertilization of Flue-Cured, Sun-Cured, and Shipping, Tobacco Grown on Average Soils in Virginia, North Carolina, South Carolina, and Georgia for the Year 1938." For bright flue-cured tobacco to be grown on the heavy or more productive soils, the committee recommends a tobacco fertilizer analyzing 3% nitrogen 10% phosphoric acid, and 6% potash, to be applied at rates of 800 to 1,000 pounds per acre. The fertilizer for the less productive soils should contain the same percentages of nitrogen and potash but the phosphoric acid content may be reduced to 8%, with the application ranging between 800 and 1,200 pounds per acre. As experiments indicate that the acre value may be materially increased by additional potash, it is suggested that a side-dressing of potash supplying 60 to 120 pounds of K_2O to the acre be applied in most cases within 20 days after transplanting. To ward off possible fertilizer injury, the committee advocates placing the fertilizer in bands 3 to 4 inches to the sides of the row at the approximate level of the roots and either setting the plants between the bands or thoroughly mixing the fertilizer with the soil prior to planting. For dark tobacco the use of 600 to 1,000 pounds of 3-10-4 per acre is recommended. Analyses in all cases may be modified, provided the given ratios are maintained and the recommended sources of plant food are used. In effect, the recommended sources of plant foods are similar to those given in the past except for soils where the pH is above 5.6, for which the maximum chlorine content may be 3 per cent. Below this pH the chlorine contained in the fertilizer mixture should be 2 per cent. If non-acid fertilizers are to be produced, dolomitic limestone as the neutralizing agent is suggested.

"Fertilizing Deciduous Fruit Trees in California," Agr. Exp. Sta., Berkeley, Calif., Bul. 610, June 1937, E. L. Proebsting.

"The Effect of Nutrient Deficiency on the Growth of Longleaf Pine Seedlings," So. Forest Exp. Sta., New Orleans, La., Occ. Paper 65, July 19, 1937, L. J. Pessin.

"Liming Massachusetts Soils," Agr. Ext. Serv., Amherst, Mass., Leaf. 134, May 1937, R. W. Donaldson.

"Fertilizer Experiments with Cotton on Heavy Irrigated Soils," Agr. Exp. Sta., State College, N. M., Bul. 248, May 1937, Glen Staten and D. A. Hinkle.

"Minor Elements and Crop Fertilization," Agr. Exp. Sta., Geneva, N. Y., Cir. 168, July 1, 1937, R. C. Collison.

"Responses from Various Sources of Nitrogen Fertilizer," Agr. Exp. Sta., Clemson, S. C., Bul. 309, May 1937, W. R. Paden.

"The Effects of Fertilizers on the Productivity of Sagemoor Fine Sandy Loam Under Irrigation," Agr. Exp. Sta., Pullman, Wash., Bul. 346, Apr. 1937, H. P. Singleton and L. C. Wheeting.

Crops

United States Department of Agriculture Yearbook for 1937 rounds out the work of the Committee on Genetics appointed by the Secretary of Agriculture in 1933. It is a sequel to the 1936 Yearbook on plant and animal breeding, and like the former, Book II covers an enormous and varied field which records a wealth of instructive information invaluable to an interested public. The 1936 volume dealt chiefly with the major crop plants and classes of livestock, while the present one pertains to garden vegetables, northern tree and bush fruits, subtropical fruits, flowers, nut trees, forest trees, grasses and legumes, goats, fowls, fur-bearing animals, honeybees, and finally that good friend of the farmer, his dog. As Secretary Wallace explains, it is not intended that these two yearbooks will complete the account of the efforts of plant and animal breeders in the United States. "On the contrary," the Secretary states, "I would wish these yearbooks to be looked on as pointing the way toward a field of activity that will accomplish much more in the future than has been accomplished in the past. The work of plant and animal breeders . . . has only just begun."

Another very interesting publication of the United States Department of Agriculture that will especially appeal to official agricultural workers is miscellaneous Publication 251, "A History of Agricultural Experimentation and Research in the United States, 1607-1925," by Alfred Charles True. It is the third and final monograph in a series intended to give a comprehensive summary of the history of agricultural education, extension, and research in this country. On the same plan as was followed in the previous monographs, this publication gives typical examples of the work of private individuals and organizations in laying the foundation for the establishment of public agencies for agricultural research. It gives brief summaries of the spread of principal undertakings that developed after the passage of the Hatch Act and the reorganization of the Department of Agriculture as of Cabinet rank.

Information contained in Mississippi Agricultural Extension Bulletin 85, entitled "Winter Legumes," will prove profitable to many cotton belt farmers. Because of the open, mild winters in the South, such crops as bur clover, Austrian winter peas, the vetches, and others make satisfactory growth that not only adds fertility and humus to the soil but serves a most important function of holding the land together. Now as never before, the growing of winter legumes in conjunction with the high percentage of clean-cultured crops grown in this region is being stressed. As the authors point out, the South has 25 per cent of the Nation's cultivated land, but 61 per cent of its eroded land. Lands covered with winter legumes erode much less than when left without cover.

Among the fundamental facts discussed at length are the fertilizer requirements of these legumes which are not generally recognized by most farmers. Winter legumes require mineral plant foods as do the non-legumes and these plant foods should be supplied where they are deficient in the soil. In growing such crops with cotton it would be advisable to apply the minerals used under the cotton to the legume also, thus obtaining a faster and better growth, inasmuch as the minerals added, together with the accumulation of nitrogen from legumes, are returned to the soil when the crop is turned under. Where potash is known to be needed for cotton, an application of 50 to 100 pounds of muriate of potash per acre is advised for the legumes. Most hill soils are commonly lacking in phosphates and lime. The authors recommend the equivalent of 100 to 200 pounds of high grade superphosphate per acre. Usually 500 pounds of lime per acre drilled or 1,000 pounds applied broadcast are needed for most hill soils. Following cotton that has been well fertilized with a complete fertilizer mixture there may be enough residual effect to fulfill the needs for the legumes. However it may often prove best to apply mineral elements directly to the legumes at planting and depend on these elements and the nitrogen gathered by the legumes to feed the succeeding crop when the cover crop is turned under. Other details explained in this bulletin include inoculation, methods of planting and turning under the crop, and how to save the seed.

"Progressive Agriculture. Forty-seventh Annual Report for the Year Ending June 30, 1936," Agr. Exp. Sta., Tucson, Ariz., R. S. Hawkins, Actg. Dir.

"Bush Berry Culture in California," Agr. Ext. Serv., Berkeley, Calif., Cir. 80, Dec. 1933 (Rev. May 1937), H. M. Butterfield.

"Apple Growing in California," Agr. Exp. Sta., Berkeley, Calif., Bul. 425, May 1927 (Rev. May 1937), F. W. Allen.

"Florida Vegetables," Agr. Ext. Serv., Gainesville, Fla., Bul. 90, June 1937, A. P. Spencer.

"Science Serves Idaho Agriculture. Annual Report for the Year Ending Dec. 31, 1936," Agr. Exp. Sta., Moscow, Idaho, Bul. 221, June 1937, C. W. Hungerford, Vice Director.

"The Yield Complex of Sweet Corn," Agr. Exp. Sta., Urbana, Ill., Bul. 432, Apr. 1937, W. A. Huelsen and W. H. Michaels.

"Alfalfa for Indiana Farms," Agr. Ext. Serv., Lafayette, Ind., Leaf. 158, Mar. 1937.

"The Nutritive Value and Mineral Deficiencies of Soybeans," Agr. Exp. Sta., Lafayette, Ind., Bul. 420, May 1937, C. L. Shrewsbury and C. M. Vestal.

"Forty-ninth Annual Report of the Agricultural Experiment Station of the University of Kentucky for the Year 1936. Part I. Report of the Director. Part II. Bulletins 362-367 and Circulars 44-45." Agr. Exp. Sta., Lexington, Ky.

"Eight-year Summary of Horticultural Investigations," Agr. Exp. Sta., Baton Rouge, La., Bul. 287, May 1937, Julian C. Miller and W. D. Kimbrough.

"Annual Report of the Massachusetts Extension Service for 1936," Agr. E·t. Serv., Amherst, Mass., Leaf. 168, May 1937, Willard A. Munson, Director.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., Vol. 1, No. 5, July 1937.

"Management of Alfalfa," Agr. Ext. Serv., East Lansing, Mich., Mimeo., June 22, 1937. S. T. Dexter.

"A Study of the Development of Alfalfa with Variations in Fall Management," Agr. Ext. Serv., East Lansing, Mich., Mimeo., H. C. Rather.

"Influence of Fall Clipping on Stand and Vigor of Alfalfa," Agr. Ext. Serv., East Lansing, Mich., Mimeo., H. C. Rather.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 20, No. 1, Aug. 1937.

"Pasture Production Manual," Agr. Ext. Serv., State College, Miss., Bul. 82, Mar. 1937, R. E. Waters.

"Corn Production in Mississippi," Agr. Ext. Serv., State College, Miss., Bul. 82, Apr. 1937, F. J. Hurst and E. B. Ferris.

"Better Pastures," Agr. Ext. Serv., Durham, N. H., Cir. 199, Feb. 1937.

"Blueberry Tillage Problems and a New Harrow," Agr. Exp. Sta., New Brunswick, N. J., Mar. 1937, Bul. 625, Charles A. Doehlert.

"The Canning Industry in New Jersey During the 1936 Season," St. Dept. of Agr., Trenton, N. J., Cir. 270, Apr. 1937, D. T. Pitt.

"Roster of County Boards of Agriculture and State Agricultural Organizations for 1937," St. Dept. of Agr., Trenton, N. J., Cir. 271, Apr. 1937, William B. Duryee, Secretary.

"The New Jersey Science Fair, 1937," St. Dept. of Agr., Trenton, N. J., Cir. 278, May 1937, Harry B. Weiss.

"Sanding Cranberry Bogs," Agr. Exp. Sta., New Brunswick, N. J., Cir. 371, Apr. 1937, Charles S. Beckwith.

"The Calcium and Phosphorus Contents of Important New Mexico Range Forages," Agr. Exp. Sta., State College, N. M., Bul. 246, Apr. 1937, W. E. Watkins.

"The Daily Rate of Photosynthesis, During the Growing Season of 1935, of a Young Apple Tree of Bearing Age," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y. Mem. 201, Feb. 1937, A. J. Heinicke and N. F. Childers.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXII, No. 187, July-August 1937.

"Permanent Pasture Studies," Agr. Exp. Sta., Clemson, S. C., Bul. 308, Apr. 1937, E. C. Elting, J. P. LaMaster, and J. H. Mitchell.

"The Cotton Contest—1936—for Better Yield and Staple Value," Agr. Ext. Serv., Clemson, S. C., Cir. 156, Apr. 1937, R. W. Hamilton and B. E. G. Prichard.

"Fruits, Old and New, and Northern Plant Novelties," Agr. Exp. Sta., Brookings, S. Dak., Bul. 309, Mar. 1937, N. E. Hansen.

"Further Tests of Vegetable Varieties for the Winter Garden Region," Agr. Exp. Sta., College Station, Texas, Bul 546, July 1937, Leslie R. Hawthorn.

"Studies in Tolerance of New England Forest Trees. Part XIII. The Effect of Root Development on Height and Diameter Growth," Agr. Exp. Sta., Burlington, Vt., Bul. 422, May 1937, G. P. Burns.

"Department of Agriculture—Immigration of Virginia," Richmond, Va., Bul. 351, Aug. 1937, and Bul. 352, Sept. 1937.

"Crop Rotations," Agr. Exp. Sta., Pullman, Wash., Bul. 344, Mar. 1937, E. G. Schaefer, L. C. Wheeting, and S. C. Vandecaveye.

"Growing Raspberries in West Virginia," Agr. Exp. Sta., Morgantown, W. Va., Cir. 72, Mar. 1937, H. E. Knowlton, W. H. Childs, and C. R. Orton.

"Drought Survival of Native Grass Species in the Central and Southern Great Plains, 1935," U. S. D. A., Washington, D. C., Tech. Bul. 549, Mar. 1937, D. A. Savage.

"Results of Field Crop, Shelterbelt, and Orchard Investigations at the United States Dry Land Field Station, Ardmore, S. Dak., 1911-32," U. S. D. A., Washington, D. C., Cir. 421, Jan. 1937, Oscar R. Mathews and Verner I. Clark.

"On the Front Lines with Agriculture, A Report of Extension Work in Agriculture and Home Economics in 1934," U. S. D. A., Washington, D. C., Jan. 1937, C. W. Wharburton, Director.

"State and Federal Agricultural Publications Applicable to Tennessee Valley Area," U. S. D. A., Washington, D. C., May 1936.

Soils

A very comprehensive background in the field of chemical soil tests for determining the nutrient content of soils and requirements for plants is given in U. S. D. A. Miscellaneous Publication No. 259, entitled "Comparison of Various Chemical Quick Tests on Different Soils," by M. S. Anderson and W. M. Noble. Agriculturists who are interested in quick soil tests will obtain much worthwhile knowledge on the correlation between the numerous testing outfits either sold commercially or used by experiment station officials and others. The preliminary investigations presented in this publication give comparative data on the different determinations with a group of widely diversified soils. The sets used included the Simplex, Truog, Morgan, Emerson, La Mott, Indiana, Sudbury, and Hellige. The authors state that while the results from most of the numerous efforts in evaluating the availability of soil constituents by chemical means have frequently proven disappointing, the short tests aid materially in a more intelligent selection of soils for certain purposes and even made probable a more economical use of fertilizer than if no tests were used. It is not expected that satisfactory results will be obtained with any single test for a particular element on all kinds of soil for all kinds of crops. It is hoped, however, that subsequent developments may make possible more intelligent application of various procedures to different types of soil, thus adding to the practical value of the various testing methods now being used. In many agricultural experiment stations the chemical tests have been found a valuable indicator for the diagnosis of the soil needs when interpreted by trained agronomists. Their value to farmers in states where the tests are extensively used by trained workers cannot be overestimated. Disseminating the data contained in the tables and charts permits a means for selecting the particular soil test that may more nearly answer the requirements for certain needs. The results obtained were for available phosphorus and potassium, acidity, lime requirement, and nitrates. Soils used were virgin samples of Barnes silt loam, Carrington silt loam, Clinton silt loam, Miami silt loam, Cecil clay loam, Ruston loamy sand, and Caribou loam. The authors conclude that each test has a particular value under certain circumstances, but the scope of their usefulness is not yet defined. For this reason none of the tests is recommended or condemned.

"Muck Experimental Plots," Mich. St. Col., East Lansing, Mich., Mimeo., Paul H. Harmer.

"Soils Experimental Plots," Mich. St. Col., East Lansing, Mich., Mimeo.

"Influence of Depth of Ground-water Level on Yields of Crops Grown on Peat Lands," Agr. Exp. Sta., University Farm, St. Paul, Minn., Bul. 330, Aug. 1936, H. B. Roe.

"Soil Testing as a Guide to Soil Management," Agr. Ext. Serv., Columbus, Ohio, Bul. 190, Apr. 1937, F. J. Salter.

"The Effect of Land Use and Management on Erosion," Agr. Exp. Sta., Wooster, Ohio, Bul. 585, July 1937, E. H. Reed and J. I. Falconer.

"Relation of Soil Acidity to Cotton Root Rot," Agr. Exp. Sta., College Station, Texas, Bul. 545, June 1937, J. J. Taubenhaus, W. N. Ezekiel, and J. F. Fudge.

"Overliming Injury in Relation to Tannin-containing Materials," Agr. Exp. Sta., Burlington, Vt., Bul. 420, June 1937, A. R. Midgley and D. E. Dunklee.

"Field Demonstrations of Cropping Systems and Practices Related to Erosion Control, Improved Soil Fertility, and Profitable Production," Col. of Agr., Madison, Wis., Mimeo.

"The Occurrence of Selenium and Seleniferous Vegetation in Wyoming," Agr. Exp. Sta., Laramie, Wyo., Bul. 221, May 1937, S. H. Knight and O. A. Beath.

"Soil Survey of Rush County, Indiana," U. S. D. A., Washington, D. C., Series 1930, No. 44, Mar. 1937, C. S. Simmons, D. R. Kunkel, and H. P. Ulrich.

"Soil Survey of Iron County, Michigan," U. S. D. A., Washington, D. C., Series 1930, No. 46, Mar. 1937, Z. C. Foster, J. O. Veatch, and L. R. Schoenmann.

"Soil Survey of Greeley County, Nebraska," U. S. D. A., Washington, D. C., Series 1933, No. 4, Mar. 1937, S. R. Bacon, F. A Hayes, and E A. Nieschmidt.

"Soil Survey of Rensselaer County, New York," U. S. D. A., Washington, D. C., Series 1932, No. 15, Mar. 1937, W. J. Latimer, C. H. Diebold, Wilber Secor, C. P. Mead, and Montague Howard, Jr.

"Soil Survey of Indiana County, Pennsylvania," U. S. D. A., Washington, D. C., Series 1931, No. 27, R. T. Avon Burke, C. S. Simmons, J. L. Hosterman, Richard Marshall, and C. H. Atkinson.

"Soil and Water Conservation Investigations at the Soil Conservation Experiment Station Missouri Valley Loess Region, Clarinda, Iowa," U. S. D. A., Washington, D. C., Tech. Bul. 558, Feb. 1937, G. W. Musgrave and R. A. Norton.

"Soil Erosion and Stream Flow on Range and Forest Lands of the Upper Rio Grande Watershed in Relation to Land Resources and Human Welfare," U. S. D. A., Washington, D. C., Tech. Bul. 567, May 1937, Charles K. Cooperrider and Barnard A. Hendricks.

"Use of Soil-moisture and Fruit-growth Records for Checking Irrigation Practices in Citrus Orchards," U. S. D. A., Washington, D. C., Cir. 426, May 1937, C. A. Taylor and J. R. Furr.

"Early Erosion-control Practices in Virginia," U. S. D. A., Washington, D. C., Misc. Pub. 256, A. R. Hall.

"Advance Report on the Sedimentation Survey of Bayview Reservoir, Birmingham,

Alabama," U. S. D. A., Washington, D. C., SCS-SS-11, Mar. 1937, D. Hoye Eagle and Farrell F. Barnes.

"Advance Report on the Sedimentation Survey of Lay Reservoir, Clanton, Alabama," U. S. D. A., Washington, D. C., SCS-SS-13, May 1937, Farrell F. Barnes.

"A Preliminary Report of an Infiltration Study of Some Piedmont and Coastal Plain Soils," U. S. D. A., Washington, D. C., SCS-TP-13, May 1937, G. R. Free and G. W. Musgrave.

"Progress in the Adoption of Selected Erosion Control Practices, Coon Creek Area, Wisconsin," U. S. D. A., Washington, D. C., SCS-RB-5, May 1937, Melville H. Cohee and James C. Jensen.

"Relation of Soil Conservation to Control of Floods and Silting," U. S. D. A., Washington, D. C., SCS-MP-17, Apr. 1937, H. H. Bennett.

"Soil and Water Conservation Investigations, Pacific Northwest Soil Conservation Experiment Station, Pullman, Washington," U. S. D. A., Washington, D. C., SCS-ESR-2, Apr. 1937, P. C. McGrew and G. M. Horner.

"Agricultural Engineering—A Selected Bibliography," U. S. D. A., Bur. of Agr. Eng., Washington, D. C., No. 6016, Dorothy W. Graf, Librarian.

Economics

The State of Indiana for years has published a very splendid report on commercial fertilizers sold in Indiana. For instance, in their most recent circular, No. 229, Commercial Fertilizers, published by Purdue University Agricultural Experiment Staton at Lafayette, Ind., the summary of inspections is given together with a complete summary of sales by grade of mixed fertilizers and materials. According to the circular 238,390 tons of fertilizers were sold in Indiana in the calendar year 1936, not including 7,147 tons calculated from tag sales of companies that did not report tonnage sale. This compares to 8,000 tons sold in 1883 and 291,193 tons sold in 1929. In 1936 about 84 per cent of the total tonnage sold was represented by 33 grades, while the remaining 16 per cent was distributed over 103 different analyses. It is noted that considerable saving and profit could be made by the manufacturers if the number of grades were reduced. It is interesting to note that since 1920 the pounds per ton of actual plant food have increased from 318 to 494, while the cost per ton of fertilizers in dollars which was $36.92 in 1920 has decreased in 1936 to $30.36, thus reducing the cost per pound of plant food to 6.2 cents in 1936 as compared to 11.6 cents in 1920.

In 1920, 1,680 tons of nitrogen, 24,530 tons of available phosphoric acid, and 3,462 tons of potash were contained in fertilizers used in Indiana. In 1936, the nitrogen content had increased to 5,339 tons, available phosphoric acid content to 33,993 tons, and the potash content to 19,925 tons.

In 1902, 679 samples were reported, of which 335 were equal to the guaranty in every particular, 564 were equal to the value of the guaranty, 93 were within 10 per cent of the value of the guaranty, and 22 were not within 10 per cent of the value of the guaranty. In 1936, 1,493 samples were reported, of which 1,259 were equal in every particular to the guaranty, 1,423 were equal to the value of the guaranty, while only 60 were within 10 per cent of the value of the guaranty, and only 10 samples were not within 10 per cent of the value of the guaranty. This improvement in a closer approximation of the guaranty analysis is a good indication of the refinement in the technique of production of both mixed fertilizers and materials.

The tabulation showing tonnage of the different grades of fertilizer shipped to each parish in the State of Louisiana from September 1, 1936, to June 30, 1937, prepared and issued by the Department of Agriculture and Immigration of the state of Louisiana, furnishes a splendid picture of the fertilizer industry in the state. Even though the report covers only the 10-month period from September 1 to June 30, it is a very good indication of the trend in total consumption and in the shifting in the various materials and individual analyses. Very little fertilizer is actually sold during the months of July and August, thus the report is a fairly close indication of the total consumption of commercial fertilizers in the state of Louisiana. According to the report, the total of 142,826 tons of fertilizers were shipped during the 10-month period. Of this total, 82,010 tons were in the form of mixed goods and the remainder of 60,816 tons was material. The most popular single grade within the state from the tonnage standpoint was 4-8-4, which represented 29,345 tons of the total. In the material list, nitrate of soda constituted the greatest tonnage, representing 25,646 tons. Cyanamid was second with 16,649 tons.

An analysis of the cost of producing milk in Vermont is given in the Vermont Agricultural Experiment Station Bulletin No. 421, "Studies in Vermont Dairy Farming," by G. E. Bond and J. A. Hitchcock. The bulletin confines itself to the discussion of factors affecting winter milk production costs in the Champlain Valley in western Vermont. Practically no consideration is given to the value or effect of the various types of pastures during the pasture season. The study is based on records secured from 450 dairy enterprise records for the year ending March 31, 1933. While the price relationship and business conditions were entirely different in 1933 than at the present time, the physical factors affecting the cost of producing milk have not changed materially. At that time price relationships were particularly unfavorable to the dairy enterprise, and the estimated production cost exceeded the selling price of milk in nearly every case.

Grain was fed in the winter at an average rate of 5.2 pounds per cow per day, equivalent to 1 pound to 2.6 pounds of milk. It was found that as the amount of feed increased from about 2 pounds to 6 pounds per day, the average daily milk production per cow rose from 10 pounds to 15 pounds, and the net cost of producing a hundredweight of milk declined. In a herd which was fed more than 7 pounds of grain per cow per day the average milk production was still little more than 15 pounds, and the net cost per hundredweight was higher than on the farm where the average amount of grain fed was slightly less. It appeared that the season of freshening had some influence on the point at which unit costs were lowered through the variation in amount of grain fed.

It was found that the production cost per cow was lower and the net cost per hundredweight of milk produced was higher on the farms where the majority of the grain was home-grown, than on those where most of it was purchased. Milk yields tended to be heavier with higher digestible protein content of the grain ration. A part of the difference in production associated with home-grown and purchased seed was due to the relatively larger amount of digestible proteins in the purchased seed.

The silage cost more per hundredweight of digestible nutrients than did the hay. Production of milk increased as the silage feeding rate rose, but it did not keep pace with the higher cost of the ration. Consequently the feed cost per hundredweight of milk became higher as more silage was fed.

Production per cow did not vary with differences in the rate at which hay was fed, and the herds which received relatively small amounts of hay produced milk at a lower cost than did those which were fed hay more heavily. The evaluation placed on legume hays was about $2.60 higher than on other kinds of hay, and the difference in the valuation seemed to have been fairly well worked out, in view of the fact that the difference in value of product reflected the higher feeding values.

"Shipments of Various Fertilizers in Arkansas by Counties, During Fiscal Year Ending June 30, 1937," St. Dept. of Revenues, Little Rock, Ark., D. L. Ford, Commissioner.

"Marketing Fruits and Vegetables in Connecticut with Special Reference to the Hartford, Bridgeport, and Waterbury Markets," Agr. Exp. Sta., Storrs, Conn., Bul. 217, Mar. 1937, George B. Clarke.

"Growers Contracts for Sweet Corn," Agr. Exp. Sta., Urbana, Ill., Cir. 472, May 1937, W. A. Huelsen.

"The Farmer and the Cost of Local Rural Government in Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 385, June 1937, Conrad H. Hammar and Glen T. Barton.

"Systems of Farming and Possible Alternatives in Nebraska," Agr. Exp. Sta., Lincoln, Nebr., Bul. 309, June 1937, L. F. Garey.

"Farm Labor in the Yakima Valley, Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 343, Dec. 1936, Paul H. Landis and Melvin S. Brooks.

"Corn Futures—Volume of Trading, Open Commitments, and Prices from January 3, 1933, to December 31, 1935," U. S. D. A., Washington, D. C., Stat. Bul. 55, Feb. 1937.

"Grade, Staple Length, and Tenderability of Cotton in the United States," U. S. D. A., Washington, D. C., Stat. Bul. 56, Feb. 1937.

"First Annual Report on Tobacco Statistics (with Basic Data)," U. S. D. A., Washington, D. C., Stat. Bul. 58, May 1937.

"Some Facts about Potatoes," U. S. D. A., Washington, D. C., G-74, Aug. 1937.

"Agricultural Marketing Programs. Provisions of the Agricultural Marketing Agreement Act of 1937," U. S. D. A., Washington, D. C., MI-1, 1937.

"City Pocketbooks and the Farmer," U. S. D. A., Washington, D. C., G-73, Aug. 1937.

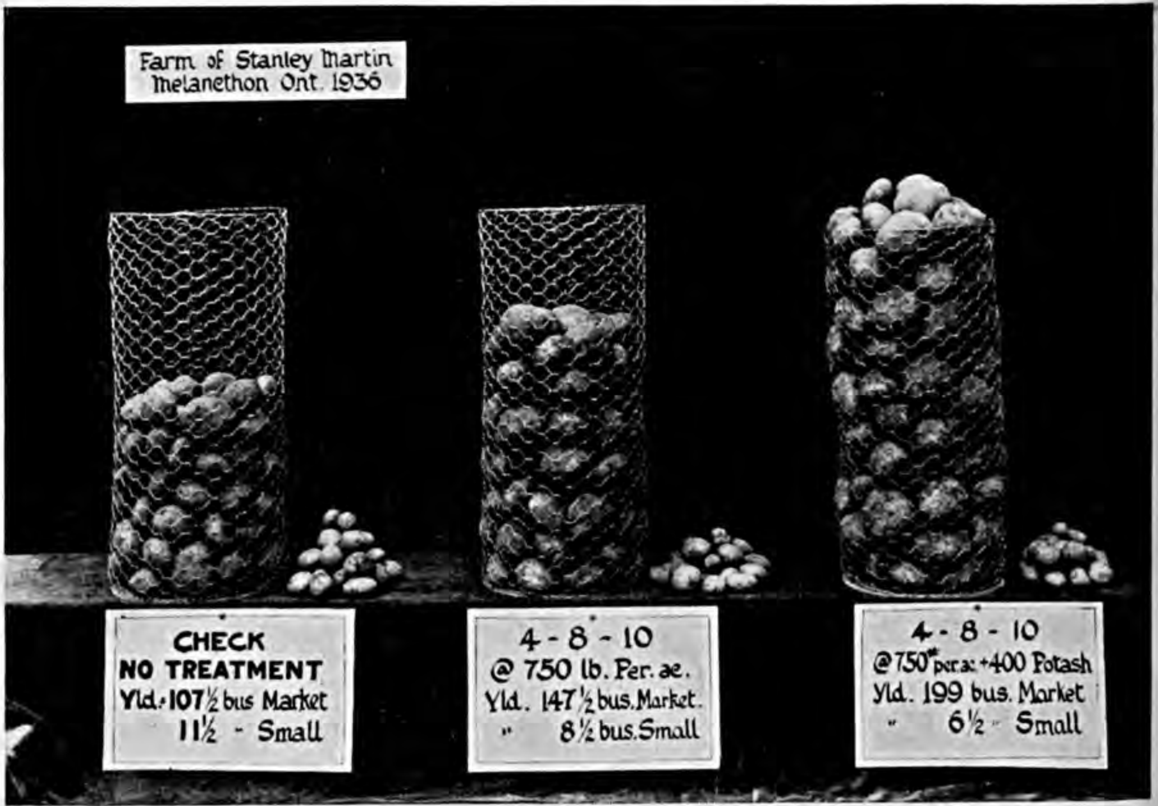
"Agricultural Statistics, 1937," U. S. D. A. Washington, D. C.

Why Not Ask the Soil What It Wants?

(From page 16)

plot which received 400 pounds of additional potash yielded 199 bushels. These weights refer to marketable potatoes.

Another test was conducted on the farm of George Drennan of Alliston, Ontario, and the same procedure was followed. Here, contrary to expecta-



This picture tells its own story of crop response to soil treatment.

tions, the phosphorus level was also moderately high, although no phosphatic fertilizers have been used on this field. The potash level was again very low.

The same recommendation was made, namely, a pre-application of 400 pounds of muriate of potash and a further application of 750 pounds of 4-8-10 at planting time. Actually, however, Mr. Drennan applied 500 pounds of muriate due to inaccuracy of the drill.

No fertilizer was used on the main crop, so the comparison is between "no fertilizer" and 500 pounds of muriate of potash plus 750 pounds of 4-8-10. The "no fertilizer" rows yielded 51 bushels per acre and the "built-up" rows 105 bushels. The low yields were due to the rows being unusually far apart and the plants in the row were also spaced farther apart than is the usual custom.

Another test on the farm of Roy Hickling of Barrie, Ontario, required 1,500 pounds of 0-12-15 to bring the phosphorus and potash up to the required level. This additional treatment increased the yield by 32 bushels of marketable potatoes per acre.

An application of 200 pounds additional muriate of potash on the farm of Bradley and Son of Orangeville, resulted in an increase of 20½ bushels.

As a new approach to fertility problems this exploration has been interesting. While we need more specific information as to the optimum levels required for the different farm crops, short methods of soil testing take a lot of guess work out of making wise fertilizer recommendations.

We must "ASK THE SOIL."

When Do Our Soils Need Potash?

(*From page* 22)

od was employed on several soils on which some field fertilizer data were available. Briefly, the soil is digested with the acetate solution and leached with more of the solution until no test for calcium is secured. (These soils are usually neutral or acid in reaction.) The potassium content of the filtrate is then determined.

The writer does not claim that the results will apply to all soils found elsewhere, but it seems to give very good indications in the soils studied. Several soils secured from eastern and southern states were included in the studies, and with the data furnished for these soils a good correlation was likewise secured.

From the field data, plant indications, and laboratory data, the following table was constructed, and while it will no doubt be modified by more extensive tests, it seems to have merit in the cases we have studied.

Potassium Content		*Crop Response*
Under 60	p.p.m.	Good response
60-100	"	Response *
100-124	"	Doubtful
125-199	"	No response ordinarily
Over 200	"	No response

* The presence of organic matter is of considerable significance in this group. Where the organic matter content is high the response may be little.

Soils on which these data were secured were used as standard soils for comparison work with some of the quick methods in the laboratory. Field data substantiated the results generally. The crops used in the field experiments and upon which crop response was determined were sweet clover, alfalfa, corn, cotton, and potatoes.

Conserving the Benefits of Soil Conservation

(*From page* 18)

flour lime in the early spring of 1936 and disked it in. He then applied the 2-1 mixture of muriate of potash and treble superphosphate, 150 pounds to the acre. After packing the ground with a heavy corrugated roller, he sowed it to alfalfa, putting in oats for a nurse crop, three pecks to the acre. Then he used the packer again.

The harvest? He threshed a very good yield of oats and now has an outstanding growth of alfalfa on the whole field. The plants are well-grown, strong, and vigorous, and they cover the ground thoroughly and uniformly.

Other farmers in the locality followed the same routine, with the exception of the fertilizer. Practically every field thus planted succumbed to the adverse weather conditions while the plants were young and tender.

"This is real conservation," says County Agent Jorgensen. "One might say it is super-conservation, since the farmer who used no fertilizer still has the government check to show for his time, labor, and the money he spent.

"But the farmer who fed his seedings of alfalfa and other soil-conservers with suitable plant food has something of more than equal value for the future right there on his farm where it can't get away, and his government check besides is just so much clear 'velvet'. He will be pocketing the profits from this extra effort and expenditure for several years to come."

To put this in other terms, Mr. Evans has converted a surplus of cash crops harvested into a reserve supply of soil fertility, upon which he can draw in future years. Those who neglected the plant food in their program now lack not only the forage for their livestock, but this reserve supply of fertility as well.

The fertilizer was the determining factor. It is the exponent of a higher degree in conservation, the key to super-conservation. The county agent and the committee show no hesitation about confirming this conclusion.

And the farmers who used potash have something over which to be jubilant for a long time to come, something concrete and tangible, beside the knowledge that they made the most of a good opportunity.

Take the Guesswork Out of Wheat-growing

(*From page* 21)

amount of plant food in the soil, or rather to know its deficiency, the soil should be analyzed. This can be done with a very little effort on the part of the farmer by sending a sample of the soil to be sown to wheat to the agricultural college, or to the county agent, or to any reliable fertilizer manufacturer, who will gladly make the analysis and recommend the correct formula, and the amount to use.

Last fall I analyzed my soil. In one field I found the phosphate was medium and the potash very low. The soil is rolling clay and black, and in order to balance the plant food and give me a sufficient amount of potash to finish the crop, I decided an 0-12-12 would be correct. I started sowing the field October 5 using clean graded seed and 250 pounds of an 0-12-12 analysis on a good seedbed. The result at harvest time was 42 2/3 bushels per acre of high quality wheat, weighing 62½ pounds per bushel. On the other field which I sowed a few days later, the result of the test showed the soil to be low in phosphate and high in potash. At first I thought I would use on 0-20-0 fertilizer to balance the plant food. However, I wanted to seed the wheat to clover and in order to keep up the high potash content of the soil I used 250 pounds of a 2-14-4 to the acre. This field had as good quality wheat as the first one, but on account of water standing on a portion of the field, the yield was 39 bushels per acre.

This year a large amount of the wheat in the wheat sections tested around 40 to 50 pounds per bushel. This made me wonder just what was the trouble with the other growers of wheat. Most of the shrivelled poorer wheat this year was grown on the supposedly best ground on the farms. This good soil, especially the black soil or bottom and sandy soil, is usually deficient in potash. Phosphate is very beneficial and is used mostly in the early part of the plant growth, and the potash is used mostly in the finish of the plant life. Nitrogen should be supplied if there is not a sufficient amount in the soil to produce an abundant top growth. The combination of the three plant foods, nitrogen, phosphate, and potash, in a proper ratio to balance the plant food in the soil, is desirable. And especially, a sufficient amount of potash to finish the crop and to give it quality is ideal.

My wheat this year had rust the same as my neighbors, but what gave me the plump quality grains was an abundance of available potash to finish the crop and resist the ravages of the rust.

C. T. Ames' Camp Proves a Success

(*From page* 20)

kinds that naming them would be out of the question also have used the camp.

But by far the most of the visitors come as members of Boys and Girls Clubs, their gatherings being sponsored by the Extension Department of the Mississippi State College and led by the Boys and Girls Club Agents in each county. M. M. Bedenbaugh, assistant State club agent for North Mississippi, has had charge of the boys and girls in this camp and for weeks at a time during the height of the season remains on the grounds all but continuously, checking out those from one county as he checks in others who take their places. The time of these boys and girls is divided about 50-50 between recreation and some form of instruction.

Boys enjoy swimming, boating, and diving in the lake at Camp Charley Ames.

So, since the mountain would not come to Mohammed, Mohammed has gone to the mountain, and it will be interesting to note at some future time the influence this innovation in agricultural instruction may have on the future of Mississippi farming. Certainly it should prove easier to teach new methods to boys and girls of impressionable ages than to men and women more or less set in their ways. But if the camp does nothing more than afford a means of recreation to the thousands of boys and girls and men and women from Misissippi farms who choose to avail themselves of its facilities, it will be worth many times its cost. Suffice it to say, all who come bless the name of Charley Ames who made it possible.

Boys at the Charley Ames Club Camp being taught how to judge mules. The picture also shows the Club building and a part of the grove in which it is placed.

Study Starvation Signs on Tobacco and Cotton

(*From page* 15)

deficiency would not have been met and the crop would have suffered in growth, yield, and quality.

The fields or areas of the fields showing these symptoms on the cotton plants during the previous year should be carefully noted, and the fertilizer mixtures for the following year's crop should carry at least 2 to 3 per cent of soluble magnesia. The cost of supplying this constituent in the fertilizer mixtures in soluble forms will be very small, considering the benefits to be derived. Its use on affected areas will in many cases increase the yields and quality of the lint as much as 50 per cent, as has been seen recently. Other soils which may not be so badly deficient in this constituent will show less increases, but in all cases where the deficiency is sufficiently pronounced to show a reddish condition of the leaves of the cotton plants, the addition of soluble magnesia will pay and pay well.

If added as side applications immediately before a cultivation when the symptoms first appear on the leaves of the plant, the deficiency may be remedied in most cases even if no soluble magnesia was added in the fertilizer mixtures used at planting time, provided the cotton is not too far advanced in growth when the application is made. The making of such side-applications before the cotton blooms in normal seasons should be entirely effective in overcoming the deficiency and enable the plants to make normal growth and produce an abundance of bolls containing lint of high quality.

If one travels over the Coastal Plain area of North Carolina or over other portions of this region of the South in late summer or early autumn in many of the cotton fields he will find that the cotton plants have lost or are losing their foliage prematurely. The defoliation has resulted in the stoppage of the growth of the plants and bolls, which results in a lowered production of lint, ordinarily of very poor quality.

This condition is known as "rust" or potash deficiency. In the field results secured by the Department of Agronomy of the North Carolina Experiment Station at three places in the Coastal Plain region of North Carolina in 1935 and 1936, it was found that the use of 400 pounds of a 3-8-3 fertilizer mixture per acre at planting of the cotton did not prevent a serious development of "rust" in the cotton. When 100 pounds of 50 per cent muriate of potash were used as a side-application immediately after chopping, the yield of seed cotton on an average of 2 years on these three fields was increased almost 45 per cent, and the market qualities of the fiber were greatly improved. Too, the size of the bolls was increased about 37 per cent and the weight of individual seed about 32 per cent from the supplemental side-application of 50 pounds of potash (K_2O) from muriate of potash.

Raising Quality Fruit on a Large Scale

(*From page* 8)

proves the quality of the fruit, both in keeping and grades. The percentage of repacks has been decreasing each year under the present fertilizer program, until in 1936 very little repacking had to be done on this orchard.

To realize the full effect of this fertilizer program upon the grades in this orchard, one must first study some of the picking practices. After these tracts are color picked a few times, they are stripped. The value of fertilizer is clearly shown in this last picking. The federal inspection certificates show that from 75 to 100 per cent of this final picking have good red color and will grade about 15 per cent "C" grade. This means 85 per cent extra fancy and fancy apples.

Cover crops play an important part in the production of quality apples, and it is only through proper fertilization that a legume cover crop can be maintained in an orchard under the present practices. With the orchard soil management programs usually practiced, a legume cover crop cannot last long in an orchard. Under constant fertilization with nitrogenous fertilizers and the severe disking that the cover crops are subjected to, the legumes are killed out, and the weeds and grasses take their place.

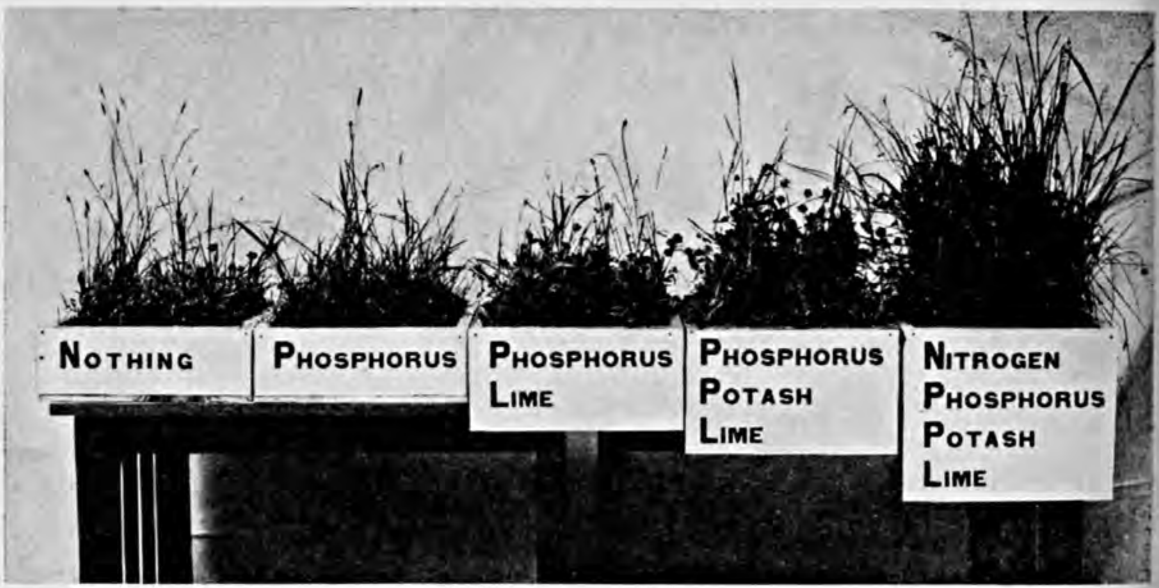
In contrast to the general run of cover crops, we find those of the Congdon orchard greatly improved with the present fertilizer program. The percentage of weeds and grasses in their legume crops has been decreasing and the quantity of alfalfa increasing. This is brought about by giving the cover crop all of the phosphoric acid and potash it needs. Each year on this orchard the cover crop has to be mashed down so that the pickers can more easily move their ladders and equipment.

The results from these two tracts are typical of the whole orchard. This orchard is divided into 15 tracts, and the fertilizer practices are the same on all of them. The production manager varies his fertilizer application when the conditions show a change is needed.

The fertilizer program on this large orchard has been in the past, and will be in the future, based upon the requirements of the trees for high yields of fine quality fruit. This means fertilizing the soil with mixed fertilizer to supply all the necessary plant foods, including generous amounts of available potash.

The Use of Soil Tests in Conservation

(*From page* 13)



Pounds Dry Matter Per Acre

1,051 1,392 1,548 1,850 2,501

Pounds Crude Protein Per Acre

171 235 266 344 488

the most likely to suffer. So far, the conservation program makes no account of this element magnesium. In view of the fact that all of the soils in the humid region embracing the eastern States are beginning to exhibit magnesium deficiency, it is doubtful whether this element can or should be long held out of the conservation picture.

The test for nitrogen either in nitrate or ammonia form may be said to be more unsatisfactory than any of the elements. It does not evaluate the organic nitrogen in the soil, and further, the season of the year has a great deal to do with nitrogen availability. Organic nitrogen becomes available through bacterial activity, and if these organisms are not working, then nitrogen in available form is not indicated. Hence a soil which shows a good nitrate nitrogen content in summer may not appear to be as fertile in winter, while in the spring and fall a good content of ammonia nitrogen may appear.

In general, fields that have recently had a heavy application of manure show a medium to high content of available nitrogen in one form or another, but if the manure application was made a year or more prior to sampling, the test does not indicate so much nitrogen in available form. The following tabular summary indicates how New Hampshire soils tested with respect to the available nitrogen:

	Nitrates	Ammonia
None	201	0
Trace	166	7
Very low	149	660
Low	202	300
Medium	143	17
Medium-high	69	2
High	59	10
Very high	11	4

With a test of very low or below, a soil should receive nitrogen for any crop. A low test may be all right for legumes, but corn, potatoes, grass hay, and other crops should have the nitrogen content bolstered up if the test is low or below the low point in the test. It is interesting to note that 516 samples tested very low or lower for nitrates, while 667 or just two-thirds tested very low or less for ammonia nitrogen. This would indicate a need for a nitrogen application on more than half these soils for any crop.

Looking at these tests from the other point of view and considering that a medium test or above is a satisfactory one for most crops, especially if manure is being used in the rotation, 282 tests or 28% tested at this point or above for nitrates and but 33 or 3% for ammonia. Referring again to grass, hay, corn, and other dairy crops, about three-quarters of the soils need more nitrogen for their production than the tests indicate will be available during the season. With more than half these soils needing nitrogen for the satisfactory establishment and production of legumes and three-quarters needing nitrogen for grass and pasture crops, it seems desirable to place considerable emphasis upon this element in the conservation program.

Tests for phosphorus and potash shown in the following table are less encouraging than for nitrogen.

It is probably fair to assume, as we have done, that when a soil test shows very low phosphorus this element should be applied for any crop, even for grass hay, which uses as little phosphorus as any field crop. Five hundred and eighty-one samples tested at this point, while 935 tests were either low or very low indicating a need for phosphorus in the fertilizer for all crops with the possible excep-

	Phosphorus	Potash
None	0	426
Trace	0	225
Very low	581	185
Low	354	60
Medium	45	29
Medium-high	14	9
High	4	12
Very high	2	54

tion of the grass-hay crop, and if this were being seeded a recommendation for phosphorus even at "low" would surely be made.

A test at medium or above, embracing 65 samples, is probably satisfactory for most field crops, although at "medium" we have recommended phosphorus for seeding and for the corn crop. There is no doubt but that phosphorus presents the most universal need, judging from these tests, although it is not advisable in our region, because of the high soluble aluminum content of the soils, to apply an excess of this element, as it is quickly fixed in insoluble aluminum or iron compounds. Smaller and frequent applications of phosphatic fertilizers are therefore desirable.

Perhaps the most surprising test of all is for potash. It might be expected that a large number of soils would show appreciable quantities of potash, for by far the greater number of these soils come from dairy farms where manure is regularly used in the rotation. It would appear from the results of these tests that the manure on these farms is not being carefully housed and applied without loss, or a more favorable potash test would result. Farmers apparently do not realize that the bulk of the potash from their animals is in the urine. If this portion is not saved by using sufficient bedding or by a tight floor in the manure pit, potash is lost in great quantities. This seems to be what is happening on New Hampshire farms.

Eight hundred and thirty-six samples tested in the three lower groups, showing none, a trace, or very low potash. At these points a complete fertilizer is indicated for top-dressing grass lands or pastures, and if legumes are to be seeded it appears advisable to recommend potash in addition to any manure that is applied prior to the seeding operation.

Samples testing "low" or above this point will be satisfactory for grass-hay production, so far as potash is concerned, but pastures and legume seedings need to have the available potash built up to the medium or medium-high point, at least. This can be done by applying muriate of potash or by using the equivalent in a complete fertilizer.

Looking at these tests from the broader viewpoint, again with clover as an example, 415 soils would produce good red clover without lime, about half, or a little more of them, would need a fertilizer carrying nitrogen or its equivalent in manure, but 935 of the soils tested would need phosphorus and 896 would certainly need potash fertilization, either from manure or from a potash fertilizer, and most of them from both.

Proven Need for Potash

Our temperimental work in New Hampshire has shown such a vital need for potash that we do not believe this element can be neglected, especially in legume or pasture production. In two widely separated experiments on alfalfa, and also on clover, potash proved to be the element most limiting and hence the most profitable substance to apply. Likewise, it has stood at the top in encouraging Dutch clover in pastures and has promoted yields as much as any other substance used on pastures, except nitrogen which is of course the element most needed by the grasses in a pasture stand.

It is for these reasons that we have encouraged farmers not to tie themselves up to a lime program, or to lime and superphosphate, but have tried to point out that a well-balanced fertilization program is not only more far-reaching on conserving and building up the soil, but that it will mean more immediate returns in the way of better legumes and pasture crops. These two things in the long run will mean an earnest participation in the Conservation program.

We Do Some Terracing

(*From page* 10)

young man attached to the county agent's office as soil conservationist secured a ruling that would permit the farm to be used as a demonstration in that locality. He realized that such a demonstration was badly needed and finally he secured the necessary permission.

Let it be said here that those CCC fellows are thorough. They went over every foot of land on the farm; made a map, drawn to scale, that showed the slope, soil character, and condition of the land; laid out the terraces and planned waterways. They also made suggestions about the plantings that should be made in certain fields and promptly vetoed our plan for opening up a piece of woods that would connect two fields and make them into one.

But the terracing outfit couldn't get there right away. Robert waited for it day after day and delayed his planting because those 20-foot strips staked across the fields looked even wider than they were. To plant cotton and corn and then see the planting torn up by a caterpillar tractor and terracing machine was more than human nature could stand. However, one day the "mens" came and began work. We were glad we hadn't planted.

When the "mens" left, the fields looked as if some giant hand had tortured the land in angry reprisal. Added to this, the CCC boys carved straight down one hillside a waterway that looks like a small canal. They built another in a beautiful curve along the edge of the other field and then did some excellent work on the gullies. But, they sodded the waterways with Bermuda or wire grass. That was the crowning insult. Those who came to see our terraces were sorry for us when they saw that "a third of your land is gone into terraces," but when they found that "wire grass" had been used for sodding the two waterways, their commiseration was the more penetrating and caustic.

One relative with the freedom permitted by such relationship, said to Iola, Robert's wife, "I knew Frank didn't have any more sense but why didn't you hit Robert in the head with a hoe before he could agree to that?" So the word got around in the com-

Close-up of waterway coming down from the lespedeza field. Terrace outlets have not yet been turned into the waterway.

munity. Many came to see this outstanding example of folly in farming. One visitor pointed out that he had been cultivating a hill on his place for 50 years and it was still there. I took it that the yields were just as good or that they didn't cost any more to produce than when the land was in its virgin state, though I did not ask the question.

"One-third of the land gone to terraces and two big ditches dug right through the fields and sodded with wire grass! Bare subsoil turned up where the terraces were built."

No need to explain that the whole field could be cultivated shortly, and no land would be wasted. No need to declare that I was not afraid of Bermuda grass as long as cowpeas or lespedeza would grow thickly in the summer and vetch and oats in winter, or that kudzu could be planted on the shoulders of the waterways. Secretly I am a little concerned about that "wire grass," but Robert and I do feel that we can conquer it anytime it starts out into the fields. Anyway, we see no reason why we should plow down into the waterways to carry the grass roots outside.

So we have done some terracing. It was a right expensive job, and the farm looks a little raw right now, but we see ahead 4 years to the time when that 80 acres will be a beautiful rolling piece of land on which contour farming will be followed and where no land is wasted. Better still, we think ahead to the time when excess water will walk down those slopes instead of running and when moisture will be stored in the soil against times of drought. Finally, we dislike to give away soil fertility which we have worked so hard to obtain. We don't mind paying a reasonable price for good fertilizer and for the side applications that we make, but we do dislike to see these wash away when they could be used for crop production on our own acres.

Just a Milk Shake

(*From page 5*)

convince me that little if any opposition would be raised were such a scheme set afloat in Congress next winter.

If by the term "surplus" we stick to Webster, then we probably have no surplus of good milk and healthful dairy products. This is because the dictionary defines "surplus" as "that which remains when needs are satisfied, or something more than sufficient."

Of course low wages are not the only reason why thousands of children do without proper nutrition. Ignorant buying and household mismanagement count for much juvenile starvation. So along with the proposed subsidy we must encourage dairy associations and State legislatures to continue advertising and educational publicity in behalf of milk products, and also emphasize the same in public schools and social centers.

Another situation no doubt having a deterrent effect on the ability of poor people to eat enough milk and dairy products lies in that oft-discussed question of the margins in between—or in other words, presumably wasteful distribution methods and excessive distribution costs. While I have real faith in legislation to act directly as stated above in the form of a subsidy for consumers in the low income class, my hopes are not so flourishing in respect to legislation to cut down overhead or whittle off the profits. In arbitrary price-fixing you meet right in the whirlpool of strife between production, capital, and organized labor, all groups claiming a certain proprietary interest in the consumer's milk dollar. You get into courts, you are besieged with lawyers and process-servers; or else you get into a jam trying to explain why you stand for higher wages on the one hand, and permit dealers to reduce plant and route wages before they can drop the milk price a cent or two per quart. Each group hides behind the other and we go in a circle.

EACH year we unload reams of surveys and tons of bulletins about the dairy middleman's "milking" propensities, but as long as the cows don't dry up completely there isn't much done about it by effective legislation. Moreover some of the cooperatives which try to supplant the private firms in this line fail to cut the costs to what we think is the salvation point for the masses. Yet if there ever comes a time when justice shall prevail and we reach real efficiency in distribution, my hunch is that it will come through producer unity such as we haven't tasted hitherto. But it won't happen in prosperous days; it will take another financial flop to germinate the movement again after its initial baffling experience under AAA agreements. Like I dismiss oleo and imports from the present dairy scene, I am obliged to "x" out feverish dreams on controlled distribution. Better stick to our original platform—high wage levels and subsidized consumption. It's a lot easier to give something to somebody than to take something away—especially from capital and labor.

It is an old wheeze to advance the idea that better feeding of better cattle will revitalize the dairy industry and put it in sounder shape to withstand risks and losses not of its own making. Yet I am old-fashioned enough to stick to this ancient doctrine, because I believe that we have never found the right method yet to encourage wider and more consistent dairy herd testing and feeding and breeding. Somehow, somewhere, something is lacking. The bright young genius who finds a way to cause more than five or ten per cent of the nation's dairy farms to engage in herd improvement in any one period of time is going to be the economic Babcock of the industry.

Finally we must review the position of the dairy industry in relation to the other major farm commodity groups, because it will be impossible for the dairymen to maintain themselves in security and stability if other branches of agriculture are going haywire.

During the life of the original AAA program, dairymen received two direct and one indirect benefit. Products, purchases, and disease eradication were the direct ones, and price increases for producers of other commodities who might otherwise have shifted to milk was the indirect benefit. Marketing agreements also contributed somewhat to alleviate harsh conditions on certain milk sheds and in the evaporated milk industry.

ONE principal reason why milk received no nation-wide adjustment program when corn-hogs, wheat, and cotton got theirs, lies in the fact that dairying exists in a widespread area under divers market relationships, whereas the other basic commodities are more centralized and knit together in homogeneous regions. If it sometimes seems difficult to cause the wheat farmer to sense the problem of the cotton planter or the orange grower to see things like the peanut producer, then we have often found it five times harder to get the New England milk producer to get the slant on dairying which the midwest manufactured milk farmer has, and vice versa. Companionship with cows has not apparently worked to make comrades of their owners when it comes to united, forward planning.

It is for this reason that I firmly believe no federal dairy adjustment program, as such, will come in this generation unless we run into tougher times than ever, which we all hope will never happen.

BUT on the eve of another set-to on farm legislation we find the dairymen wondering if some sort of adjustment will not be forced upon the industry whether they want it or not, an adjustment which may catch individual dairymen in a bewildering mesh unles they prepare in advance for a soft cushion on which to land.

The soil conservation program of shifting land from depleting cash and feed crops into legumes and grass meadows is yet regarded by many dairy leaders as a distant threat. Owing to the drought years no real test of its effect on total milk production has arisen as proof one way or the other; but studious men have prophesied that more roughage and more pastures spell more dairy cows and more milk sooner or later.

Their contention is answered by economists who bring little or no ray of hope to the dairymen's outlook either; for opponents of the grass-expansion-dairy-ruin theory point out that corn and cereals make abundant butterfat too. Secretary Wallace himself belongs in this group. He shows that Iowa in the court of King Corn made rapid gains in butter production during the years when butterfat prices were alluring and corn and hog prices were not so good.

Hence looking in either direction at the mile-post on the cross-roads, dairying runs smack into cloudy weather. The present soil conservation program has no price stability or parity guarantee other than an assumed one. The farmers most apt to shift into milk production are now seeking a renewal in some form of the old AAA program, including the ever-normal granary, cash loans, benefits for crop control, and so forth. So far the dairymen in the self-appointed spokesmen states have not taken very kindly to it.

As usual their plea is that nothing in the proposed draft deals directly with milk. Some of them state that they will oppose it unless milk and butterfat become one of the major basic commodities included for loans, benefits, *and* adjustment. Knowing how they behaved toward adjustment previously through scattered leadership and amid complex interests, we gravely doubt how sincere their present intentions are. Perhaps it would be best for them not to be included, but to resolve to help boost and bolster up the situation for the shifters and competitors, so as to keep them happy and clear off the dairy reservation.

THIS, then, is my last idea on the situation. It is for the dairymen to support a reasonable but not extra exorbitant supply and price condition for the growers of corn and cereals, because milk cannot stay up in price very long in the face of ruinous corn prices. Most of the dairymen, at least in the Midwest, grow the most of their own coarse grains anyhow, and the silage and hay situation is more important to them than cereals. Should the dairy industry neglect to support price-stability for the shifters and competitors, and another series of boom crop seasons come, what would be the result in terms of cattle values and butterfat quotations?

Who knows? Maybe the best insurance for the dairymen lies in the cooperative spirit of helping others—helping unfortunate groups of underprivileged milk consumers to get their rightful share, and aiding corn, hog, and wheat growers to maintain security within their own enterprises?

A Few Whinnies

WELL DEFINED

"Willie, what is an adult?"

"An adult is one that has stopped growing except in the middle."

A backwoods farmer was met in the field one day by a modern agriculturist. When asked what he was doing, the farmer said he was driving his hogs down to the woods where they could eat acorns and fatten up for the fall market.

"Why, that's not the way to do," said the agriculturist. "The modern way is to build a pen in the yard and carry the acorns to them. It'll save lots of time."

The old man looked at the visitor for a moment, and then in utter disgust said: "Hell, what's time to a hog?"

"Well, Sam, I see you're back for fighting with your wife. Liquor again?"

"No, sah, Jedge, she licked me dis time."

WELL NATURALLY

"What did the hen say when she laid the square egg?"

"Dunno."

"She said 'Ouch'!"

Tottie (aged 5): "I wonder why babies is always born in de nighttime?"

Lottie (aged 7, a little wiser): 'Don't you know? It's cos they wants to make sure of findin' their mothers at home."

The young city girl went swimming in the nude in a secluded mill pond. Along came a little boy who started to tie knots in her clothes. She flopped around, found an old washtub, held it up in front of herself and marched toward the little boy, saying: "You little brat, do you know what I'm thinking?"

"Yes," said the little brat, "You think that tub has a bottom in it."

"Sophisticated! My dear, that child wouldn't even believe that the stork brought baby storks!"

WELL, WELL, WELL

Mistress: "This food tastes terrible. Did you salt it?"

New Cook: "Yes'm, but I never used that brand before. It was called Epsom Salts."

"Madam," said the policeman kindly to a little old lady who persisted in crossing the street, anywhere but at the corner, "you are jay walking again."

"No such thing," she snapped. "It's rheumatism!"

A pious and uncommonly homely spinster was accosted by a staggering drunk.

"Lady," he said, "you're the homeliest persons I ever saw."

"And you, sir," replied the spinster, "are the drunkest man I ever saw."

"Mebbe so, lady," countered the drunk, "but I'll be okay tomorrow."

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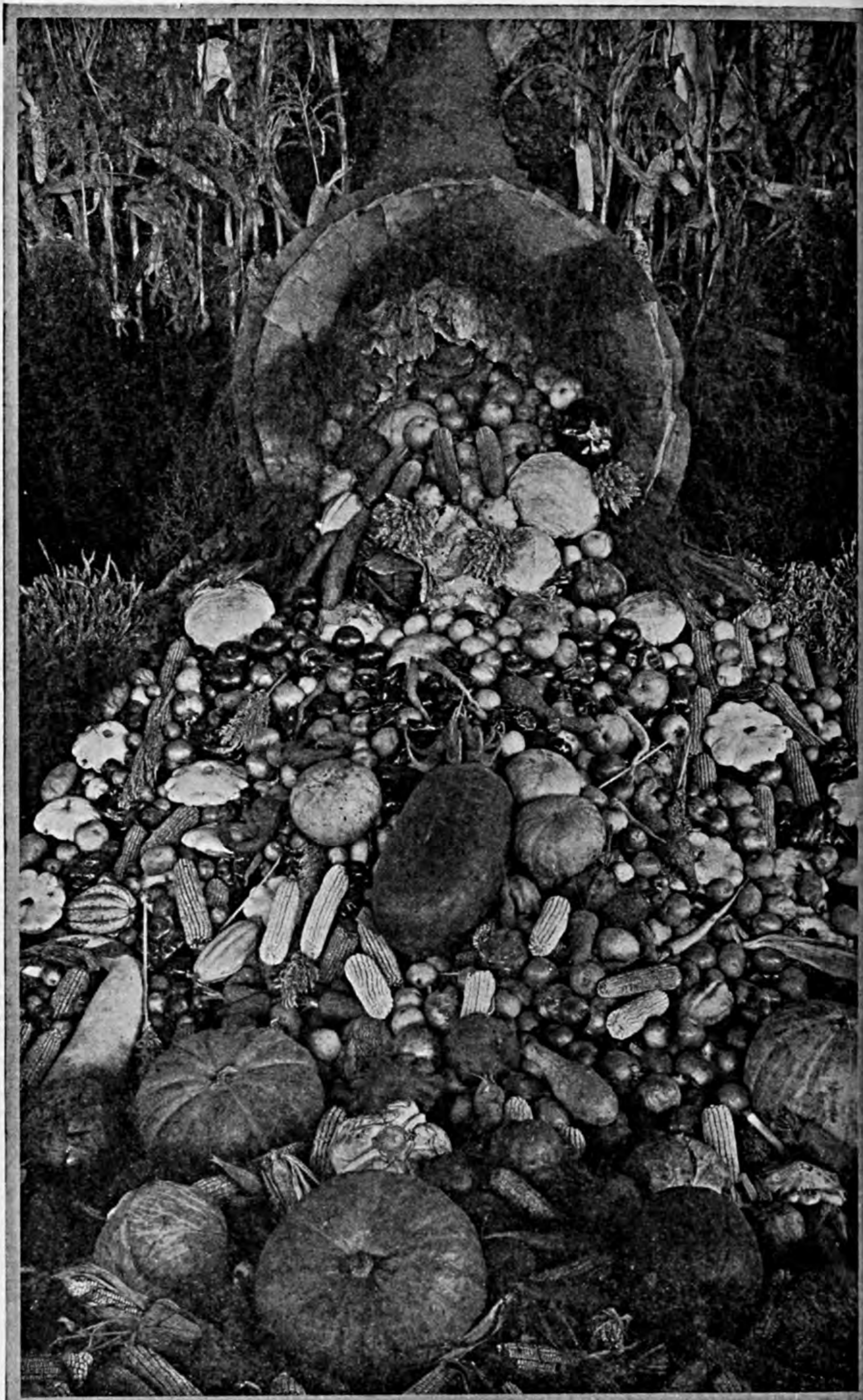

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Brawn and Bang-boards

Jeff McDermid

OUR king plant, *Zea Mays*, has brought us another gift of great abundance and comforting sustenance, stored away in brown, rustling wrappers on the mother stalks, after ninety to one hundred days of blistering sun, welcome rain, and diligent cultivation. It's almost like a Christmas or a birthday gift. All we have to do now is to open the packages. That's the thing I want to chin about.

In the simple legendary annals of Indian lore in the times known as B. C. (before Columbus) the innocent red brethren grew corn fields twenty miles long, but not so particularly rich in acre yield. They were not bothered about its being a soil-depleting crop like we are, nor did they inhale so much of it in liquid form after the customs of today. Yet authorities so far apart in literary style as poets and anthropologists and archaeologists agree in the main that the redskins made quite a fuss over harvest festivals, in which the glorious corn plant was transformed into a demi-god.

I cannot clutter up this passage with any authentic scientific documents, but I pause to quote a few revealing lines from Longfellow anent the adventures of Hiawatha whilst engaged in growing and shucking the bounteous maize.

If you recall the story of the poem, Hiawatha met and wrestled regularly for a certain period of time with the mighty Mondamin, corn-god of the tribesmen. Finally Hiawatha threw the marvelous adversary prone upon the ground, with "plumage torn and garments tattered." Acting upon previous instructions, the Indian hero made a grave for the corn-god and "laid him in the earth and made it soft and loose and light above him."

At this spot Hiawatha watched every day while the green shoots emerged and turned into the mature corn plant, a typical resurrection from the dead. Then Hiawatha and the braves learned to grow and depend upon this great gift, and of the husking at the harvest, Longfellow wrote:

"And still later, when the autumn
Changed the long green leaves to yellow,
And the soft and juicy kernels
Grew like wampum hard and yellow,
Then the ripened ears he gathered,
Stripped the withered husks from off them,
As he once had stripped the wrestler,
And made known unto the people
This new gift of the Great Spirit."

Since those ancient, legendary days, the corn plant has not changed very much in its outward appearance or manner of growth, but mankind has surely changed the methods used in unwrapping the packages.

GOING afield with corn knives and sickles, our elders mowed down the tough and resistant stalks and then embraced them with sinewy arms to make huge, wigwam-like shocks, arranged in rows down the autumnal fields. The haze in the October and November atmosphere resembled the eerie smoke from vanished Indian campfires, and those gaunt and windblown relics of a bumper season stood awhile before the advent of the hauling racks or the patient huskers.

Trying to make the most of every occasion for a frolic and a reunion of hearty wits, our ancestors soon made keen sport of the annual husking time. They sought to forget the bitter winds and the frosted pumpkins in a bit of relaxation with piles of stalks before them and bushel baskets on either side. Even today in my rambles up-state, I see a few crouched figures squatting among the brown shocks, sorting out the nubbins from the heavy ears, and thinking how much richer the yield had been with more plant food in the seed hills.

FARMERS, according to their regional customs and preference, have varied the husking methods considerably. Sometimes they let the livestock "hog down" the crop. In our intensive dairy areas the silo and the husker-shredder seem to have weaned the operators away from the husking peg. Yet in a vast stretch of country known as the corn belt, standing corn-husking is still the common way, using wagons with high racks and bang-boards at the ends to catch the high-flung ears tossed in by the most rapid rippers.

I am rather sorry that some of our honored rural programs are no longer popular, among them the jolly husking bee. Aside from the communion of rare spirits, both mental and liquid, the verve of such events was pronounced by reason of the rollicking red-ear kiss provoker. I did not share in this sport, unfortunately, but many a man has gone to such parties armed on the sly with "calico" corn and Northwestern dent, so he might be the lucky claimant of an osculatory privilege.

As the kiss became harder to obtain with the expanding use of pedigree seed stock, mostly straight white or golden yellow, something had to be devised in order to make more frolic out of the irksome job of opening the endless corn packages.

This finally led our modest agricultural secretary at Washington, then an Iowa corn breeder, to conjure up the modern sport of bang-board, open field-shucking contests. They are now the *sine qua non* of agricultural athletics, or something like that.

Whether he felt personally bereft because of the decline of the ruddy ear and its ruby counterpart, the history of Polk County, Iowa, telleth not. I may get him to grant a newspaper hearing on that issue before he gets too much het up in the ever-normal granary, but let's get on with the yarn.

We should be as proud to recount the deeds of our brawny huskers as we are to hoot ourselves black in the face when some hunky digs a groove in the sod with his snoot in a football classic.

BACK in 1923, farm folks quit speculating about the McNary-Haugen bill and export debentures and had their eyes glued on the first interstate corn-husking contest known to history. Over in western Illinois a "kid" about 20 years old, weight 160 pounds, named Dallas Paul, had given a private sketch of his own in a convenient corn field, and hung up a 10-hour record of husking 235 bushels of ear corn. This was conceded as mighty near professional caliber, so some of his friends wagered that nobody in overalls could equal Paul's fling feat. However, Iowa also had a runner-up that year, a 28-year-old rustic with a gnarly wrist measuring seven and three-fourths inches in circumference, and so the Hawkeyes chortled at the Suckers and accepted their challenge with the new state champion bang-board artist, John Rickelman, of Lee County. After the necessary insulting preliminaries, somebody paid Paul's expenses over to Des Moines, and there Henry Wallace gave his blessing to the first interstate tussle amid the tassels.

It seems that the crowd was not satisfied with the first regulation heat of 80 minutes husking, so they hollered for a second round, and the grimy, sweaty state champions went at it again for an extra hour. When the "shavings" were all sorted out and the balance struck on the net weights, Paul had lost seven bushels and Rickelman about six bushels on penalties. This left the contest in the scales of justice for half an hour, while the judicial committee retired for a guzzle. When they emerged with the official score, Rickelman won with 44.5 bushels to 40.5 bushels chalked up for Paul in two hours and twenty minutes running time.

Both men were well steamed up and going strong, even though the corn ears were not very large, about 180 to the hundredweight. Yet the bang-boards had to stand some stiff punishment, because both huskers were throwing an average of forty-five ears a minute when the gun-shot ended the battle. At that time in Iowa, about the only chap who could equal Rickelman's pace was Grimmius of Grundy, but both men finally passed into oblivion as the scene shifted to new champions.

In 1924 the interstate struggle took

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Better Yields of Better Cotton

By A. B. Bryan

Clemson Agricultural College, Clemson, South Carolina

THE biggest story in South Carolina farming in the last decade, says a recognized authority, is the story of improvement in cotton production. First is the decided improvement in yield per acre in the face of the boll-weevil, yields for 1924-28 inclusive averaging 186 pounds per acre for the state, while yields for 1932-36 inclusive averaged 251 pounds per acre. Equally significant is the long stride in staple improvement—from the predominance of ⅞-inch staple to that of 1-inch or better. In 1929, less than a decade, only 36.7 per cent of South Carolina cotton was 15/16-inch or longer, and in 1936 this length of staple had risen to 94.7 per cent, 72 per cent of the 1936 crop being 1-inch or longer.

Much of the advance, as to yields and staple length, may be credited to the 5-acre cotton contest conducted every year but 2 since 1926 by the Extension Service of Clemson College and to efficient seed breeders.

The chief aims of the South Caroline 5-acre cotton contest are indicated in the contest slogan: "For better yields and staple lengths," that is, the more economic production of greater yields per acre and the production of improved staple lengths so that the mills of the state may have home-grown cotton such as they need in the manufacture of superior cloths.

"Uncle Bob" Smith, Johnston, South Carolina, four times a prize winner in the cotton contest; and his wife, Mrs. Carrie B. Smith, first prize winner in 1936.

In 1925 a survey by the Extension Service showed that less than 20 per cent of South Carolina cotton was 15/16-inch or longer. The requirements of the mills of the state for such lint were being met by cotton shipped in from other areas, and most South Carolina cotton of shorter staple was being exported from the state. Furthermore, the average per-acre yield of cotton in the state was only 152 pounds, a yield economically not profitable, as data on cost of production will show conclusively.

Hence the contest—"for better yield and staple value"—begun in 1926 with prize money totaling $2,000 donated by *The State*, Columbia, a progressive daily newspaper, through the Extension Service. Since that year, except in 1932 and 1933 when no contests were held, the Cotton Manufacturers Association of South Carolina has generously donated $2,000 each year for prize money to help carry on this big job of cotton improvement.

Progressive Figures

That real progress has been made is shown by interesting facts and figures from the records of R. W. Hamilton, extension agronomist and assistant to the director, who has directed the contest work with energy, enthusiasm, and fine judgment since it was begun in 1926.

With less than 20 per cent of South Carolina cotton 15/16-inch or longer in 1925, there was 36.7 per cent of such lengths in 1929, 76 per cent in 1932, and 94.7 per cent in 1936. Better still 72 *per cent of the state's cotton in* 1936 *was* 1-*inch or longer.*

These figures put South Carolina in the lead of the other cotton states in the production of cotton 15/16-inch or longer. North Carolina's percentage has risen from 24.4 per cent in 1929 to 87.9 per cent in 1936; Georgia's from 10.8 per cent to 56.1 per cent. The percentage of 15/16-inch cotton for the United States was 64.1 per cent in 1936.

Bryce Gainey, Darlington County 4-H Club boy, who won first place in the Darlington County section of the long-staple contest.

The rise from a yield of 152 pounds in 1925 means lower cost per pound comparatively, and therefore greater profit to the producer. Material aids toward this improvement in yields per acre have been the better cultural practices taught in the contests, such as closer spacing, better-yielding varieties, judicious fertilizing, and diligent fighting to control the boll-weevil.

The cotton contest is of course only one of several agencies that have brought about these profitable results of higher yields and longer staples. There are the seed breeders, the research activities of the South Carolina Experiment Station, the progressive farmers who cooperate for personal and public good.

The increase of 65 pounds of lint per acre, as shown in these 5-year averages, at 12 cents per pound means an increase of $7.80 per acre in lint value; and 25 per cent of that would mean an increase of $2,730,000 in the value of the 1936 crop alone.

As to the prize money, if the increase in staple length since 1925 is valued at only ½ cent per pound, for the state's 1936 crop of 800,000 bales, the total increase in value due thereto would be around $2,000,000. This for 1 year only! What a dividend on the prize money which for the entire 9 years of the contest has totaled only $18,000!

The improvement in the quality of the cotton grown by the contestants themselves from 1926 to date is emphasized by figures on the staple lengths of the cotton produced in the contests. In 1926, first year of the contest, 54.6 per cent of the lint grown on contest plots was short cotton, that is, ⅞-inch or less; by 1935 only 1.9 per cent was of these short lengths. On the other side of the picture, the percentage of lint 15/16-inch or longer produced by the contestants increased from 40.8 per cent in 1926 to 98.1 per cent in 1935. In 1936 there was a slight drop from this high figure to 95.8 per cent, still a very high percentage of superior lint.

And most interesting is the fact that only five of the varieties used by contestants in 1936 averaged as low as 31/32 inch, four varieties averaged 1 inch, one averaged 1 inch plus, one 1 1/32 inches, one 1 1/16 inches, one 1 3/32 inches, one 1⅛ inches, and two averaged 1 3/16 inches. Most interesting and significant also is the fact that the prize winners in 1936 all made cotton measuring over an inch in staple length, one winner's cotton measuring 1 1/16 and the other's all 1 1/32.

In the first year of the contest, many farmers thought that the only thing necessary for a large yield was a large amount of fertilizers per acre, and that the contestants using the largest amount would make the highest yield. Actual results have shown that rainfall or climatic conditions, fertility of soil, stand or number of plants per acre, and insect and disease infestation are other factors of great importance. Contestants have realized this, and the amount and kind of fertilizer used on contest plots averages in pounds of plant food per acre, 20 to 48 pounds of phosphoric acid, 18 to 28 pounds of ammonia, and 12 to 24 pounds of potash.

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County Agent W. J. Tiller (left) and a seed breeder of Chesterfield County are inspecting P. M. Arant's cotton in the State 5-acre contest.

Diagnosing Fertility Needs of Orchards*

By J. H. Weinberger

Assistant Pomologist, U. S. Horticultural Field Station, Beltsville, Maryland

NITROGEN, phosphorus, and potassium are the elements usually thought of as fertilizers for orchard trees. These are the elements that are most often lacking for plant growth in soils in this country. However, there are eight other mineral elements that have thus far been found necessary for the successful growth of a fruit tree. If the soil lacks any one of these, the trees can not survive and definite disorders or symptoms are produced in the tree by which it is often possible to diagnose the cause of the trouble. A fertile soil must necessarily contain an adequate available supply of all essential elements, and most orchard soils in Maryland are deficient only in nitrogen.

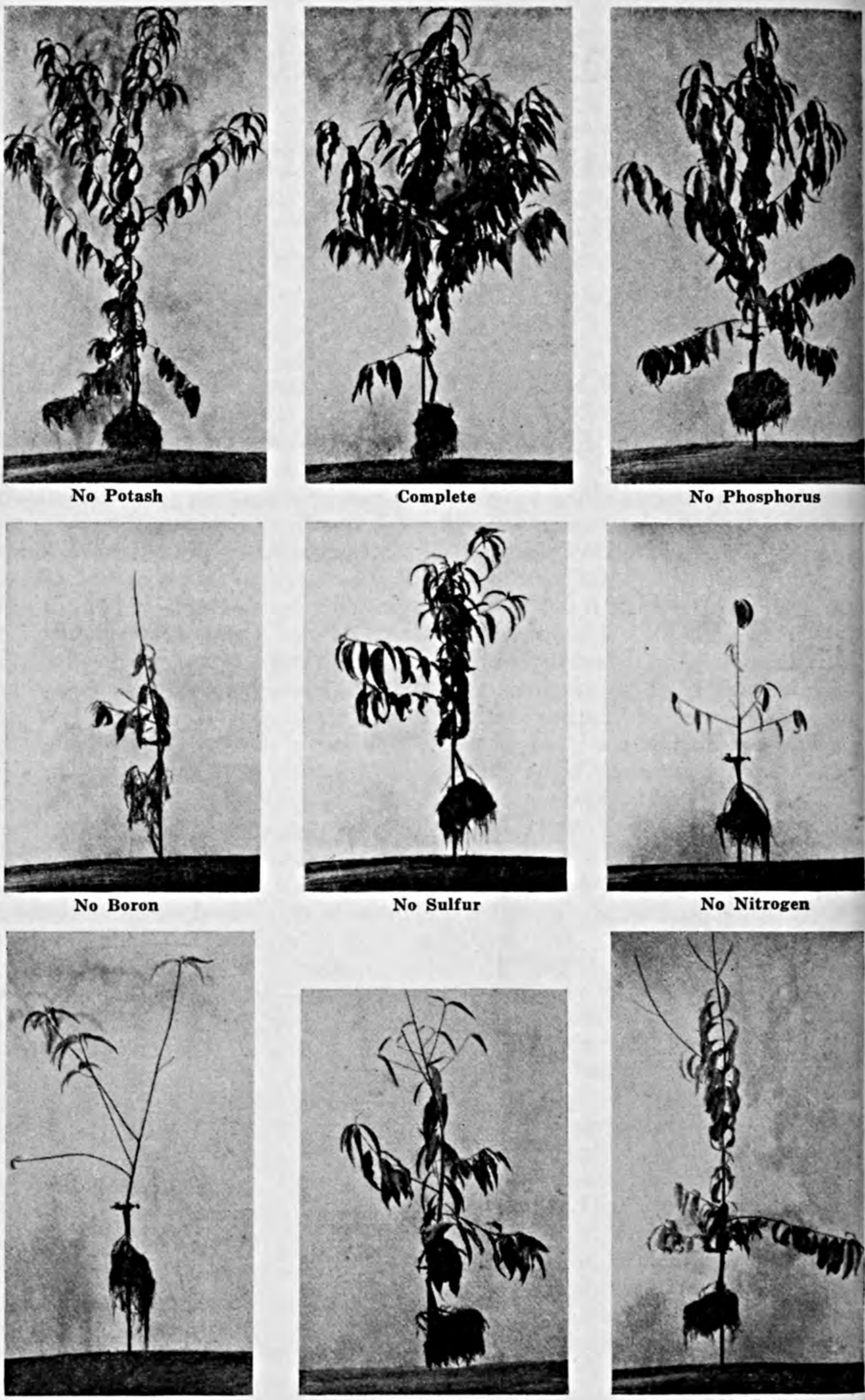
Deficiency Symptoms

In many sections the disorders caused by lack of one or more of these elements are of considerable economic importance. For example, a yellow mottling of the leaves and a rosette of peach, citrus, and other fruit trees in California are cured by applying zinc sulfate to the soil. A similar disorder affects apple trees in Washington and pecan trees in the South. In South Africa ¼ to 2 pounds of copper sulfate per tree is applied to the soil to overcome chlorosis (loss of green coloring matter or chlorophyll) and rosetting of peach trees. In Florida, die-back of citrus trees is controlled by application of copper salts. Die-back and chlorosis of prune trees in California are associated with deficiencies of potassium in the soil. Leaf scorch of apples in Massachusetts is also associated with potassium deficiencies. In parts of California and Florida manganese is regularly applied to citrus trees to overcome chlorosis. In any part of the country trees on a high-calcium soil may suffer from a lack of available iron. Internal cork and certain types of drouth spot of apples are physiological disorders which are associated with nutrition.

It is possible to produce these symptoms of mineral deficiency under controlled conditions. In order to be able to identify them when they occur in the field, 1-year-old peach trees were grown in sand supplied with a series of nutrient solution in each of which, one particular element was lacking. In this way definite disorders were produced whose cause could be identified. Most of the observations reported here were made on peach trees grown under controlled laboratory conditions at Beltsville, Md. (7). Description of deficiency symptoms of apples are taken from the reports of Wallace (6) on behavior of trees in the field and in sand cultures.

By far the most important element in the fertilizing of orchard trees is nitrogen. This element is easily leached out of the soil and under Maryland conditions trees respond most readily to applications of nitrogenous fer-

* Reprinted from Proceedings of the Maryland State Horticultural Society.



No Potash — Complete — No Phosphorus

No Boron — No Sulfur — No Nitrogen

No Magnesium — No Calcium — No Iron

Elberta peach trees grown in sand culture supplied with nutrient solution lacking the element indicated.

tilizers. When the nitrogen supply in the soil is low the trees lack vigor, terminal growth is short, few leaves are formed, and few fruit buds are differentiated. Leaves are small, yellowish green, much twisted and curled, and develop reddish tints and reddish brown spots. Leaf and blossom buds are slower to open in the spring and defoliation takes place earlier in the fall. The flowers are weak, often do not set, and if they do set, the fruits are apt to drop. The fruits ripen earlier, are smaller, and usually highly colored. Nitrogen starvation is apt to appear in sod orchards or on shallow soils. It is the most easily controlled deficiency and seldom proves fatal to the tree.

Phosphorus and Potash

Phosphorus deficiency on fruit trees has seldom been reported under field conditions. When peach trees are grown in pure sand supplied with a nutrient solution lacking phosphorus, they stop growth early in the season, but appear perfectly healthy. The leaves are large, dark green in color, and have a tough, leathery appearance. They lack the bright green color of leaves on a vigorously growing tree. In severe cases shoot growth is small, leaves are small, and defoliation occurs early. Wallace (6) reports that on apples fruit size is reduced, as in nitrogen starvation, but the fruits are poor in quality and have a dull, bronze finish. In certain soils in England, where the phosphorus supply is so small that pasture plants cannot grow healthily, fruit trees show no sign of phosphorus deficiency.

When available potash is scarce in the soil, the effects on the trees are less drastic than from nitrogen deficiency but are more serious because of the difficulty of control. Terminal growth may be just as great on potassium starved trees as on others, but the twig diameter is smaller and the leaves are spaced farther apart, giving the tree a spindly appearance. The distinguishing symptom of potassium deficiency is the "leaf scorch" which develops when the margins of the leaves die, and the dead tissue falls off in ribbons. In the center of the leaf small spots of dead tissue appear also. The leaves are light green in color, smaller in size, and seem thin, brittle, and papery. The edges of the leaves are curled inward. Sometimes a chlorosis appears in the leaves near the margins and between the veins.

With apple trees as reported by Wallace (6), defoliation occurs early, the leaves at the twig tips dropping off first. In severe cases the tips of the branches may die back. Blossom buds are formed and may set, but the fruits are small and of poor flavor. In mild cases, applications of potassium fertilizer to the soil will correct the trouble, but in severe cases recovery is more difficult, and often death of the tree results. In any potash fertilization it is important that the fertilizer be placed as close to the roots as possible, since this element is quickly combined in the soil and rendered unavailable.

Calcium and Magnesium

A simple calcium or lime deficiency of fruit trees does not often occur in the field. Calcium-starved trees grown in sand cultures have large, deep green leaves which tend to be stiff and to roll the edges inward. Late in the season a large area of dead tissue, usually in the center of the leaf, becomes yellow and quickly dies. The injured leaf soon drops off. Shoot growth may or may not be normal. So far as has been observed with apple trees by Wallace (6) bark, blossoms, and fruit are normal.

Magnesium deficiency symptoms are quite similar to calcium deficiency symptoms, except they are more severe, and breakdown usually occurs in areas between large veins. Unless large amounts of iron are available, chlorosis is apt to occur also. Defoliation follows the appearance of breakdown in the leaves, the old leaves dropping off first. New foliage is continually being produced, but it, too, is soon affected and drops off. Apple fruits are woody and fail to mature because of lack of foliage.

Where iron is lacking or is unavailable in the soil, severe chlorosis results. The veins, as well as the areas between the veins, lose their green color and may even become almost white before they drop off. The leaves at the tip are lost first, as contrasted to the older leaves lost first on no magnesium treatment. Lack of iron under field conditions may occur where considerable calcium carbonate or limestone is found in the soils or in the rock from which the soil is derived. Although the soil may be high in iron content, the iron may be rendered unavailable to the trees by the action of the excess lime. Iron chlorosis on peach trees also occurs readily in sand cultures when potassium, calcium, or manganese are lacking and iron supply is low. Under these conditions, if the trees are given either iron or one of the other elements, the trouble may disappear.

No disorder of fruit trees due to a lack of sulfur has been reported, and where trees are sprayed with sulfur for the control of diseases, there is likely to be none. However, sulfur is an essential element, and fruit trees growing in its absence soon stop growth. With peach trees the terminals die and new shoots start out below the tip, which are small and produce only small, light green leaves. These later assume red or orange tints. The older leaves turn light green, resembling low-nitrogen leaves, and later large areas of the leaves at the tips or margins die, shrink, and distort the leaves. Defoliation does not occur until late in the season.

Most soils contain ample supplies of manganese, and the cause of manganese deficiency disorders usually lies with certain soil conditions, which render manganese unavailable to plants. High-lime content is a common cause, as with iron deficiency. With peach trees, lack of manganese produces a dull, yellowish green color on the

(*Turn to page* 43)

1 2 3 4 5 6 7 8 9

Leaves from trees grown in sand culture supplied with nutrient solution deficient in (1) complete, (2) potassium, (3) calcium, (4) magnesium, (5) iron, (6) nitrogen, (7) sulfur, (8) manganese, (9) phosphorus.

Corn responds to applications of muriate of potash in Henderson County, North Carolina. F. R. Farnham, Dairy Extension Specialist at State College, and County Agent G. D. White are examining corn grown on one of the county's successful dairy farms.

Potash Enters the Dairy Business

By F. H. Jeter

North Carolina State College of Agriculture, Raleigh, North Carolina

UP IN the mountain country of western North Carolina, where farms are relatively small and where there is not so much good land available for row crops, every acre must yield well or the owner finds himself in distress. Corn has always been a staple crop in this section and is growing in importance as the mountain landowners are turning to dairying and poultry raising.

Fresh milk, poultry, and eggs are needed for the great number of tourists who visit this land in summer and early fall. Then, too, a profitable local market is developing for milk to be manufactured into ice-cream mix, butter, and semi-solid buttermilk. In the past few months, farmers in six of the mountain counties adjacent to Asheville have captured for themselves a $200,000 business of supplying milk to the famous Biltmore Dairy. Formerly the dairy bought this milk from outside of the state. E. D. Mitchell, manager of the dairy, told me recently that his business was expanding, that he would need more milk for manufacturing purposes, and that he was preparing for any increased volume that might be offered him by the farmers of the section.

These men so far have from 2 to about 15 cows, and the milk is gathered daily by trucks coming from the milk plants, or it is assembled at central points where refrigerating plants have been installed. Other farmers produce Grade "A" milk for direct retail distribution.

All of which is by way of saying that more corn is needed. And since the acreage of lush, reek lowlands is limited, the acres must be made to produce more. It seems that white corn will grow fairly well in these valleys, even though it responds readily to a more progressive method of fertilizing than has been followed in the past; but yellow corn seems to be light and nubby. Yet yellow corn is fine for poultry and cows. The corn contains the "something extra" usually called vitamins by those scientifically informed.

A. B. Corpening, of Horse Shoe, Henderson County, planted 5 acres of Jarvis Golden yellow corn in his creek bottoms this spring, fertilizing it with 200 pounds of an 0-10-4 mixture to the acre. One acre of this corn he top-dressed with 100 pounds of muriate of potash, when the corn was about knee high. Mr. Corpening had not harvested his corn when I visited the field on October 4, and it was too late in the evening to make a picture, but there was a decided difference in both growth and ear. F. R. Farnham, dairy extension specialist at State College, and G. D. White, county agent of Henderson County, examined the corn and estimated that where the land had received the application of muriate, the corn was 50 per cent better than where no such application was made.

Convincing Response

Where no potash was applied, the ears were light and chaffy, and the growth was poor. The stalks had a tendency to lean over, and many were broken. Four rows away from this check plot, Mr. Corpening had planted the remainder of his field in Lance's Prolific white corn, a local variety, and he had some of the muriate left over, so he tried it on a few rows of this corn. Again was the same striking difference noted.

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Corn demonstration on the farm of C. F. Ward, Hendersonville, North Carolina. The whole plot was fertilized with 200 pounds of an 0-10-4 per acre at planting and side-dressed with 100 pounds of nitrate of soda. In addition, the corn on the left from the stake back received 100 pounds of muriate of potash.

We Met the Change In Burley Tobacco

By H. G. Kolb

County Agent, Switzerland County, Indiana

DURING the past 10 years the increased consumption of cigarettes has made a great change in the type of burley tobacco desired by the manufacturers who buy the crop. Formerly the darker, heavier grades of burley brought the best prices. Now it is the thinner, brighter, and lighter colored crops that bring the highest prices. To meet this situation, the burley tobacco raisers of Switzerland County, Indiana, have changed their tobacco-growing methods so successfully that their tobacco is noted for its quality and the high prices that it brings on the market.

Burley tobacco is the chief cash crop in Switzerland County, being raised on more than 80 per cent of the farms. Normally, more than 3,000 acres are planted to tobacco, and more than 3,000,000 pounds of leaf are sold on the near-by loose-leaf markets. The comparative size of the crop raised is best shown by the fact that Switzerland County produces more than 1 per cent of the burley crop grown in the United States, even though 400 counties raise this type of tobacco and there are only four smaller counties in Indiana.

In the past 10 years good growers in the county have made much progress in producing the quality that tops the market. One helpful change is the use of seed of various strains of improved white burley. Another change is the increased number of plants set per acre in the past few years. The best growers now set 12,000 or more plants per acre, where they formerly set 7,000 plants. Recently there has been a change in methods of handling the crop. Topping is delayed, and the suckers are removed just a day or two before cutting. Besides improving the quality, this latter item has also reduced labor costs.

These changes have all been helpful, but the greatest improvement has been brought about by the special fertilizer used by a majority of the successful burley growers of Switzerland County. To better meet our local conditions, these growers have used a sack of 2-12-6 mixed fertilizer supplemented with 50 to 60 pounds of sulphate of potash and 25 pounds of nitrate of soda. This mixture is drilled in the row, usually at the rate of 200 pounds per acre.

Content is Important

Some growers have used as little as 100 pounds per acre of this mixture, and others as much as 500 pounds. The desired quality is produced by the smaller amount, and increased yields per acre are obtained by the larger application in favorable years. Over a period of years, an application of about 200 pounds per acre has shown the largest returns per dollar of investment for fertilizer. The important item seems to be using the proportions and the ingredients listed above.

Most farmers who use this special

mixture also use from moderate to heavy applications of stable manure on their old ground that is set to tobacco. However, excellent results have been obtained where this fertilizer mixture has been used alone on old ground. Equally good results have been obtained on all kinds of soil—river bottom, creek bottom, limestone ridge land, and flat slash land—and Switzerland County has 26 distinct soil types, most of which are subdivided into leached or eroded phases.

Chlorosis or mottling, indicating potash starvation, begins at the tip of the older leaves.

Variable Factors

No exact tabulated results, such as an experiment station would have, have been made by the writer. A county agent has neither the time nor facilities to obtain such figures, and tobacco is a difficult crop on which to obtain exact figures. Weather at cutting and curing time may cause considerable variation in quality. It is a very difficult task to handle two or three or more plots of tobacco under exactly the same conditions, so that comparable results can be obtained. For these reasons, data on the results of the use of this special fertilizer mixture in Switzerland County can only be given in terms of returns per acre.

Some figures follow: Clair Shaw, a 4-H Club boy, sold $240 worth of tobacco from a measured one-fourth acre of land in 1936, raising his crop on ridge land. James Green received $1,400 from tobacco grown on 2 acres of creek bottom land. In December of last year, the writer saw seven Switzerland County crops sell on the Carrollton, Kentucky, loose-leaf market in one day. These crops averaged from 51 to 70 cents per pound, while the floor average for all crops was below 40 cents a pound for the day. Similar figures could be quoted for hundreds of crops.

Good tobacco raisers state that they have used this fertilizer mixture and produced on old land tobacco equal in quality to new ground tobacco, with about twice the number of pounds per acre. In 1936 Dick McKenzie had 1.5 acres of new ground that made 450 pounds per acre and sold for 58 cents. He also had 1.5 acres of old ridge land, on which he applied 200 pounds of this fertilizer per acre, which produced 900 pounds per acre, selling for 65 cents per pound.

The ability of this fertilizer to produce a quality of tobacco equal to that grown on new ground is of considerable importance nowadays. The amount of new ground suitable for tobacco production is very limited. If the quality of tobacco that the market demands is to be produced, this fertilizer or some similar one that is equally effective must be used.

Profitable Results

Switzerland County burley growers do not claim that this special mixture is the best possible, nor do they know exactly why it works. They do know that it is inexpensive to use and that it produces results that are almost unbelievable when the resultant crops of burley are sold and the returns per acre calculated. They know that it has added from $50 per acre to the sale value of their tobacco in low-price years, to as high as $300 per acre in high-price years. The use of this fertilizer has spread in recent years to adjoining counties in Indiana and Kentucky, with equally good results.

The 2-12-6 fertilizer is used as the base for this fertilizer, because it is a standard brand easily obtained, provides the needed phosphorus, and contains potash in the muriate form. Muriate of potash alone produces a poor quality of leaf, but when it does not make up more than one-third of the potash applied, it adds weight and finish to the crop, without harming the quality. Sulphate of potash is used to provide the remainder of the potash needed, as it produces the thin, light-colored leaf that buyers want. Used alone, sulphate of potash produces leaf lacking in finish and weight. Growers find that a mixture of one-third or less of muriate of potash with two-thirds or more of sulphate of potash produces burley that sells the highest.

The 25 pounds of nitrate of soda are used merely to give the transplanted crop a quick start. Usually growers transplant in cool, wet weather, when soil nitrification is poor. The application of this small

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A properly balanced fertilizer makes burley tobacco leaves smooth and of fine texture.

Easy picking for these workers—larger, more accessible bolls resulted from proper fertilization.

1937—A Cotton Year Of High Records

C. B. Sherman

United States Department of Agriculture, Washington, D. C.

THIS is a year of extremes in the cotton crop of the United States. The crop will reach a record total—18,243,000 bales being forecast by the Crop Reporting Board of the Bureau of Agricultural Economics. This forecast is larger by nearly 2,700,000 bales than the one published in August, for weather conditions were unusually favorable after that date, and the boll-weevils have not been so destructive as usual. It will be the largest cotton crop in our history, the previous record having been made in 1926. In round numbers this year's crop compares with 12,400,000 bales in 1936 and 10,600,000 bales in 1935. The 5-year average (1928-32) was 14,667,000 bales.

The estimated abandonment of cotton acreages is one of the lowest on record. It will probably total only a little more than 1 per cent, leaving nearly 33,750,000 acres for harvesting.

Yield is chalking up another record. This year's indicated yield of 258.8 pounds per acre for the United States has never before been reached. Last year the yield averaged 197.6 pounds. There is some evidence that the average per-acre yield is steadily increasing in the United States, but statistics are not yet sufficient to justify a positive statement.

For the year 1936-37 as a whole, a new all-time high consumption of cotton in the United States is recorded, exceeding the 5-year average by more than one-third. World mill consumption also reached a new high of 31,000,000 bales.

Consumption of American cotton in foreign countries dropped to a near-record figure for recent decades. It was about 5,400,000 bales. Exports of United States cotton in these 12 months were about the same as foreign consumption, 5,400,000 bales—9 per cent less than a year earlier. Cotton mills in the United States consumed 7,800,000 bales of American cotton during these 12 months. The year before they consumed 6,200,000 bales.

The proportion of the cotton crop exported has been between 50 and 60 per cent during recent years. The decrease in cotton exports during the last 5 years has been caused by (1) the low level of general business conditions during most of this period, (2) reduced buying power in foreign countries, (3) smaller supplies of American cotton and higher prices relative to prices of foreign cotton, and (4) an increase in foreign production.

Stocks of old American cotton in the world on August 1 totaled 6,000,000 bales, compared with 7,000,000 a year earlier. Thus the total supply of American cotton for the current marketing season, according to present indications, will exceed 24,000,000 bales. Last year the total supply was 19,400,000 bales.

Improvement in the quality of cotton produced and in the marketing methods is an objective toward which the U. S. Department of Agriculture is consistently driving. Basic to success is precise knowledge of just what constitutes quality in cotton. Therefore, this question itself is being studied in the laboratories with meticulous precision.

The staple length of the American cotton crop has improved during the course of the last 9 years. Staple length can be measured accurately and official grade and staple reports, not published for the nine crops of 1928 to 1936, show an appreciable increase in the average length of staple since the date of the first report.

Change in Quality

Before that date it was commonly believed that the quality of our cotton crop had been deteriorating, particularly after the boll-weevil got to work. Even before, manufacturers had complained of a serious depreciation in the quality of cotton grown in Louisiana and Mississippi. How well these beliefs were justified can never be definitely known, but an accurate determination of these factors of quality for the cotton crops since the reports began is now possible. The reports show the number of bales in each individual grade and in each staple-length group, so an account can be given from either standpoint.

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Bringing in cotton to be weighed.

Crotalaria Is Good For Southern Soils

By E. B. Ferris

Superintendent, Holly Springs Branch Experiment Station, Holly Springs, Mississippi

ONE of the main troubles with summer legumes, such as cowpeas, soybeans, velvet beans, and lespedeza when used as soil builders, is that they are so valuable as feed crops that the average grower cuts them for hay or grazes them with livestock rather than turn them into the soil. In so doing he removes from 80 to 90 per cent of their restorative properties, unless said crops are fed to animals and the manure returned to the soil, a procedure seldom carried out in ordinary farm practice. Even when such crops are grown and not cut for hay, animals turned into the fields during fall and winter, half starved as they frequently become, finally consume the most of such vegetation, leaving little to be plowed into the soil the following spring. This is why so much more progress is being made in the South in soil building with winter rather than with summer legumes. Winter legumes grow at a time when the farmer has not been accustomed to receive a revenue from his land, and are much more apt to be turned into the soil without being cut as hay or used for grazing animals.

A new crop recently introduced into the South as a summer legume has the best possibilities for soil building of any we have seen. This crop is crotalaria and not only has the advantage of making enormous yields

A field of Late Crotalaria Spectabilis growing at the Holly Springs Experiment Station. This variety makes the heaviest growth, but does not always mature seed as far north as the Tennessee line.

of vegetable matter on the poorest soils, but of being unpalatable to all kinds of livestock, so that the farmer will not attempt to save it as hay nor the animals to consume it when given the run of the fields in fall and winter. In 1936, as agronomist for the Mississippi Extension Service, the writer placed tests with crotalaria, sesbane, and soybeans with farmers in 36 Mississippi counties extending from the Gulf Coast to the Tennessee line and kept records of green weights produced the following fall. This resulted in 50 per cent higher average yields of crotalaria than of soybeans, with the beans giving considerably higher yields than the sesbane. Visits to certain of these tests the following winter showed that animals having access to them had largely consumed the soybeans, even after frost had killed the vines and they were seemingly worthless as feed, there being no limit to the length a hungry animal will go in eating any kind of crop that was ever palatable. However, in no instance had they ventured to disturb the crotalaria or sesbane.

Showing crotalaria sown in the same drill with corn. Its habit of starting active growth late makes it a less serious competitor for moisture with the corn than soybeans similarly grown.

Results of Comparison

In tests begun in 1933 at the Holly Springs Branch Experiment Station, crotalaria has been planted on the same plots in three ways: in alternate years with corn; every year in the same drill with corn; and annually in corn middles at lay-by time. It has been compared with soybeans grown in the same way, except these beans have not been planted alone in the test.

It may be interesting to note the results of such a test in 1937, when the seasons were dry and when the vegetable matter and nitrogen stored in the soil by the crotalaria turned under the year before had a very marked effect. Corn following corn made only 8.9 bushels per acre; corn following crotalaria 23.2 bushels per acre; corn with crotalaria in drill, 12.4 bushels per acre; corn with crotalaria in middles, 9.5 bushels; corn with soybeans planted in the same drill and at the same time, 11.1 bushels per acre; and corn with soybeans planted in the middles at last cultivation, 11.0 bushels. All these plats were fertilized annually at the rate of 400 pounds of a 2-8-4 mixture per acre. In fact, in studying hundreds of tests with soil-building crops at the Holly Springs Station, no treatment has shown such marked beneficial results as the ones following the use of crotalaria. Even when planted in the drill and at the same time with corn, it grows off so much slower than soybeans that it is never a serious competitor for moisture with the corn and does not lower corn yields as is so often the case with soybeans, especially in dry years. As a matter of fact, the delicacy of the young crotalaria plants and the slowness with which they start growing after germination are the greatest objections to the crop, especially on land infested with weeds or grasses, and on such land make it all but imperative that the crop be planted in drills and given some early cultivation. However, it has many of the characteristics of the proverbial mustard seed and will soon attain a height and strength where the birds may roost in its branches.

While there are as many varieties of crotalaria as of other common farm crops, only a few kinds are grown in Mississippi. Early Spectabilis, Late Spectabilis, and Intermedia are the ones generally used. Both Early and Late Spectabilis have been tried at Holly Springs, with the Early making much less vegetation but seeding freely before frost, and the Late being far more valuable for adding vegetable matter but frequently blooming so late as to make seed production uncertain. To date, it is the opinion at the Holly Springs Station that it is more economical to buy seed of the Late Spectabilis every year than to use the Early and be more certain of producing one's own planting seed, the difference between the soil-building properties of the two kinds making this advisable.

For Reseeding Purposes

Farther south in Mississippi, Holly Springs being within 15 miles of the Tennessee line, the Late Spectabilis might be planted earlier and be expected to reseed with more certainty. However, as far south as Poplarville, 50 miles from the Gulf Coast, the South Mississippi Experiment Station uses Early Spectabilis mainly because of its ability to make seed. They even find this early kind valuable as a catch crop in cotton, germinating as it does after the cotton is laid by and in time to make seed. The seed lie dormant for months and germinate again the following spring and summer in sufficient quantities to leave a stand up to the last cultivation, even after much of it has been destroyed in plowing.

The South Mississippi Experiment Station reports in 1937 the following comparative effects of crotalaria, lespedeza, and a 6-8-4 fertilizer as measured by cotton; after crotalaria, 904 pounds of seed cotton per acre; after lespedeza, 824 pounds per acre; after 600 pounds of 6-8-4, 660 pounds per acre. The cotton following crotalaria and lespedeza had been fertilized at the rate of 600 pounds of an 0-8-4 per acre.

Need Plant Food

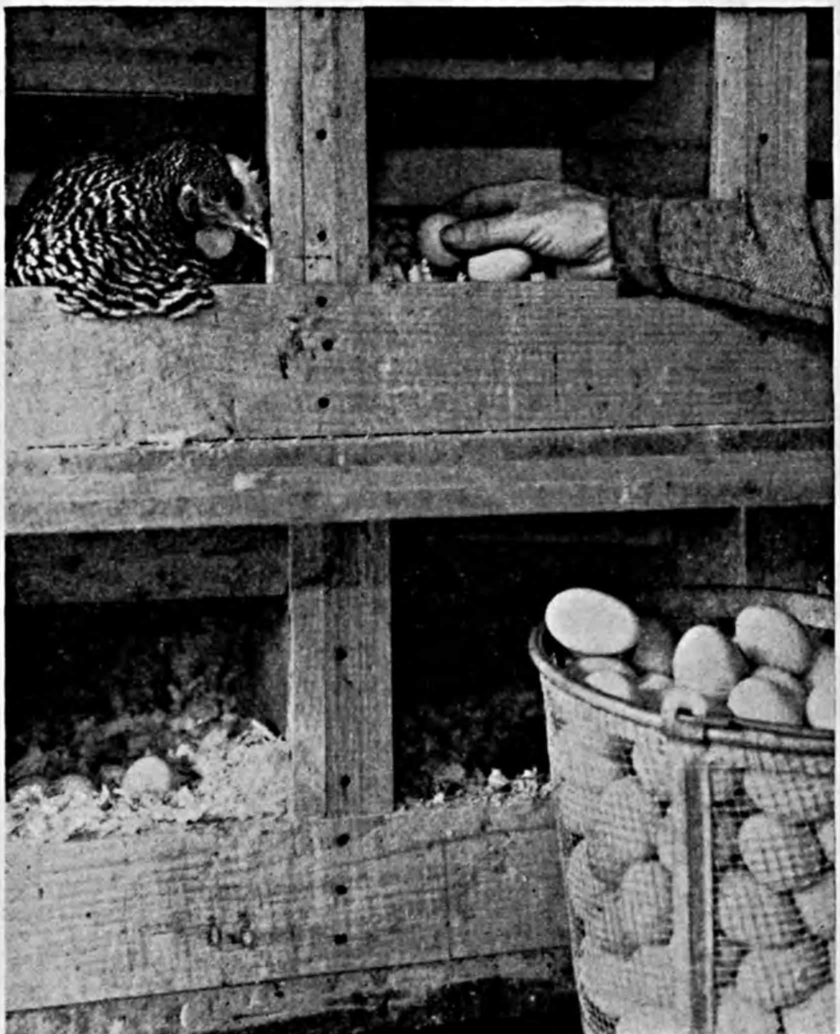
While crotalaria will make more vegetation on poor soils than any other crop of the kind within our knowledge, it has no power to get mineral plant foods except as they are present in the soil naturally or added in the form of fertilizers. In the work done in the 36 Mississippi counties referred to above, the three legumes, crotalaria, sesbane, and soybeans, were grown with and without the use of mineral plant foods. Their increased yields with these minerals added were seemingly in the same proportion to be expected from the non-legumes, such as cotton or corn, after the necessary nitrogen had been supplied.

Twenty to thirty thousand pounds of green matter per acre are not an uncommon yield for crotalaria, and when this amount of vegetation is finally turned into the soil it will not only add in nitrogen the equivalent of hundreds of pounds of nitrate of soda or sulphate of ammonia, but at the same time sufficient humus to come nearer putting the soil back into its once virgin state than any other operation, possible of accomplishment in a few years, that we know anything about.

Crotalaria seed are very hard and germinate poorly without first being scarified. While cowpeas, peanuts, and velvet beans previously grown on the land will inoculate for crotalaria, complete inoculation is so important and so cheaply done with commercial cultures that it is doubtful if it pays to plant any of the newer legumes anywhere or at any time without first inoculating the seed.

PICTORIAL

LOOK OUT—BELOW!



Left: "Wait a minute, can't you?

Below: One of the first families of America.

Above: Let your conscience be your guide.

Right: Caught for the axe.

Cotton running in the gin, corn a'filling up the bin—you'd smile too!

The Editors Talk

Plant-food Erosion

During the past few years an unusual amount of publicity has been given to soil erosion, and rightly so. It is to be hoped that there will be no let-up in the efforts to awaken public consciousness to the dangers of letting our soils go to waste. When pointed out, stark gullies, denuded hills, and wind-swept plains are mute but very visible evidence of these dangers and serve to impress even the less-thinking. Full cooperation with the endeavors of the Soil Conservation Service and H. H. Bennett, its tireless chief, should be the aim of everyone concerned with the welfare of our country.

Not so visible, in fact, invisible, is the additional, important, but less understood danger of plant-food erosion. It is gratifying to find no less eminent a soil scientist than Dr. J. G. Lipman talking before a recent meeting of farmers in New Jersey and emphasizing the fact that soluble plant nutrients are disappearing unobserved from the farmer's soil. Chemical erosion was referred to as the invisible thief in the mystery of America's vanishing soil fertility.

"Dissolved in rainwater, the natural and artificially applied lime, potash, sodium, and magnesium are vanishing in two directions," Dr. Lipman said. "Part of the solution runs off the land laterally in the same erosive waters that cause gullying and sheet washing. Another part leaches down through the soil, carrying the desirable materials to lower levels where they are unavailable for plants to feed upon. When we see muddy water, carrying off particles of the farmer's soil, we say 'that's erosion.' And we can also see dust storms—wind erosion. But the naked eye does not see the agricultural wealth which is dissolved."

The "chemical erosion" problem is common to the entire Northeast and to the Mississippi Valley, Dr. Lipman explained, because of the large amount of rainfall. It is particularly acute in fruit-growing sections where a toxic condition of acid soil causes "sick" apple and peach trees. There is an annual net deficit of 60,000,000 tons of lime alone, he estimated, and large losses of other necessary elements of plant food result from chemical erosion.

In a bulletin on the subject entitled "Preliminary Note on the Inventory and Balance Sheet of Plant Nutrients in the United States," Dr. Lipman calls attention to the fact that American agriculture started with vast soil fertility resources. These resources are still vast, but in the course of time there have been tremendous deductions from the original inventory of our plant-nutrient resources. If we are to look ahead and to make provision for maintaining our soils at a satisfactory level of productivity, we not only must know about our soil resources but should also familiarize ourselves with the rate of soil depletion.

Measures which will assure some means of effective conservation and lessening of the drain on plant-food resources should be promptly taken. Changed methods of soil management, which would include proper provision for lessening the losses due to erosion and leaching, would represent a major conservation measure. Such changes in soil and crop management systems as would permit a lessening in the runoff, an increase in the amount of water stored in the soil, and an increase in the area occupied by legumes are other suggestions made.

Along with the educational work on the efficient use of commercial plant foods there should be more emphasis on the causes and measures of control of plant-food erosion. Plant foods applied cannot result in maximum benefits unless they remain in proximity and available to the growing plants.

The Value of A Reputation

The innumerable advantages accruing from obtaining and maintaining a reputation as a grower of quality produce are so well-known that it becomes almost trite to mention them. However, there continually come to hand instances which bear repeating because of the inspiration and help they may provide other growers.

Such an instance is that of the potato growing of Louis Ruderman, of Auburn, Indiana. At the Northern Indiana Muck Crops Show recently held at Kendallville, Indiana, Mr. Ruderman exhibited a sack of Katahdin potatoes which was judged the best commercial pack at the show. This was not the start of Mr. Ruderman's reputation. Last year he topped the market at Chicago with his car-load lot of potatoes. Because his produce has become known, this year buyers came direct to the farm and purchased his potatoes as fast as they could be dug and crated. He uses a brush machine to clean the potatoes before they are marketed and has found that the trade is willing to pay a 30 per cent premium for his crop.

We do not know all the details of Mr. Ruderman's cultural practices, but we would gamble that he does not neglect any factor that might jeopardize his reputation as a grower of quality produce. We do know his fertilizer practices, which indicate an intelligent study of the importance of balancing the plant food applied with the fertility of his soil and the requirements of his crop.

In years of high yields and the resultant price competition on crowded markets, the reputation for growing quality produce may very often mean the price difference and trade preference which determine profit or loss on a whole year's work.

MY GARDEN is an honest place. Every tree and every vine are incapable of concealment, and tell after two or three months exactly what sort of treatment they have had. The sower may make a mistake and sow his peas crookedly; the peas make no mistake, but come up and show his line.—*Ralph Waldo Emerson.*

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

J.Y.Oakes summarizes many informative facts resulting from investigations on the role of potash in the fertilization of cotton under field conditions in Louisiana Agricultural Experiment Station Bulletin 291, entitled "The Effects of Potash Fertilizer on Cotton in Louisiana." Previous work in Louisiana showed that the Coastal Prairie soils and the lighter textured Coastal Plain soils respond markedly to applications of potash in a balanced fertilizer mixture. The nature of these tests was designed to determine the most economical amount of potash to apply to cotton on a number of soil types of the state. Soils in the northern part of the state are subject to severe drouths followed by heavy rainfalls that result in leaching and severe erosion, thus causing heavy losses of plant-food elements. The large amounts of rainfall occurring in the southern part of the state throughout the year, while causing little erosion owing to the level topography of the soil, result in a considerable amount of plant food being lost through leaching. These lighter soils are in greater need for potash than some of the heavier or more recently formed alluvial soils. Results on one of the predominating soils in the Coastal Plain red hills area indicated that even under unfavorable conditions 6 per cent potash in a mixture with 5 per cent nitrogen and 8 per cent phosphoric acid used at the rate of 600 pounds per acre was the most desirable. The Ruston soils of the Coastal Plain hill areas gave highest cotton yields from 8 per cent potash. Cotton grown on many of the soils in the Coastal Prairie region respond to applications of from 6 to 10 per cent potash. In the rice-producing section, soils spoken of by farmers as sandy ridge land are very responsive to phosphorus and potassium, and at least 12 per cent potash for cotton could be recommended on such soils for the first few years. Generally speaking, the results indicate that a balanced fertilizer mixture containing 6 or 8 per cent potash should be used where potash starvation occurs. The author states that the control of cotton "rust" and wilt through the use of potash fertilizers seemed in nearly all cases to be correlated with or coincident to stimulation of vegetative growth and increased yield of seed cotton. The length of lint and percentage of fiber are also increased where starvation conditions are corrected by applications of potash.

"Fertilizer and Crop Experiments on Certain Soils of the Black Belt," (A Progress Report), Agr. Exp. Sta., Auburn, Ala., Cir. 78, July 1937, M. J. Funchess, Director.

"Fertilizer Experiments with Cotton in Type-of-Farming Areas," Agr. Exp. Sta., Fayetteville, Ark., Bul. 346, June 1937, Martin Nelson.

"The Response of Celery to Manures and Fertilizers," Agr. Exp. Sta., Kingston, R. I., Bul. 260, Mar. 1937, F. K. Crandall.

"Machine Placement of Fertilizer for Cotton," Agr. Exp. Sta., College Station, Brazos County, Texas, Bul. 548, August 1937, H. P. Smith, H. F. Morris, and M. H. Byrom.

Soils

The striking results obtained from the soil fertility experiments carried on at the Moses Fell Annex Farm at Bedford, Indiana, under the direction of A. T. Wiancko and G. P. Walker of the Agronomy Department, Purdue Agricultural Experiment Station, are given in a recent mimeographed report. Farmers in southern Indiana especially will derive a great deal of value from this work. It is evident that the spread between the good and poor soil treatments is becoming greater year by year and that the better treatments are becoming more and more profitable. Without soil treatment, the average value of crops per acre per rotation of corn, soybeans, wheat, and clover is now $24.51. With lime, manure, and fertilizer, the value is $71.91 at an average cash outlay of $10.06 for lime and fertilizer. Formerly the main fertilizer treatments that returned appreciable profits consisted of superphosphate, either alone or in addition to manure. In recent years, however, potash has become increasingly important on the land which had been receiving only phosphate, showing that the available supply of potash has been so reduced that it has become a limiting factor. It is showing up particularly on the corn and hay. Among the experimental results compiled in tabular form and briefly discussed are the general fertility test, top-dressing wheat with nitrogen in the spring, phosphate experiment, crops variety tests, pasture fertilization, and crop rotation experiments.

"A Study of the Operation of the 1936 Soil Conservation Program in Vermont," Bulletin 413 of the Vermont Agricultural Experiment Station, by J. A. Hitchcock, gives a concise interpretation of data compiled by several cooperating agencies in determining the effects of farm conservation practices due to the 1936 program. It was found from these data obtained from nine Vermont towns that participation of the 1936 soil conservation program was more general among the operators of large farms, among operators who were handling their farms intensively, and among Farm Bureau members. Participants who filled out conservation program work sheets applied 43 per cent more commercial fertilizer in 1936 than they did in 1935, whereas non-participants in the program increased their fertilizer purchases between the two years by only 21 per cent. Similarly the program was responsible for an appreciable increase in acreage stocked down.

Though entitled "AAA Conservation Guide for Women, Western Region 1937," WR-Leaflet 104 of the Regional Information Series, United States Department of Agriculture, will be found very interesting to Mr. Farmer as well. This publication is profusely illustrated with a number of farming scenes, usually with a scenic background typical of the mountain, valley, or desert sections. They show the good and bad effects upon the land resulting from the manner in which erosion control had been practiced. This leaflet contains a minimum of text material, but the brief definitions and outline of the essential information about the farm and range programs are simply explained. The cropping and other practices of the 1937 agricultural conservation program in the Western Region described and illustrated in this publication will help to make any farm or ranch a more productive and profitabe unit through the years to come.

"Studies on Soil Structure: Some Physical Characteristics of Puddled Soils," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 67, June 15, 1937, W. T. McGeorge.

"Studies on Soil Structure: Some Nitrogen Transformations in Puddled Soils," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 69, August 15, 1937, J. F. Breazeale and W. T. McGeorge.

"Washington County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rp. 58, June 1937, R. S. Smith and L. H. Smith.

"Marshall County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rp. 59, June 1937, Eric Winters, Jr., R. S. Smith, and L. H. Smith.

"Putnam County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rp. 60, July 1937, Herman Wascher, R. S. Smith, and L. H. Smith.

"Wabash County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Rp. 61, July 1937, R. S. Smith and L. H. Smith.

"The Occurrence of Azotobacter in Iowa Soils and Factors Affecting Their Distribution," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 217, June 1937, William P. Martin, R. H. Walker, and P. E. Brown.

"Soils in Relation to Fruit Growing in New York, Part XI. The Organic-Matter Content of New York Orchard Soils in Relation to Orchard Performance," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 672, June 1937, Ralph W. Cummings.

"The Ground-Water Problem in Oregon," Agr. Exp. Sta., Corvallis, Oregon, Sta. Cir. 124, June 1937.

"Irrigation Requirements of Cotton and Grain Sorghum in the Wichita Valley of Texas," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 543, Aug. 1937, C. W. McDowell.

"Some Moisture Relations of the Soils from the Erosion Experiment Stations," U. S. D. A., Washington, D. C., Tech. Bul. 562, July 1937, L. B. Olmstead.

"Soil Survey of Dubois County, Indiana," U. S. D. A., Washington, D. C., Series 1930, No. 45, March 1937, C. S. Simmons, R. T. Avon Burke, T. M. Bushnell, J. E. Adams, and H. P. Ulrich.

"Soils Survey of Brunswick County, North Carolina," U. S. D. A., Washington, D. C., Series 1932, No. 17, Feb. 1937, S. O. Perkins and E. F. Goldston.

"Soil Survey of Abbeville County, South Carolina," U. S. D. A., Washington, D. C., Series 1932, No. 18, March 1937, F. R. Lesh, W. J. Geib, A. E. Shearin, C. H. Wonser, and W. D. Lee.

"Soil Survey of Mayes County, Oklahoma," U. S. D. A., Washington, D. C., Series 1932, No. 19, March 1937, M. H. Layton and O. H. Brensing.

Crops

"A Year's Progress in Solving Farm Problems of Illinois" is the descriptive title of the Illinois Agricultural Experiment Station Annual Report of Director H. W. Mumford for 1935-1936. Considerable attention to the review of accomplishments on soil conservation and erosion prevention is given in this report along with a volume of other scientific facts emanating from the station's investigations. Even before 1876 the problems of soil conservation and erosion prevention were recognized, and the attack in this state took definite form that year with the laying out of the Morrow plots, now recognized as America's oldest soil experiment plots. Director Mumford looks back 60 or 75 years when farmers of Illinois believed their rich prairie soils would never wear out. This report represents the 60th year in which the problems of soil mining and destruction have been attacked by the College of Agriculture, and in it are given the results not only from the Morrow plots and numerous experimental fields, but also from some 30 other experiments and studies which have a more or less direct bearing upon the problems of soil conservation and erosion control.

Field experiments in Illinois indicate that responses to various soil-treatment materials are related to the productivity levels of the soils. If farm lands of this state are to be conserved and improved, deficiencies of essential material must be replenished by means of suitable practices, the report stresses. Among the deficiencies that may need attention under general conditions are organic matter, lime, phosphorus, and potassium. When these deficiencies are made up, better responses are obtained, not perhaps from the mineral or minerals alone but through better functioning of the organic matter. Recent results secured in southern Illinois indicate that the repeated growing of sweet clover, with accompanying increase of other crops, removes large amounts of potassium from the soil. When available potassium is present naturally in limited amounts, increased crop yields can be secured only by supplying potassium in the form of straw, manure, or through potash fertilizers. This work reveals that sweet clover does not unlock sufficient available potassium to meet the needs of ordinary crops on most soils and that instead of sweet clover increasing the usefulness of soil potash, potash fertilization has increased the value of sweet clover for soil improvement.

The constructive activities pursued by this station are doubtless pointing the way for Illinois farmers, and the success of the soil conservation measures set down will be borne out through the years to come.

"The Natural Vegetation of Arizona," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 68, July 15, 1937, A. A. Nichol.

"Growth of Second-Growth Pine on the Coastal Plain Soils of Arkansas," Agr. Exp. Sta., Fayetteville, Ark., Bul. 342, June 1937, Lewis M. Turner.

"Variety and Inter-Cultural Experiment with Cowpeas," Agr. Exp. Sta., Fayetteville, Ark., Bul. 343, June 1937, C. K. McClelland,

"Cotton Variety Tests of 1934 and 1935," Agr. Exp. Sta., Fayetteville, Ark., Bul. 344, June 1937, L. M. Humphrey.

"Growth and Fruiting Responses to Pruning and Defloration of Tomato Plants," Agr. Exp. Sta., Fayetteville, Ark., Bul. 347, June 1937, Victor M. Watts.

"A Study of Factors Concerned with Rice Growth," Agr. Exp. Sta., Fayetteville, Ark., Bul. 349, June 1937, L. C. Kapp.

"Control of Root-Knot in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 311, July 1937, J. R. Watson and C. C. Goff.

"Inheritance of Rest Period of Seeds and Certain Other Characters in the Peanut," Agr. Exp. Sta., Gainesville, Fla., Tech. Bul. 314, Sept. 1937, Fred H. Hull.

"Composition of Mature Corn Stover as Affected by Variety, Soil Type, and Fertilizer Treatment," Agr. Exp. Sta., Urbana, Ill., Bul. 437, July 1937, D. C. Wimer.

"Eighth Biennial Report of the Director for the Biennium July 1, 1934, to June 30, 1936," Agr. Exp. Sta., Manhattan, Kans., L. E. Call, Director.

"Forest Industrial Expansion in Southeast Texas—Possibilities and Dangers," Southern Forest Exp. Sta., New Orleans, La., Oc. Paper 66, August 9, 1937, Robert K. Winters.

"Tomato Production in Massachusetts," Agr. Ext. Serv., Amherst, Mass., Leaf. 51, May 1937, Grant B. Snyder and Paul W. Dempsey.

"Winter Wheat Culture in Michigan," Agr. Ext. Serv., East Lansing, Mich., Ext. Bul. 187, Sept. 1937, H. M. Brown and E. E. Down.

"Garden Roses," Agr. Exp. Sta., East Lansing, Mich., Sp. Bul. 222, (Revised), Mar. 1937, C. E. Wildon.

"Science Points the Way. Work of the Agricultural Experiment Station During the Year Ending June 30, 1936," Agr. Exp. Sta., Columbia, Mo., Bul. 387, July 1937, F. B. Mumford and S. B. Shirky.

"Trees, Shrubs, and Vines at the North Platte Experimental Substation," Agr. Exp. Sta., Lincoln, Nebr., Bul. 310, July 1937, H. A. McComb.

"The Inheritance of Various Morphological Characters in Alfalfa and Their Relation to Plant Yields in New Jersey," Agr. Exp. Sta., New Brunswick, N. J., Bul. 628, May 1937, Glenn W. Burton.

"Soybeans for Grain," Agr. Exp. Sta., New Brunswick, N. J., Cir. 373, July 1937, Howard B. Sprague.

"Sugar-beet Production Studies in Southern New Mexico 1931-1936," Agr. Exp. Sta., State College, N. Mex., Bul. 252, July 1937, John C. Overpeck, Harry A. Elcock, William B. Morrow, and Rufus Stroud.

"Incidence of Fire Blight in Young Apple Trees in Relation to Orchard Practices," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Mem. 203, May 1937, E. M. Hildebrand and A. J. Heinicke.

"Fifty-seventh Annual Report of the North Carolina Agricultural Experiment Station for the Fiscal Year Ending June 30, 1934. Progress Report for Year Ending December 1, 1934," Agr. Exp. Sta., Raleigh, N. C., R. Y. Winters, Director.

"The Comparative Values of Peanut and Soybean Hay for Milk Production," Agr. Exp. Sta., Raleigh, N. C., Bul. 312, Aug. 1937, C. D. Grinnells and J. L. Moore.

"The Panhandle Bulletin, Fertility Losses from High Plains Soils Due to Wind Erosion," Agr. Exp. Sta., Goodwell, Okla., No. 63, Sept. 1937, Wright H. Langham.

"Forty-ninth Annual Report, Rhode Island State College Agricultural Experiment Station," Kingston, R. I., Contb. 503, June 1937, Basil E. Gilbert.

"Twenty-one Years of Crop Yields from Cottonwood Experiment Farm," Brookings, S. Dak., Bul. 312, May 1937, A. N. Hume, Edgar Joy, and Clifford Franzke.

"A Study of Utah's Winter Range, Composition of Forage Plants and Use of Supplements," Agr. Exp. Sta., Logan, Utah, Bul. 277, June 1937, A. C. Esplin, J. E. Greaves, and L. A. Stoddart.

"Should Flax Be Grown in Utah," Agr. Exp. Sta., Logan, Utah, Bul. 278, July 1937, R. W. Woodward, D. C. Tingey, and A. C. Dillman.

"The Grazing of Maple Sugar Orchards," Agr. Exp. Sta., Burlington, Vt., Bul 414, Mar. 1937, J. A. Hitchcock.

"Fiftieth Annual Report 1936-1937," Agr. Exp. Sta., Burlington, Vt., Bul. 425, July 1937, J. L. Hills, Director.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 353, Oct. 1937.

"Production of Carrots," U. S. D. A., Washington, D. C., Leaf. 125, J. H. Beattie.

"The Culture of Table Beets," U. S. D. A., Washington, D. C., Leaf. 127, J. H. Beattie.

"Production of Spinach," U. S. D. A., Washington, D. C., Leaf. 128, J. H. Beattie.

"Production and Preparation of Horseradish," U. S. D. A., Washington, D. C., Leaf. 129, W. R. Beattie.

"Cauliflower and Heading Broccoli Production," U. S. D. A., Washington, D. C., Leaf. 130, J. H. Beattie.

"Production of Eggplant," U. S. D. A., Washington, D. C., Leaf. 131, J. H. Beattie.

Economics

Of special interest to those associated with the fertilizer industry and scientific agriculture is the excellent tonnage report published by the Mississippi State Department of Agriculture, "County Fertilizer Data: Mixed Goods and Materials." For a number of years the State of Mississippi has prepared and published this information in tabular form, indicating the consumption of fertilizers by grades, materials, and by counties. According to the report covering the period July 1, 1936, to June 30, 1937, 148,460 tons of mixed goods were sold in Mississippi. In addition to this, 103,641 tons of nitrogenous materials, 40,099 tons of phosphate materials, and 8,360 tons of potash materials were sold to Mississippi farmers, making a grand total of 300,561 tons of fertilizers. The increase over the previous year was 38% for mixed goods, 26% for nitrogenous materials, 60% for phosphate materials, and 77% for potash materials. The total tonnage in increase was 37%. The leading grade sold in Mississippi from the tonnage standpoint is 4-8-4. This grade alone represented 116,624 tons as contrasted to 94,707 in 1935-36. On a percentage basis, the 23% increase in consumption of 4-8-4 was not as great as the increase in 4-8-6, 4-8-8, or 6-8-4, the increases being 1,563%, 768%, and 1,119%, respectively. The consumption of fertilizers is fairly well distributed through the State of Mississippi. The marked increase in consumption in the state since 1932 reflects largely the improved position of the cotton farmer. However, in spite of the increase which has taken place, Mississippi fertilizer consumption has not yet attained the high levels of 1928, 1929, and 1930, when consumption reached the 400,000-ton mark.

"Some Factors Affecting Citrus Costs, Yields, and Returns," by R. H. Howard, Assistant Extension Economist in Farm Management, University of Florida, presents a very comprehensive summary of the results of a study based upon grove records kept by Florida citrus growers in cooperation with the Agricultural Extension Service of the University of Florida. The study was instigated for the purpose of determining as nearly as possible some of the important economic factors affecting costs, yield, and price on a citrus grove, and of course most important, net returns for owners' supervision.

There is a close inter-relationship between the above mentioned factors; however, it was found that the relationship appeared to be greatest between cost and yield. Good cultural care, which includes the proper fertilizing and use of soil amendments if needed, irrigation during drought periods, economical tillage practices, and pest control measures, affects the costs, yield, and price—inasmuch as the price received depends to a large extent upon the quality of the fruit.

On the second page of the circular is an interesting chart which breaks down the factors affecting the net returns accruing to the owner into cost, yield, and price. Under cost are five major factors of (1) grove management practices, (2) cost of materials, labor, and equipment, (3) taxes of grove, (4) age of grove, and (5) kind of fruit. Under yield is (1) location of the grove, (2) natural adaptability of soil, and (3) cultural care. Under price are (1) supply, (2) quality of fruit, (3) size of fruit, and (4) demand. It is important that the citrus grove be large enough to accommodate the amount of machinery and equipment purchased. Considerable saving can be attained through wise purchasing methods and cooperative effort on the part of a number of growers. It is noted that the amount of organics that can be grown in the grove will depend largely upon the size of the trees and that normally it is more economical to grow the organics than to buy them. The amount of plant food used is one of the most important factors affecting the net returns of the grove. During the depression years, owing to financial strain, growers failed to fertilize their groves adequately, and net returns were severely affected in many cases. Of all the items of cost involved in production, on the average, the amount spent for fertilizer brought greater dividends for every dollar spent than any other item of expenditure.

In order that the effects of fertilization could be studied more accurately, the age of the trees was considered, and it was found that on the average each additional year in age amounted to an increase of 10 to 20 boxes per 100 trees on 145 groves where less than 400 pounds of fertilizer were applied to each 100 trees. On trees of an average age of 15 years, 132 boxes of grapefruit were harvested, and the net returns for 100 trees for the owner's supervision were a minus $9.42. On 134 groves, the average age being 17 years and the average fertilizer application 490 pounds, 214 boxes were harvested, and the net returns per 100 trees for the owner's supervision were $24.94. On 187 groves where the average age was 20 years and an average application of 781 pounds of fertilizer was made, 318 boxes of fruit were harvested, and the net returns per 100 trees for the owner's supervision were $84.62.

Other items affecting the cost are: efficient use of equipment and labor; the amount of pruning as a result of cultural care, and in this connection it was noted that proper fertilization, deep or excessive cultivation, or lack of moisture may affect the amount of pruning necessary; timely pest control; and irrigation. It is pointed out that while irrigation is often expensive, it may be profitable in times of severe drouth. It was found that even though irrigation increased the cost per acre, the net returns per box for the owner's supervision were greater on the irrigated groves than on the non-irrigated groves over a period of 10 years.

From the collective standpoint, the price is affected by the total supply and the purchasing power as measured by national income. There is a very close relation between price of oranges and the national income. From the standpoint of the individual producer, the price received for the citrus is more dependent upon the methods of production and the quality of the fruit.

"Influence of Tenancy on Types of Farming and Agricultural Income by Soil Types, Minidoka Irrigation Project," Agr. Exp. Sta., Moscow, Idaho, Bul. 222, June 1937, Paul A. Eke and Harold F. Brown.

"Farm Leases for Illinois," Agr. Ext. Serv., Urbana, Ill., Cir. 474, June 1937, H. C. M. Case and Joseph Ackerman.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., Nos. 26 and 27, July and Aug. 1937, and Nos. 28 and 29, Sept. and Oct. 1937.

"Indiana Crops and Livestock," Agr. Exp. Sta., West Lafayette, Ind., No. 142, July 1, 1937, No. 143, Aug. 1, 1937, No. 14, Sept. 1, 1937, and No. 145, Oct. 1, 1937.

"Practices on Iowa Farms," Agr. Exp. Sta., Ames, Iowa, Bul. 360, June 1937, John A. Hopkins and Wylie D. Goodsell.

"Corporate-Owned Land in Iowa, 1937," Agr. Exp. Sta., Ames, Iowa, Bul. 362, June 1937, W. G. Murray and H. W. Bitting.

"The Baltimore Wholesale Fruit and Vegetable Markets," Agr. Exp. Sta., College Park, Md., Bul. 409, May 1937, R. F. Burdette and S. H. DeVault.

"Commercial Fertilizers, Commercial Feeds, and Agricultural Liming Materials," State Insp. Serv., Univ. of Md., College Park, Md., Control Series 163, Aug. 1937.

"Minnesota Farm Business Notes. County Agricultural Planning," Agr. Ext. Serv., St. Paul, Minn., Mimeo. 176, *August* 20, 1937, *S. B. Cleland and J. B. McNulty.*

"Minnesota Farm Business Notes. Crop Price Movements Following Harvest," Agr. Ext. Serv., St. Paul, Minn., Mimeo. 178, *October* 20, 1937, *Rex W. Cox.*

"Land Utilization in New Hampshire. I. Problems in the Back Highland Areas of Southern Grafton County," Agr. Exp. Sta., Durham, N. H., Bul. 298, *June* 1937, *Harry C. Woodworth, Max F. Abell, and John C. Holmes.*

"Type-of-Farming Areas in New Hampshire," Agr. Exp. Sta., Durham, N. H., Cir. 53, *June* 1937, *Harold C. Grinnell.*

"An Economic Study of Land Utilization in Genesee County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 668, *April* 1937, *J. N. Efferson.*

"An Economic Study of Grape Farms in Schuyler and Yates Counties, Crop Year 1935*," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul.* 670, *May* 1937, *E. G. Misner.*

"Economic Studies of Vegetable Farming in New York. I. Market-Garden Farms with Greenhouses, Rochester Area," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 671, *May* 1937, *G. A. M. Baptist and E. G. Misner.*

"Economic Studies of Vegetable Farming in New York. II. Market-Garden Farms without Greenhouses, Rochester Area," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 673, *June* 1937, *J. L. Paschal.*

"Farm Economics," Cornell Univ. Agr. Ext. Serv., Ithaca, N. Y., No. 103, *Oct.* 1937.

"The Organization, Practices, and Membership Participation of Two North Carolina Farm Cooperatives," Agr. Exp. Sta., Raleigh, N. C., Bul. 311, *July* 1937, *S. L. Clement.*

*"Official Report on Feed Stuffs, Commercial Fertilizers, and Agricultural Lime and Limestones—*1936*," State Dept. of Agr., Columbus, Ohio, Bert V. Leas.*

"A Study of Land Utilization in Washington and Kent Counties, Rhode Island," Agr. Exp. Sta., Kingston, R. I., Bul. 261, *June* 1937, *Basil E. Gilbert.*

"Types of Farming and Farm Business Studies in South Carolina," Agr. Exp. Sta., Clemson, S. C., Bul. 310, *June* 1937, *J. L. Fulmer.*

"Analyses of Commercial Fertilizers," Agr. Exp. Sta., Clemson, S. C., Bul. 311, *Aug.* 1937, *H. P. Cooper, Director.*

"Milk-Production Costs in West Virginia: II. A Study of the Costs Incurred by 36 *Farms in the Huntington and Charleston Markets in* 1935-36*," Agr. Exp. Sta., Morgantown, W. Va., Bul.* 281, *June* 1937, *L. F. Herrmann and G. A. Bowling.*

"Agricultural Conservation, 1936. *A Report of the Activities of the Agricultural Adjustment Administration," U. S. D. A., AAA, Washington, D. C., G-71, June* 15, 1937, *H. R. Tolley.*

"What About Wheat in 1938?", *U. S. D. A., AAA, Washington, D. C., G-72, Aug.* 1937.

"Crop Insurance for Wheat," U. S. D. A., AAA, Washington, D. C., G-75, Sept. 1937.

"Farm Solidarity," U. S. D. A., AAA, Washington, D. C., G-76, Oct. 1937.

"Agricultural Conservation in 1938*—Why?", U. S. D. A., AAA, G-77, Oct.* 1937.

"Charting the Course for Cotton," U. S. D. A., AAA, Washington, D. C., G-78, Oct. 1937.

"Monthly Indexes of Nonagricultural and National Income," U. S. D. A., AAA, Aug. 1937.

Profitable Farming and Life Management

THERE has long been a need for a reference book of a non-technical character on agriculture to help farm people receive more profit from their endeavors and live country life at its best. This principle is set forth in "Profitable Farming and Life Management" (The Interstate Printers and Publishers, Danville, Ill., $2.75), by Wilber J. Fraser, Professor of Dairy Farming, University of Illinois, with an introduction by Thomas Nixon Carver, Harvard University. The contents are easily understood and have a very practical bearing on everyday life.

The book is divided into three parts: I. Profitable Production, II. Rational Consumption, III. Abundant Living. As the author proceeds from chapter to chapter and from one part to the next, a continuity exists in every respect. In all there are 38 chapters in the book. These are rather equitably represented under the classifications shown above. Under "Profitable Production" the chief concern is "raising the low factors in production to obtain the most efficient interaction or cooperation between factors and the highest profit from the farm enterprise." "Rational Consumption" has to do with "spending, saving, and investing wisely to accumulate capital in order to raise low factors in production and in life." "Abundant Living" deals with "keeping the vital factors of life high to maintain the most worth while standard of living."

Especially to be noted are the excellent illustrations that contribute a great deal to the reader's interest. Having spent considerable time among the peasant farms in western Europe, the author includes in the book a collection of many excellent photographs of farms in Germany, England, Scotland, and Denmark, as well as typical scenes from different agricultural sections in this and other countries. Each illustration tells an interesting story, even in the well-selected titles used.

Professor Fraser's preparation of this manuscript is not only timely, but it opens the way for an understanding of the principle of balance in estimating the farmer's chances of success. While written mainly in the interest of farmers and laymen interested in farming, the book is suitable for students desiring elementary training in agriculture.

Needs More Than Lime

SOIL treatment for clover is coming to be more than merely a limestone addition, says W. A. Albrecht, of the Missouri College of Agriculture. Soil tests in Missouri, now accumulating to numbers in the thousands, emphasize also the need of phosphorus and potassium.

Phosphorus application on wheat has been commonly beneficial to the succeeding clover for which the wheat is the nurse crop. Most soils in the state are so low in phosphorus that its addition should be regularly considered, not only for the wheat, but for the clover following.

Potassium additions have not been given much attention, though clover failures have been occasioned more often than is believed by the deficiency of this nutrient in the soil. Experimental results and soil tests point to the emphasis that should go to potassium as a fertilizer treatment in helping to guarantee clover. Straw which is rich in potassium leaches out its store of potassium quickly. This is also true of corn fodder.

It is frequently observed that much better clover grows in a ring around the spot where the wheat, oats, or corn shocks stood for a long time the preceding year. The rainfall leached out the potassium and much better clover resulted. When a soil gives such a demonstration, it is evident that a treatment of potassium will help the clover. Manure contains much potassium and helps clover because of this item.

Bacterial soil treatment, as well as fertilizer additions, may help to lessen clover failures. Clover is a legume and cannot make its best growth unless it cooperates with nodule-producing bacteria on its roots. Well-fertilized soil and well-inoculated seeds are necessary for the bacteria to function effectively in helping clover in its use of extra nitrogen from the air. Legumes without nodules are not able to draw on the additional air supply for soil improvement.

Winter Planning Is Step in Better Pasture Program

NO BETTER time than winter months can be found in which Illinois farmers can plan an improvement program for the 8,195,209 acres of pasture land in the state, according to J. J. Pieper, chief in crop production, College of Agriculture, University of Illinois.

This pasture acreage, amounting to more than 25 per cent of the 32,000,000 acres of land in farms in Illinois, is equal to 30 per cent of the land available to crops and is equivalent to nearly half of the area from which crops are harvested.

"In a livestock system of farming, there is probably no better means of reducing the cost of animal products and thus rendering a profit than by the improvement of pastures," Pieper said.

"Outstanding problems are to increase the carrying capacity of low-producing pasture lands, to produce a uniform supply of forage throughout the growing season, to improve the quality of the forage produced, and to manage the grazing lands so as to maintain them in a high state of productivity for a long period."

To increase the carrying capacity of pastures it is necessary to determine the causes of low yields and to correct these deficiencies, Pieper explained. Frequently pastures are located on the poorest soils of the farm, which is often the cause of unproductiveness. It pays to test such land to determine what mineral elements are lacking so that they may be added.

Limestone, phosphorus, or potash may be needed, and less fertile soils will require nitrogen for satisfactory growth of pasture plants. Nitrogen may be supplied by adding manure as a top-dressing or by plowing it under in preparation for seeding, by growing legumes in the pasture mixture, or by adding commercial fertilizers rich in nitrogen.

Where the soil is wet, drainage will help, and if the pasture is badly eroded, terraces may be used. Cultivation and reseeding will be of little value unless the causes of poor stands of grass are corrected. Mowing established pastures to control weeds and thus cause a more rapid development of grass is recommended. Rolling in the spring is beneficial if heaving has been severe.

In producing a uniform supply of forage, the second pasture problem listed by Pieper, it is necessary to see that the soil is maintained in a high state of fertility. This helps to minimize low rainfall, which is the most pronounced cause of poor production. Choice of forage plants which will reach their maximum production at different seasons of the year is suggested. Alfalfa and brome grass are producing well in mid-summer when Kentucky bluegrass and white clover are in a semi-dormant stage. Grazing management together with supplemental pastures will aid materially.

Control Grazing

To improve the quality of forage produced, it is necessary to choose only those plants which are palatable and which have a high nutritive value. For this reason legumes are recommended. Application of fertilizers to correct soil deficiencies will improve palatability and increase the mineral and protein content of the forage. Fairly close grazing will keep the grass in a succulent condition.

Proper management of grazing lands is necessary to give the grass a chance to develop and maintain a high state of productivity for a long period.

Pieper pointed out that grass should be permitted to reach a good growth in the spring before animals are turned onto it. Then too, grazing should not be so close as to cause the grass to die during unfavorable weather conditions. Late fall grazing is as harmful as early spring grazing, since the plants do not have a chance for root storage in preparation for winter.

Alternate rather than continuous grazing is best adapted to most pastures. Burning pastures to control weeds is discouraged, since it is also injurious to the grass. Pastures can be improved only by discovering the cause of low yields and correcting such practices, Pieper said.

Potash Fixation By Muck Soils

EXPERIENCE and experimental evidence have indicated that potash fertilizer added to a soil sometimes is absorbed or held by the soil so tightly that the plant cannot use the potash. Under these conditions, of course, the efficiency of the fertilizer is reduced. As a rule, sufficient extra potash must be added to take care of this absorption, so that some potash will remain in a form available to the plants. Cases have been observed in which small potash applications to soils evidently lacking in potash did not produce any beneficial effect. When larger potash applications were made on some of these soils, beneficial effects were produced.

This strong absorption of potash has been observed more on heavy mineral soils than on lighter soils or peats and mucks. However, the great importance of potash fertilizers on muck soils led G. H. Enfield and S. D. Conner, of the Indiana Agricultural Experiment Station, to study this phenomenon on several types of this soil. Their results were published in the February 1936 issue of the Journal of the American Society of Agronomy. The amounts of available potash in the soil were determined, and known amounts applied. Crops were intensively grown on the soil, and the amount of potash they removed, which is the available potash under most conditions, was determined by analyzing the harvested crop. The results show that some of the potash was fixed, since only 80.7 per cent of the applied potash was recovered in the crop.

When lime was used on acid mucks, potash recovery was improved. This is the opposite to the effect of lime on many mineral soils where it usually reduces potash availability. On high lime mucks, the additional lime had no apparent effect on the availability of potash.

This work shows that provision should be made for possible soil absorption of potash on muck soils as well as on mineral soils, and is an additional argument for making sure that sufficient pounds of potash are applied in the fertilizer to take care of this absorption as well as crop needs.

Brick: "Boy, she certainly gave you a dirty look."

Bat: "Who did?"

Brick: "Mother Nature."

He (shyly): "I'm going to steal a kiss."

She: "Well, let the crime wave begin."

Soybeans like these offer no opportunity for wasting plant food on weeds.

Crops Are Well-fed On Craigmile Farms

George R. Harrison
Valparaiso, Indiana

LAND on the 900-acre Craigmile Farms near Knox in Starke county, Indiana, is kept producing in high. The main crops are mint, alfalfa, soybeans, and potatoes, and the last three named are great consumers of potash. Taking this fact into consideration, Robert Craigmile, the manager, uses 200 pounds of potash to the acre every time he plants one of the potash-consuming crops. Even in the very dry season of 1936 when short yields were the general rule on farms over the Midwest, Mr. Craigmile saw his 90 acres of soybeans yielding an average of 26 bushels per acre, and there was a certain 10-acre plot that made 46 bushels per acre because it had had potash for a longer period of years than the rest.

"For 10 years we have been applying the potash here regularly," said Mr. Craigmile as we stood in the finest field of soybeans I had ever seen. "On the rest of the soybean area, the potash has been used only 3 or 4 years."

Then he told of a 3-acre plot on which onions were grown back in 1928. The hired man was told to put about 400 pounds of potash on that piece, but through his misunderstanding he used twice that amount.

"We still see the effect of its liberal use," said Mr. Craigmile. "The crop yield is much better there. Especially was it noticeable in the 2 very dry years we had. By that time the potash had been plowed down so deep that it was below the top soil, and roots reaching into it were getting benefit of moisture and plant food at the same time. I have a theory that plowing just as deep as we possibly can every 3 or 4 years on any field is going to work big benefit in this way."

It is mint that made Craigmile Farms a fortune in the first place. Samuel Craigmile, father of the present part-owner and manager, began with it many years ago. Then came the mountain-high prices for the oil with a peak of $25 a pound in the old prosperity years. But 100 acres of mint yielding 40 pounds of oil per acre as $2.50 a pound are still a pretty good bet, according to Mr. Craigmile. However, mint, like other crops, needs rotation. Alfalfa, soybeans, and potatoes are the means to that end while making money on their own account. Hence, the potash for every planting.

The soybeans, with their only fertilizer being potash, develop into tremendous growths after they have been planted in rows 36 inches apart. Then they are cultivated the same as corn and as often through the season as weeds appear. Generally, no matter how much cultivating is done on soybeans, enough weeds escape to show themselves neck and neck with the beans at harvest time. Not so on Craigmile Farms, for what weeds the tractor cultivators miss are pulled by hand. Mr. Craigmile hires enough help to get over 40 acres a day with the weeding process. The result is the cleanest fields of beans anyone ever saw. It means that the plant food put on isn't wasted on weeds. The beans get the full benefit. That makes quality seed for which there is a strong market demand.

"It is cheaper, after my way of thinking, to hire the weeds pulled than it is to harvest and thresh them along with the soybeans," Mr. Craigmile said.

Just as careful is Mr. Craigmile with the potatoes he raises. The rows are kept clean to make easy digging, and then the potatoes are run through a grader that at the same operation brushes off all the dirt to make a product that gets the highest offers.

The picture was taken as Mr. Craigmile stood almost hip deep in the soybeans the second week in August.

New Rice Varieties Have Superior Table Quality

RICE of good table quality, a desirable flavor, and a tender, flaky product when cooked, is the goal of United States Department of Agriculture plant breeders. In cooperative work at the Rice Experiment Station at Crowley, three varieties that have these requirements, Fortuna, Rexoro, and Nira, have been developed and distributed to commercial growers.

Nearly 76,000 acres of the new varieties were harvested in Louisiana, Texas, and Arkansas in 1935, a crop of such superior table quality that growers received an estimated $300,000 in premiums.

Last fall, 116,423 acres of the new varieties, about 14 per cent of the entire rice acreage in the three States, were harvested, a gain of more than 40,000 acres in 1 year. Most of the acreage is concentrated in Louisiana and Texas, where these varieties are best adapted.

The new varieties yield as well as or more than the old established Early Prolific and Blue Rose varieties, says Jenkin W. Jones, department agronomist in charge of rice production and improvement.

Grapefruit By-Products Industry Is Growing Up

HOW the infant grapefruit by-products industry has been growing up in Texas, since the United States Department of Agriculture laboratory was established at Weslaco in 1932, is indicated by figures reported recently by J. L. Heid, of the Bureau of Chemistry and Soils.

In the 1933-34 season, three plants began operations and paid approximately $10,000 for culls.

In the 1934-35 season, seven plants operated paying $70,000 for fruit.

During the 1935-36 season, 17 plants paid $266,000 for 25,000 tons of grapefruit, a return of more than a quarter million dollars from an industry that did not exist 3 years before.

This season, says Heid, the prospect is that citrus plants will pay in the neighborhood of half a million dollars for about 60,000 tons of oranges and grapefruit to be converted into canned juice, concentrates, marmalades, wines, flavoring, beverage bases, and pickled and candied peel.

Food Varies Little As to Quantity; Much As to Kind

AMERICANS have been eating about the same quantity of food for the past 10 years, notwithstanding the great reduction in incomes between 1931 and 1935. But after an analysis of dietary records kept by different types of families, Dr. Hazel K. Stiebeling, of the Bureau of Home Economics, points out that the kinds of food eaten by families at different income levels are very different. Some have had a liberal diet. Others have had to do with very little of the important protective foods. The average diets of families spending $100 or more per person per year for food afforded some margin of safety in all nutritive essentials.

The families studied reported on the kind, quantity, and cost of food consumed. They included those of business and professional workers, wage earners, and low-income, semidependent families. The dietary records collected at intervals since 1914 were taken in every season of the year, in cities and villages, in 44 States, and the District of Columbia, and represented yearly expenditures for food from $32 to $200 per person (spring 1935 price level).

Greater expenditures for food per person are not evenly distributed over all commodities, says Dr. Stiebeling. A greater proportion is likely to go for eggs, meats, milk, butter, and the succulent vegetables and fruits than for grain products, potatoes, dried legumes, and fats other than butter.

A threefold increase in total pounds of food purchased may mean only a threefold increase of milk and lean meats, but a fivefold increase in fruits and vegetables other than potatoes, and in butter and eggs. The groups spending the most for food not only have more food, but food richer in high quality proteins, in minerals, and in vitamins. Some waste is evident with increasing expenditures for food and a tendency to purchase more expensive forms of food; more butter, and a higher percentage of fluid, rather than canned milk.

Fertilizer May Do As Well As Manure for Evergreens

MOST nurserymen have shunned commercial fertilizers for evergreens. They preferred manure even at a higher price. P. C. Marth and F. E. Gardner, of the Bureau of Plant Industry, investigated the grounds for this prejudice and found that well-balanced chemical mixtures are just as satisfactory and cheaper. But they also found some basis for the prejudice because of the tendency to apply too much concentrated food. Applications of chemical fertilizer high in nitrogen were as effective as manure, but heavy doses stunted the plants—caused something similar to indigestion from overeating of food too rich. Nurserymen frequently have failed with commercial fertilizers for evergreens because they gave the plants too much of a good thing.

Better Grass Varieties Aim of Pasture Research

SINGLE grass plants in a pasture do not get much attention because there are so many of them, but a pasture is the sum of the individual plants in it as surely as a crop of corn is the sum of all the corn plants in the field. Farmers seed the more productive strains of wheat and other cereals. But generally they overlook the point that there probably is as much difference in bluegrasses, for example, as there is in wheats. One plant may produce several times as much feed as another, and if all the bluegrass plants in a pasture were as good as the best of them, that kind of pasture might well provide feed for more animals for a longer season.

This is roughly the idea back of Federal and State pasture research. P. V. Cardon, in charge of pasture plants for the United States Department of Agriculture, points out that grass breeding has lagged behind, while cereals have been improved by selection of desirable single plants and by the crossing of varieties to combine the best features of each.

The grass research program of the Department calls for continuing studies of pasture management, fertilizer tests, and seeding methods, but it also provides for special attention to selecting and breeding better varieties of grass plants, kinds that will add up to a larger total in feed value.

We Met the Change in Burley Tobacco

(*From page* 17)

amount of nitrate does not affect quality adversely, but does start the crop quickly, so that it will mature, and can be cut at least 10 days earlier, which is usually an advantage.

In 1928 when the writer came to Switzerland County as County Agricultural Agent, it was easy to see that tobacco was the important crop in the county, and that its improvement would be a sure way to increase farm incomes in the county. Being entirely ignorant of tobacco production, an immediate start was made to find improved methods of producing burley. This quickly worked down to a study of what fertilizer would produce the type of tobacco the market demanded. A magazine now defunct, *The Burley Tobacco Grower*, gave the results of fertilizer experiments in Kentucky in 1928, conducted by Dr. G. N. Hoffer, which indicated that burley tobacco responded very profitably when the amounts of potash normally used were doubled or tripled.

A grower was found who had been mixing fertilizers that contained muriate of potash and sulphate of potash. He had accidentally found that such a mixture produced a crop for him that sold 10 cents a pound higher than his neighbors' tobacco. Another man was found whose tobacco started growing quickly after transplanting, who explained that he used some nitrate of soda in his fertilizer to start the crop. From this scanty supply of data, this special tobacco fertilizer was evolved.

In 1929 three growers were induced to try it out, D. J. Allen, L. P. Rous, and Wm. O. Protsman. Incidentally, Mr. Protsman has one of the finest quality crops in the county this year, 1937, produced by using this special mixture exactly as recommended. Twenty growers were induced to use the special mixture in 1930, and the following year 65 farmers tried it. This season the mixture was used by half the growers in the county, and by a considerable number of growers in near-by counties.

This stab in the dark as to proper burley tobacco fertilizer fortunately worked out satisfactorily. Its results can best be summarized in the words of H. T. Mylor, a local tobacco grower and dealer, "Using this fertilizer mixture has made the farmers of Switzerland County a million dollars." An exaggeration? Ask a grower who has used it.

Diagnosing Fertility Needs of Orchards

(*From page* 12)

leaves. Chlorophyll is lost from the areas between the veins, but not from the veins and the areas adjacent to the veins. Growth is stunted, and the leaves drop prematurely.

Internal cork and certain types of drought spot in apples are rather widespread in occurrence and appear to be associated with boron deficiency. Various workers in New Zealand (1), British Columbia, New York, and the U. S. Department of Agriculture (5) have reported success in the control of internal cork and drought spot in apples by the use of one-third to one-half ounce of boric acid placed in holes in the trunk of large apple trees, or by application of one pound of boric acid per tree on the soil. With peach trees in boron-deficient sand cultures, the terminals die back, and lateral buds commence growth, but soon become affected. Small irregularly-shaped areas in the leaf die and drop out. Injured leaves fall off readily. On the stem dark brown corky spots appear, giving it a very rough appearance.

Applications of zinc to fruit trees have been successful in combating a disorder called rosette or little leaf (4). The leaves are small, chlorotic, and branch growth is stunted, giving a rosette appearance. In severe cases the trees will die. This disorder is common in California in all tree fruits, and also appears in sections of Oregon and Washington, and in nut trees in Southern United States.

Copper deficiency has been observed in citrus trees in Florida, and in apples, peach, and plums in South

Africa (2). The leaves become chlorotic, the terminals are rosetted, and the twigs die back. Spraying the leaves with copper, or applying 1/4 to 2 pounds of copper sulfate per tree to the soil readily corrects the trouble.

Of the eleven elements whose deficiency symptoms have been described, nitrogen is the one commonly lacking under Maryland conditions. The symptoms of lack of nitrogen are easily recognized. Available potassium is scarce on many of Maryland's orchard soils, yet no cases of severe deficiency and injury have been observed, as has been reported in Massachusetts and Canada. However, with available potassium low and lime content high, injury from lack of available iron may occur on fruit trees on certain soils. It is probably the first deficiency to be suspected if chlorosis occurs.

Physical injuries to trees that produce disorders resembling mineral-deficiency chlorosis are common, and winter injury to the crown, mouse injury, or disease, may be suspected when there is a pale or chlorotic appearance. If no injury is apparent on an unhealthy tree close examination of the nature and degree of chlorosis, the pattern of green and yellow areas, the appearance of dead areas in the leaf, the progress of defoliation, and the presence of twig injury may provide clues as to the cause of the disorder.

(1) Atkinson, J. D. Progress report on the investigation of corky pit of apples. The New Zealand Journal of Science and Technology. Vol. 16, No. 5, March, 1935.

(2) Anderson, F. G. Chlorosis of deciduous fruit trees due to a copper deficiency. Jour. Pomol. and Hort. Sci. 10, No. 2, 1932.

(3) Burke, E. Chlorosis of trees. Plant Physiology 7, 329 (1932).

(4) Hoagland, D. R., W. H. Chandler and P. L. Hibbard. Little Leaf or Rosette of fruit trees. V. Effect of zinc on the growth of plants of various types in controlled soil and water culture experiments. Proc. Amer. Soc. Hort. Sci. Vol. 33, 131-141. 1935.

(5) Magness, J. R., E. S. Degman, L. P. Batjer, L. O. Regeimbal. Effects of nutritional treatments on internal cork of apples. Proc. Amer. Soc. Hort. Sci. 34 (1936).

(6) Wallace, T. Some effects of deficiencies of essential elements on fruit trees. Ann. Appl. Biol. XVII. 649-657. (1930).

(7) Weinberger, J. H., and Cullinan, F. P. Symptoms of some mineral deficiencies on one-year Elberta peach trees. Proc. Amer. Soc. Hort. Sci. 34. 1936.

1937—A Cotton Year of High Records

(*From page* 19)

The increase in staple length has been general through most of the Cotton Belt, with the exception of Texas and Oklahoma. The increases have been most apparent in the Southeast and in the irrigated parts of the Southwest.

The average staple length of ginnings from the 1936 crop was greater than for any other crop since these reports were first made. The proportion of ginnings from the 1936 crop 1 inch and longer in staple was greater than for any other year. No consistent change has been noticed in the *grade* of the American cotton crop since these reports were inaugurated.

Changes in the staple length may have been caused chiefly by differences in the growing seasons. Then the Extension Service in some of the states has promoted the planting of better seed, as have seed breeders, farmers' organizations, and others. The promotion of one-variety communities by the Bureau of Plant Industry has been rather successful in improving the quality of cotton in some parts of the Cotton Belt. State experiment stations have studied problems that are more local in nature and have made recommendations. The North Carolina station, for instance, has made a 2-year investigation of the influence of "cotton rust" on quality and yield of cotton, and advised the farmers that at present additional applications of potash appear to offer the most practical method of decreasing rust damage. Cooperative marketing associations have obtained differences in price for different staple lengths, and this has probably encouraged many farmers to grow cotton of longer staple length. During the last few years, the information on grade and staple length of individual bales furnished by the Bureau of Agricultural Economics, in connection with the compilation of its reports, has enabled the farmers who cooperate in this work to compare the cotton produced by different varieties of seed and thus improve the quality of their cotton.

It is not practicable to measure the separate effect of each contributing cause. The important thing is that the American cotton crop is improving in staple length and, even more important, an increasing quality consciousness has been created among farmers.

Better Yields of Better Cotton

(*From page* 8)

There are certain soil-fertility practices that are followed by those contestants who consistently produce, year after year, an acre-yield of lint above the average of the other contestants. These high producers:

1. Have the soil full of organic matter by rotation of crops, by turning under of legumes, or by use of manure.

2. Have a soil that is only slightly acid, either because of soil type or the proper use of lime material.

3. Have increased the amount of potash used per acre, thus correcting or preventing "cotton rust."

4. Have used readily available nitrogen material as a side application at the time and in amounts needed, as indicated by the growth of the plants.

"Uncle Bob" Smith, Edgefield county cotton grower par excellence, has been a persistent prize winner in the cotton contests. His better half, Mrs. Carrie B. Smith, won first prize in 1936 on 5 acres of her own farm, with "Uncle Bob" as her farm manager. Her yield was 1,328 pounds of 1 1/32-inch lint per acre. This is more than 2½ bales of cotton per acre. On his farm "Uncle Bob's" personal entry in the contest failed to win one of the eight prizes, but with true sportsmanship he declared he wouldn't let her beat him again. His optimistic philosophy he sums up in these words: "Let nothing keep out cheerful persistence; that rule has won me several cotton contest prizes and has helped me learn how to produce cotton."

Intelligent fertilizing, "Uncle Bob" asserts, is a big factor, and potash is most essential in a cotton fertilizer. To be a winner with cotton, he continues you must not only have good land in good condition, but you must fertilize well.

"When I had my soil analyzed by Clemson College, the report was that it was O. K. for general crop production but needed a little more potash," says Uncle Bob. "So I doubled the quantity of potash. In my general cotton crop I use at planting a mixture of 300 pounds of acid phosphate, 100 pounds of muriate of potash, 50 pounds of calnitro per acre, and at second plowing a top-dressing of 100 pounds of calnitro or nitrate. For my 5-acre contest plot I triple this except for soda, using 250 pounds of soda.

"I have no regrets on doubling the potash, for I find it does five things: (1) It relieves rust on cotton, (2) it prevents 'frenching' of crops, (3) it increases yield through better vigor and vitality of plants, (4) it affects ability of plants to hold fruit, (5) it helps develop bolls and makes picking cotton easier because of fluffiness of cotton in open bolls."

To have plenty of plants per acre to produce good yields, Mr. Smith likes his cotton rows 38 to 40 inches wide, with two stalks per hill about 18 inches apart. This is closer spacing than the old practice, but still not as close as some advise.

His rotation practice is: No cotton following cotton, no corn without legumes interplanted. Thus he keeps his soil fit for cotton or other clean crops.

Other supporters of liberal potash for cotton are P. M. Arant, Chesterfield farmer who won second state prize in the 1936 cotton contest on a yield of 1,253 pounds of lint per acre, and J. F. Hopkins, of Mayesville, who won first prize in the central district on a yield of 1,216 pounds of lint per acre.

Mr. Arant reports that with plentiful potash the cotton bolls on his 5-acre contest plot developed right on up to the top of the stalks, and these upper bolls opened well for easy picking, his pickers finding it possible to gather 35 to 40 pounds more per day per person than in the cotton on the rest of his farm. His contest cotton, by the way, which was 1 1/32-inch staple, sold for 3 cents more per pound than ⅞-inch cotton was bringing.

Mr. Hopkins' fertilizer practice, resulting from cotton contest practices, calls for close spacing—rows 36 inches wide, hills 8 inches apart—and liberal fertilization. He uses at planting 500 to 600 pounds of a mixture analyzing 8-4½-5½ (NPK) and side-dresses with 100 to 150 pounds of equal parts of muriate of potash and nitrate of soda.

Potash Enters the Dairy Business

(*From page* 14)

Carl Ward, of East Flat Rock, in another section of Henderson County, tested some white corn on a 10-acre field, using fertilizer similar to that used by Mr. Corpening. Mr. Ward top-dressed 1 acre with the muriate, and his results are even more pronounced than those secured by Mr. Corpening.

Both men grew their corn on a Toxaway loam soil. "The two demonstrations are very striking," said County Agent White. "We have other similar results over the county and I am of the opinion that potash has just about solved our corn problem for us."

It may be interesting to note that Mr. White is engaged in a lively corn-growing contest with J. A. Glazener, county agent of the adjoining county of Transylvania. Last year, Transylvania won the silver trophy cup offered by a bank in Hendersonville to the farmer growing the highest yield per acre. It was my pleasure to attend the banquet in Brevard, county seat of Transylvania, celebrating the close of the contest last year and to present the cup to a man who had produced 140 bushels. Mr. White said then that the cup would come to Henderson County for 1937, and I now have an invitation to attend the banquet at Hendersonville, when all harvests have been completed and the corn show is finally arranged. Mr. Glazener has also invited me to Brevard.

Potash is perhaps having something to do with a new corn-growing era in these two counties, and it may determine which county I shall visit this winter.

Brawn and Bang-boards

(*From page 5*)

place near Alleman, Iowa, at which time Fred Stanek, of Webster County, beat all comers with 24.3 bushels net. Thumb, palm, and wrist hooks were common in this contest, and the one outstanding thing to mark it was the work of an Illinois farmer, aged fifty-four years, who tossed in about 18 bushels in a field of youngsters.

Next season Illinois got ready in advance with a bunch of tall-geared lads and chose a field where the ears averaged five feet from the ground. Out for blood and deep revenge for two defeats, they sent in a hoss of considerable unknown quantities, named Elmer Williams, and when the dust settled he had hung up a scintillating record hitherto unmatched—35.8 bushels net—and put Iowa's bravest knuckle-scratchers into the discard. His husk weights in 100-pound samples were less than five ounces, and he only missed 28 pounds of merchantable ears en route. He grabbed the ears with his left hand, thumb up, used the right mitt to hold the tip of the ears, and inserted the peg just enough to keep a firm "holt." He banged about fifty ears per minute at times, and they could hardly stop him when the sun went down.

Twelve huskers threw away their shirts and entered the contests of 1926 and 1927, the first being held near Fremont, Nebraska, and the second one near Blue Earth, Minnesota. About five thousand folks attended each of these events. The circle of interested parties was fast widening. Illinois' revenge was short-lived, for back came Fred Stanek and captured both contests hands down. Both times the going was tough, for in Nebraska the crowd followed the huskers in drifting snow, and in the Gopher match the North Star icebergs coated the field and every stalk with glass, so that Stanek did no better than he had before. In fact his Minnesota record proved to be the lowest one ever made in a national meet, only 1,083 pounds, hardly worth figuring up, relatively speaking. Besides, in the Blue Earth battle the ears were nubbins, running almost 250 to the hundredweight, making Iowa see red with disgust.

In 1928 Indiana entertained the national meet. The weather and the field were ideal, and few huskers could claim alibis. Illinois got its modicum of revenge again, before eighteen thousand fans. Walter Olson, of Illinois, had his turn basking in the sun of favor, for his was the winning load, about 27 bushels net, with only 19 pounds of gleanings behind him and seven ounces of husks in the sample.

MISSOURI corn-cobbers craved the 1929 engagement, so all the State demons of the crib assembled in Platte County in a nasty field of down corn, partly ruined by a sudden autumn rain. Olson repeated his former victory, but with less glory, making 25.2 bushels net.

Again in 1930 the Southwest claimed the national tournament. Kansas staged it near Norton before thirty thousand sunflower-wearing rooters, and with thirteen huskers at the bat. Here the all-time repeat record was busted, for Iowa money was multiplied in the feat of Fred Stanek, fourth-time victor. He husked and threw in 30.3 bushels in the regulation eighty minutes, leaving 24 pounds of gleanings and only about 11 ounces of husks on the sample. Nobody is quite sure yet how long Stanek will stay in quiet retirement, and his memory haunts the dreams of all who aim at the tail end of the racks.

Somnolent old Grundy Center, Iowa, awoke to the tread of thousands in 1931, as the huskers converged with their backers on a likely field in the commonwealth where corn is king, queen, jack, and ace combined. Sixteen men lathered up amid the hybrid, and Illinois earned a sweet revenge, getting it through the achievement of Orville Welch, while sixty thousand people parked over ten thousand cars on somebody's alfalfa. Welch threw in about 31 bushels.

ALTHOUGH corn sank to 15 cents a bushel in 1932, Illinois was not discouraged and invited the gang to cross the Mississippi again to learn how fast the ears fly. The attendance slumped 20,000 from the Grundy record the year before, but there were 15 huskers anxious to sweat it out. Here at Galva the winner was Carl Seiler, of Knox County, Illinois, 36.9 bushels with 23 pounds of gleanings about 5 ounces of husks to the sample. Until Carlson arrived, this was the high-water mark in corn husking.

Nebraska's turn to claim the crown came in 1933, when at West Point in that state the champion of the corn world happened to be Sherman Henriksen, a real "cornhusker" in nat'ur as well as name, whose record was 27.6 bushels.

In the season of 1934, Minnesota again opened her gates and furnished a better field and fully fifty thousand onlookers. Eighteen huskers bowed finally to the home-state clipper, Ted Balko, of Redwood Falls, whose bangboard racket netted him a trifle over 25 bushels.

Yet in the 1935 heats over in Newtown, Indiana, Balko finished sixth in a field of the fastest young huskers the world has ever assembled in one pumpkin arena. Elmer Carlson, Audubon County, Iowa, after registering a 35-bushel top in the state event, swung into the fiery stride of fifty-five and sixty ears per minute, with all movie reels running overtime, and clinched the national ahead of Bauman, of Illinois, with 39 bushels, and Pitzer, of Hoosier fame, and his 36 bushels. Carlson threw 4,000 ears for a peak, unbeaten mark of 41.5 bushels. Just prior to the starter gun Carlson donned his tennis shoes, tossed off his shirt, gobbled a double handful of brown sugar, and tore into the 85-bushel-per-acre field with a vim. Carlson is now 28 years old, weighs close to 190 pounds, and is training hard for the 1937 national in Missouri.

The Swedish Carlsons on their 320-acre farm have a complex for corn husking, so when his elder brother Carl set out in 1936 for the state and national trophy, folks kept their eyes on Audubon. Indeed the curiosity was justified, for although Carl was about ten years Elmer's senior, he beat the former Iowa record Elmer had hung up, and in the national contest at a soggy field in Ohio, Carl finally beat all comers and joined his brother in the hall of rural fame.

WEATHER conditions play no small part in the speed and the volume of the huskers. Many State meets have been held with records far above the nationals. The number of ears per bushel, the way the ears grow on the stalks, and the direction of the wind, as well as the amount of moisture in the corn, each contributes its share to make or mar the contest.

At any rate, the old hand method of husking will vanish in a blaze of romantic glory, if it must vanish at all. The annals of the nubbin snatchers will last as long as agricultural tradition treasures its workaday heroes. Making play out of work is one sure method of finishing it minus a grouch.

IT WORKED

Mr. Smith—"Your wife used to be so nervous. Now she seems quite cured."

Mr. Brown—"Yes, and it was so easy. The doctor simply told her it was a sign of age."

An Irishman obtained leave from work to attend a wedding. He returned with two black eyes.

The foreman asked him what had happened.

"When I got there," replied the Irishman, "I saw a fellow all dressed up like a peacock. 'An' who are you?' says I. 'I'm the best man,' he says, an' begorra, he was, too!"

SURE DOES GO

A colored man deposited his savings, some twenty-five dollars, in a private bank operated by some of his dusky brethren. Some time later, he wished to withdraw his simoleons, and appeared at the pay-window with passbook. But the ebony-tinted teller shook his head.

"Yo' cain't draw no money out dis bank, big boy," he announced firmly.

"Why cain't I?" clamored the depositor.

"Yo' money been in heah so long, de interest done eat it all up."

Salesman: "I sell underthings to nudist colonies."

Farmer's Daughter: "What kind of underthings do nudists need?"

Salesman: "Cushions."

THE LAST STRAW

"I don't mind washing dishes for you," wailed the henpecked husband; "I don't object to sweeping, dusting, or mopping the floors, but I refuse to run ribbons through my pyjama jacket just to fool the baby."

The doctor was visiting Rastus' wife to deliver her twelfth offspring. While riding along with Rastus he saw a duck in the road.

Doctor: "Whose duck is that?"

Rastus: "Dat ain't no duck. Dat's a stork with his legs wore off."

COULD YOU?

"Is that Venus?" said the gushing lady.

"No, that's Jupiter," said the Prof.

"How clever," said the lady, "to be able to distinguish the sex at this great distance."

I see by the papers that "Fanny" has passed on; that that posterior portion is now referred to as "Twin Sitties."

It was a warm day, and a dull case concerning the rights of certain river commissioners was being argued in court.

Counsel made speeches of interminable length, and the judge fell into a doze.

"But we must have water, your honor," thundered the defending lawyer in such stentorian tones that the judge came to.

"All right," he mumbled, hastily, "but only a very little in mine."

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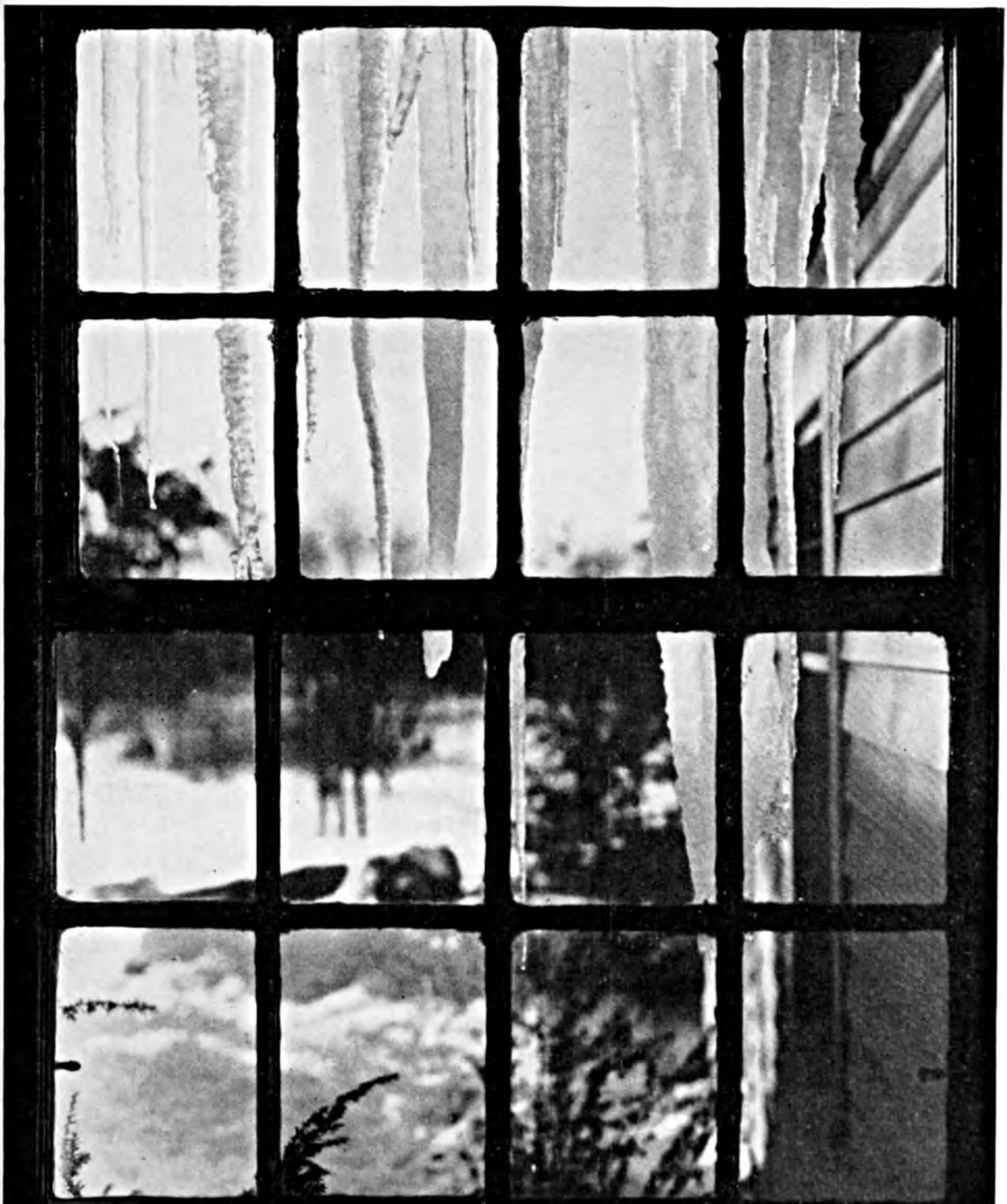
Better Crops with PLANT FOOD

December 1937 10 Cents



The Pocket Book of Agriculture

THE LAST STAND AGAINST WINTER'S GRIP.

Better Crops with PLANT FOOD

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VOL. XXI WASHINGTON, D. C., DECEMBER 1937 No. 12

The light of past years still makes

Candle Glow

Jeff McDermid

CHRISTMAS doings of long ago have dangled in my fancy lately, not in the softened callousness of a Scrooge, but in the wistful consciousness of a scribe. Santa Claus was a hardy old annual in those times and had his abode near the north pole. Kids believe nowadays that he resides in Washington and drives his reindeer with red tape.

Believe it or not, I was almost ready for long pants before I reluctantly renounced Santa as a personal reality. It was mighty tough for me to remove his ruddy countenance from the boyish hall of living immortals, like Buffalo Bill, Jim Corbett, and Richard Pearson Hobson. So rather sadly, as one buries an old dog, I slipped his picture off the wall and placed it in my nook of acknowledged mythical heroes, where he still holds quiet communion between stiff yellowed leaves with the demi-gods and paladins who wave their wands and swords eternally in Bullfinch's "Age of Fable" and the "Idylls of the Kings."

Jim Corbett soon followed Santa into the limbo of the lost, but in his case I had a red-haired Australian blacksmith to stick up in his place, whereas the banishment of the whiskered saint left a glaring void in an adolescent's world of realism.

I recall that for a long spell afterward when I awoke of a winter morning to smell the batter cakes, this absence of Santa Claus (resolutely facing Corbett's mighty fist with grinning nonchalance) stirred within me yearnings to hang up my socks again. But I have steeled myself against this weakness for lo, these many jumbled years; no matter how great my expectancy, how gaudy the socks, or how convenient the blazing hearth.

FROM that date thenceforth the coverings of my pedal extremities were reserved for the wash line and the darning basket, although it is true that metaphorically, I have often hung them up on some absorbing scheme, only to awaken not to find them filled, but vanished with my shirt!

I have never spent the holidays in Dixie land, though I am aware that we import our gorgeous holly wreaths and mistletoe from there, as well as sundry warm-hearted customs incident thereto. No doubt I should feel just as merry and generous as my temperament and purse would allow were my lot cast in the Deep South at the Yuletide; but for awhile it might be difficult, as the winter climate there is not the rough and tumble sort which makes us naturally hasten toward the ingle-nook and the toddy bowl. A gracious, balmy, outdoorsy Christmas would find me so excited that I might trim the tree with Roman candles and festoon things with firecrackers — punch or no punch.

This preface is inserted to pacify the readers who were fetched up under a more salubrious Santa Claus than I catered to. It is not my desire to thrust the congealed Christmas of Yankee-land down the necks of our Southern friends, whose hospitality and sentiment can only be matched by their tolerance of a provincial essayist whose only working knowledge of cotton is that it proves useful in fringing the mottled jowls of some lank-shanked Saint Nicholas in the department store business.

Moreover, I am persuaded that were a Southern family to exchange abodes with mine for a couple of Christmases we would all soon become acclimated to the particular brand of good cheer that tradition and climatic conditions have bred into us through generations —since the Pilgrims went north with grim faces, and Lord Baltimore and Cap John Smith (it should have been "Colonel") chose to populate the opposite clime.

Indeed, we may say quite freely that the way we have differed from each other in sectional details of Christmas joy-making has led to minor misunderstandings and crops of ignorance touching upon our other circumstances, policies, and programs. Happily it is easily visualized that we possess a binding tie, both in the deeper meaning of Christmas that we in both regions mutually share, and likewise, if we ponder on it, concerning most of the other strands in our loom of American life. They may appear twisted, irregular, and often of a different hue, but taken as a whole they pattern out a pretty strong shank of tweed—all wool and a yard wide!

THANK heaven, most of us both north and south are poor in worldly goods and rich in spirit, courage, and heritage. As soon as the bulk of a nation become "newly rich" and thoroughly conscious of their nicer playthings, the same thing happens to them that happens to a pampered, snooty kid whose every day is Christmas. They forget how hard Grandpaw worked to earn a dollar or how hard Grandmaw planned to take it away from him so it would be properly spent.

Being thankful over relative poverty does not signify the degrading form of poverty that crime and ignorance fatten on. A useful, hardy, upstanding kind of poverty is what I mean. It's the kind that keeps you in sympathy with the fellow who turns an honest penny, pays his debts, and enjoys a few simple things at Christmas.

Humble folks who make the most of what they possess without grumbling, and the well-to-do who share

their joys with less fortunate are usually the happiest ones at this season. The situation is emblematic of the Son of Man who was also the Son of God—one who mingled with humble carpenters and fisher folks, and yet who had the power if he chose to claim the wealth of the world as his right.

Even the avowed skeptics and pretended unbelievers, the infidels and the agnostics, are not callous to the spirit of charity or unresponsive to the beneficent effects of love and good will. Therefore there is always something universal and humanizing in the Christmas season, which we all admit would do us more service if it persisted through the year.

The pealing of the bells and the sweet solemnity of evening candle glow, the distant echoes of the jolly carolers, the combination of present, hushed expectancy and hallowed remembrance—these find a response in all normal humanity who still deserve the name.

Those who happily possess a parental diary or journal are particularly fortified when modern plans go wrong. More especially are they brought face to face with the conditions and circumstances surrounding the holidays of their childhood.

They find that there were scant pleasures as we know them now, and the amount of money then available for a family's entire Christmas spree would not buy a desirable gift for one member of the modern household. As standards of life rise (and who says they shouldn't?) we may be pardoned for looking backward if for no other reason than to see how far most of us have come since the days of relative universal privation.

I doubt if any other single generation has been able to see such a swift change from what were the luxuries of youth to the everyday necessities of middle age—doubly emphasized of course at Christmas. For instance, in my native burg there were in my teens just four "horse and buggy blocks" and tie-posts, and as many backyard barns for the whole length of wood-paved Maple Street; whereas today you cannot find a place to park anywh e along that concrete causeway, and every domicile boasts its own garage. Did some of the old spirit of Christmas vanish with the jingling sleigh-bells? If so, I doubt if a "honk" will bring it back.

YET peradventure by 1980 some of my youthful "contemptuaries" will look back from their air-conditioned, centrally heated, television equipped parlors, with elevators ready to shoot them to their take-off platforms on the roof—and sort of sigh for the old familiar smell of gasoline and yearn for a squeaky brake or a raucous horn to remind them of queer old Dad and his six-cylinder Christmas! Like me, they too may ransack the attic and thumb over an ancient diary, as a sort of mental pinch in the arm to prove they are not dreaming.

Consulting my Mother's penciled

(*Turn to page* 47)

Certain Elements Affect The Growth of Turnips

By M. B. Davis and Wm. Ferguson
Central Experimental Farm, Ottawa, Canada

DURING recent years much attention has been attracted to the turnip on account of the rather remarkable results which have been obtained by the use of boron as a corrective for the trouble known as brown heart.

Attention was attracted to the possibility of boron as a cure for brown heart by the results from Germany, where heart rot of sugar beets had been correlated with a lack of boron. The earliest demonstration in Canada to indicate the efficacy of boron in the control of brown heart of turnips was in the Maritime Provinces. Field trials conducted by the Experimental Farms Branch indicated satisfactory control when 10 pounds of borax were applied per acre. This work was later reported by MacLeod and Howatt in the December 1936 issue of Scientific Agriculture, and still later a bulletin for practical use was issued by Hurst, Division of Botany, Experimental Farms Branch, Ottawa, Canada.

In an endeavour to study the role of boron in the turnip plant, Hill and Grant conducted experiments with turnips in sand cultures which were reported in Scientific Agriculture, May 1935. This work, together with subsequent experiments and the field trials of others, has given much inter-

Fig. 1—Turnip plants showing the effect of boron on growth and vigour. (Left) Boron fed at the rate of 1 part per million, (center) at the rate of .25 part per million, (right) plant received no boron.

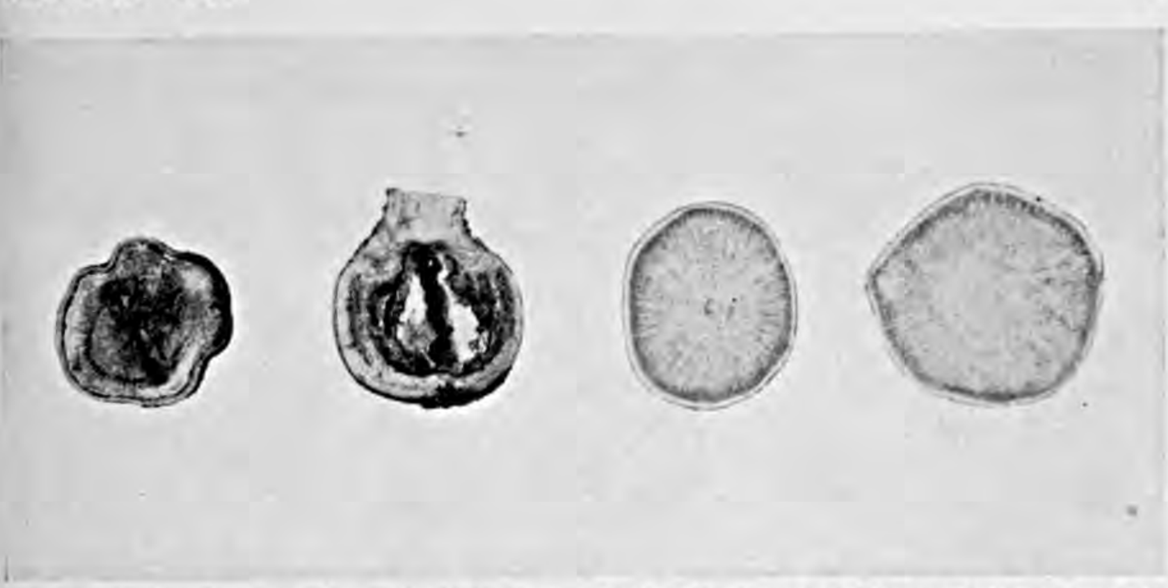

Fig. 2—The two turnip roots on the left showing hollow heart were fed boron at the rate of .25 and .50 part per million. The two roots on the right which are free of disorder were fed boron at the rate of 1.5 parts per million in the nutrient solution.

esting material of a practical nature.

There is, of course, no longer any question as to the absolute necessity of boron for the successful growth of the turnip plant. Unless boron is included in the feeding solution, growth ceases at a very early stage, the root or tuber does not develop and eventually decays, and the foliage presents very definite symptoms of malnutrition.

Effect of Boron

Figure 1 shows what happens when boron is withheld from the feeding solution, as compared with increasing amounts of the element up to one part per million, while Figure 2 shows a cross section of turnips grown with varying amounts of boron in the feeding solution.

The interesting thing is that while full sized turnips developed with only one-half part per million of boron in the feeding solution, the turnips were so bad with hollow heart and browning that they were practically useless. In the field, the trouble may vary from cases as severe as that depicted in Figure 2, due to only .50 part per million of boron, to a very mild "water core" or glossy appearance of the central area which only slightly affects the actual value of the root.

The most absolute symptom for diagnosis for boron deficiency in turnips is the occurrence of brown heart, but in addition the plant may exhibit foliage, stem, and other external symptoms, all of which may be described as follows:

The plant gradually becomes stunted or dwarfed in appearance. The leaves are smaller and less numerous and gradually assume a variegated colour, which appears as a mixture of yellow and purplish red blotches over part or all of the leaf, while the stalks of such leaves usually show a longitudinal splitting. The root does not grow to full size and under conditions of severe boron deficiency remains very small, distorted, and has a rough, unhealthy, grayish appearance instead of a clean, smooth, yellow surface. Often the surface will be quite wrinkled and cracked.

On cutting through a root, boron deficiency is shown by the familiar brown heart which appears as dark brown, water-soaked areas in the central flesh of the root. It may vary from a few, small, scattered, isolated spots to large water-soaked areas, and even result in a hollow centre, with all the inner flesh of the root badly discolored depending upon the severity of the deficiency.

At what stages in the life of the

Fig. 3a—Side and section views of turnips. (1) Complete nutrient solution. (2) Lacking boron after first month. (3) Lacking boron after 2 months. (4) Lacking boron after 3 months. (5) Lacking boron first month, then complete.

3b—(1) Lacking boron first 2 months, then complete. (2) Lacking boron first 3 months, then complete. (3) Solution lacking boron, boric acid sprayed on plants first month. (4) Same as 3, boric acid sprayed first 2 months. (5) Same as 3, boric acid sprayed first 3 months.

3c—Nutrient solution lacking boron in all cases. Boric acid sprayed on plants (1), after first month, (2) after second month, (3) after third month, (4) check—no spray.

plant is boron required? In order to answer this question, plants have been grown in culture solutions with boron supplied or omitted at different periods as follows:

Group I—Boron fed throughout the life of the plant.

Group II—Boron fed to the end of the first; the second; and the third months of the life of the plant, then omitted from the solution.

Group III—Boron omitted from the feeding solution to the end of the first; second; and third months of the life of the plant, then supplied in normal amount.

Can Be Reclaimed

From these groups of feedings, it became evident that the plant could be starved for boron for the first month and then brought to normal development by the introduction of boron to the feeding solution (see Figure 3 and Figure 4). The starvation of plants for 2 months with subsequent feedings of boron produced roots which externally appeared normal but which possessed a small amount of brown heart.

In the reverse series where boron was fed only during the early life of the plant, the results were hardly as expected. With boron fed for the first month and then withheld from the feeding solution, very small turnips were developed with severe brown heart. The feeding of boron for the first 2 months only, produced larger roots but with severe brown heart, and the feeding of boron for the first 3 months only, produced normal sized roots with a moderate amount of brown heart largely confined to the epidermal region.

It is very evident from these results that the feeding of boron in the later life of the turnip is of more benefit than the feeding of boron in the early stages only. It is possible that this is due primarily to the fact that the plant is unable in its early life to store boron for future use, but may start growth and continue for a time in its absence.

From the observations made on the various series and the results obtained, as seen in the illustrations, it can be said that boron is not essential for good root development during the first 2 months and certainly not during the first month after transplanting. It is after this time that root development is greatest. This would indicate that the time of greatest root development coincides with the time during which the plant has its greatest need for boron.

The exact role that boron plays is not yet evident, but previous work in this Division indicated a much lower accumulation of calcium in the roots of high boron plants than in the roots of low boron plants. Warrington, in the Annals of Botany, Volume 48, 1934, has suggested some kind of relationship between calcium and boron, the exact nature of which is not yet determined.

Is Spraying Successful?

It has long been known that plants may absorb through their foliage certain amounts of plant food and apparently translocate these to other regions.

Since boron is necessary for the proper root development of the turnip, this plant affords a good means of determining the ability of boron to be translocated from the leaves to the roots. To eliminate any possibility of the spray being applied to the soil or sand and thus entering in minute amounts through the roots, the pots were covered carefully with rubber and a small atomizer employed in some cases, while in other cases, the boron was applied to the foliage by brushing.

Observations on the condition and amount of foliage and on the size and appearance of roots clearly prove the plant can and will absorb boron through the leaves and utilize it for greater growth. The fact that the characteristic foliage symptoms were absent from the plants while they were being sprayed with boron indicates that the boron was absorbed, whereas the check plants receiving no boron showed very pronounced foliage symptoms. The healthy appearance and size of roots from plants sprayed with boron also prove that the boron is not only absorbed by the leaves but is transported through the plant to the various regions where boron is required for growth and development.

Root-feeding Preferable

Laboratory analyses of young and old leaves, stems and sections of the roots of plants receiving a boron spray, and of plants receiving no boron show on the whole a higher concentration of boron in the various parts of the sprayed plants than in the same parts of those plants lacking boron.

However, the efficiency of this method of feeding boron to turnip plants is not as great as feeding through the roots. Not one of the sprayed plants at the final examination yielded a root which showed as little brown heart as those plants receiving the corresponding boron feeding through the sandstone, and whereas some of the latter were free of brown heart as may be seen in Figure 3, yet there was brown heart present in every root of a sprayed plant. It is possible though that a stronger spray solution or more frequent sprays would give just as excellent results as were obtained by feeding through the roots.

For the development of any plant it has always been considered that adequate amounts of nitrogen, phosphorus, and potassium, calcium and magnesium were essential. This is in the main true, but a recent deficiency or starvation experiment with turnips has indicated the positive necessity of potassium in conjunction with nitrogen for the development of this crop. Furthermore, the balance between nitrogen and potassium, as with several other crops, appears to be of primary importance.

Excess feedings of nitrogen in the presence of small amounts of potassium have resulted in small root development. Deficient nitrogen, either in the presence or absence of abundant potassium, has resulted in decreased size of root. Deficient feedings of phosphorous have also resulted in decreased size about equal to that obtained from a nitrogen deficiency. Actual starvation for phosphorus permitted a considerable root development, while actual starvation of potassium resulted in the development of a root stock only, with a few fibrous feeding rootlets (see Figure 4). The elimination of magnesium or calcium from the feeding mixture did not

(*Turn to page* 41)

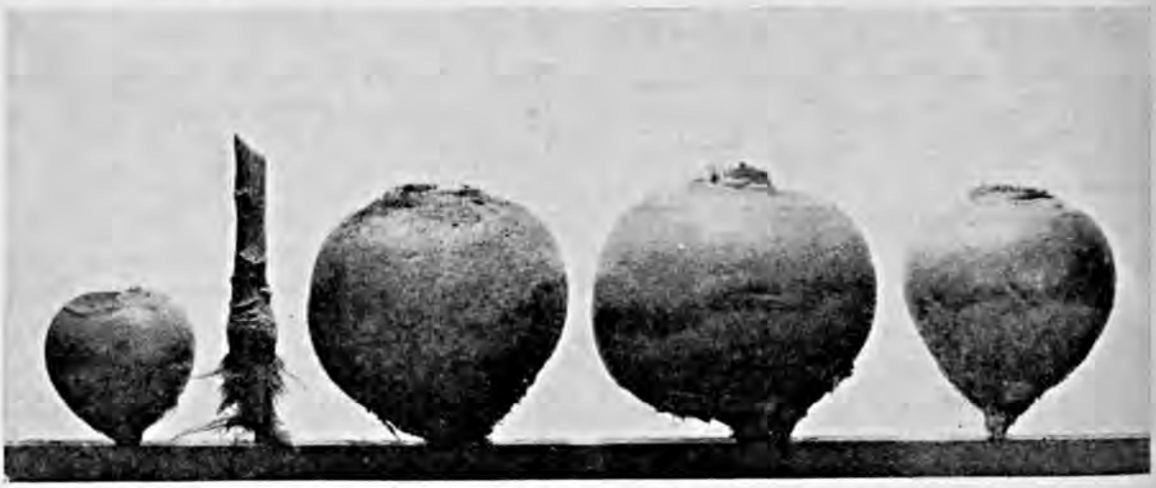

Fig. 4—Showing the effect of deficiencies of certain elements on turnip roots. From left to right, lacking phosphorus, lacking potassium, lacking magnesium, lacking calcium, and lacking half the normal supply of potassium.

Hooking a big one like this makes waiting worth while.

Make Your Fish Pond Pay Dividends

By Dr. Ross E. Hutchins

State Plant Board, State College, Mississippi

IN THIS country there are thousands of fish ponds varying in size from mere puddles to large lakes. Few of these are managed in such a manner as to produce the maximum amount of fish. The average pond owner seems to be under the misapprehension that all a fish needs is water to swim in. This, of course, is anything but true, just as it is not true that all a cotton plant needs is some dirt to grow in regardless of the soil elements contained therein.

Pondfish culture is a complex subject, and volumes have been written about it, no two of which agree in all respects. There are, however, some general principles which might well be considered. It should be understood that the fish pond can be made a paying proposition if managed properly, not only from the standpoint of pleasure and satisfaction, but of actual food value as well. The time and money it necessitates are usually little when compared to the results.

First let us consider the pond, or rather the area where the pond is to be. A large majority of the smaller ponds, especially in the South, are rain ponds depending for their water supply upon rain in the immediate vicinity. The area selected should have as large a watershed as possible, then

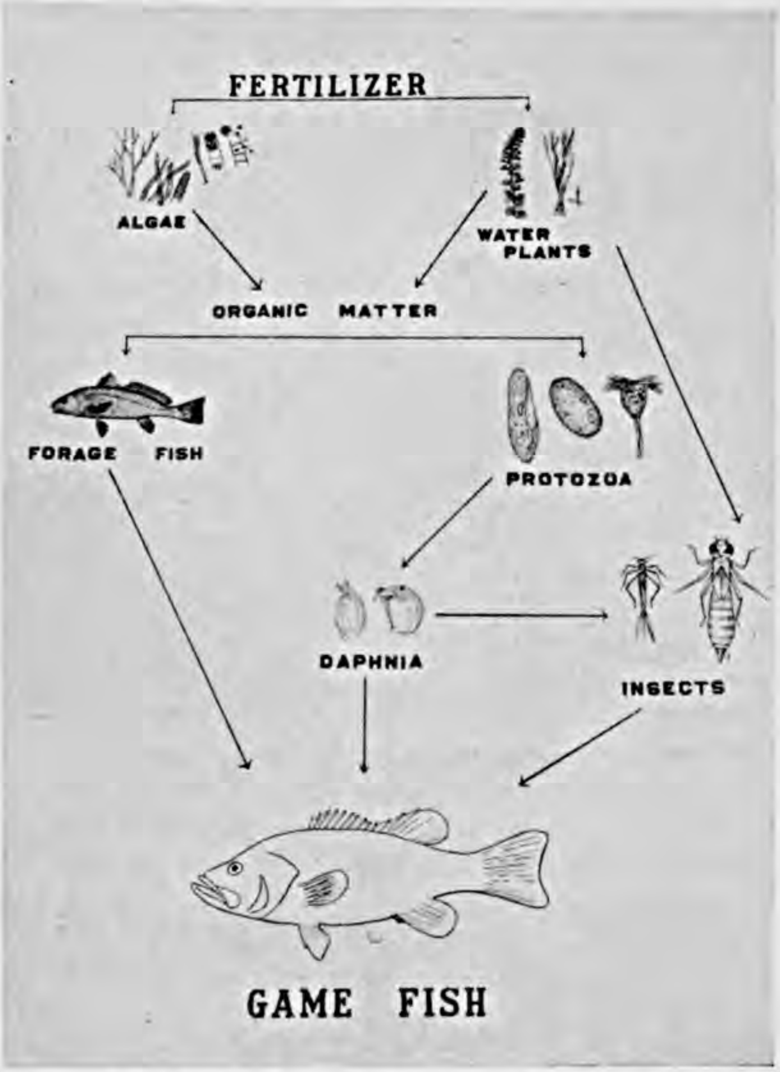

Diagram showing how pond fertilizers are transformed into fish.

too the cost must be considered, and the dam located where as little work and materials as possible are required. Generally speaking, a pond to be truly successful should be at least 1 acre in area and should have a general slope toward one point where a drain pipe is located. This drain pipe is very important, yet in the writer's experience very few ponds are so equipped. An easy means of drainage is desirable because it is often necessary to remove the water to destroy undesirable or predacious fish, or for the control of aquatic vegetation.

The pond at its lowest point should be at least 5 feet deep, so that during hot weather the fish can seek the cool depths. Much of the area under water should be relatively shallow, as it is in the shallow water that most of the fish food is produced. When vegetation dies and sinks to the bottom in deep water, it is more or less lost; but when it is deposited in water only a foot or so in in depth, it is fed upon by countless kinds of microscopic organisms which are in turn fed upon by fish.

This brings us to the subject of fish food, and a very important phase of fish culture it is, too. It is always best to provide natural food for fish rather than to feed artificially. In the fish pond there are very definite cycles of life going on. Many forms of plant life grow in the water from microscopic algae to larger floating vegetation. These plants die and are fed upon by bacteria, which in turn form the food of single-celled animals called protozoa. Now these protozoa are devoured by small crustacea called water fleas, and fish, especially the minnows, feed on the water fleas as well as organic matter.

Let us now go back to the beginning—the plants—again. What do they feed upon? Like all plants they manufacture their own food with the aid of sunlight, but in this process certain mineral elements are absolutely necessary. Just as cotton will not grow on worn-out land where no fertilizer has been applied, so these aquatic plants will not grow in water not containing the necessary foods. These are chiefly nitrogen, phosphorus, and potassium, and are the same elements as in commercial fertilizers used on farm lands. This fact was strik-

(*Turn to page 39*)

Growing Tomatoes With Chemical Fertilizers

By Victor A. Tiedjens

New Jersey Agricultural Experiment Station, New Brunswick, New Jersey

THE old question whether high yields of tomatoes can be grown with chemical fertilizers is always before us. The answer, however, is not always so evident. Occasionally one finds a grower who has grown better crops with chemicals than with manure. In the days of abundant manure the question did not have the importance it has today, because many growers have not used manure for a number of years. Some have been more successful than others. There are certain plant-food materials absolutely essential to a good crop of tomatoes, and manure has some of each of these ingredients in proportions that are suitable for the crop under average soil conditions. As a result growers who have used manure have fared better than those who have used only chemical fertilizers. Many growers who have substituted all the manure with chemicals have not fared so well, not because chemicals will not produce the results, but because they have not substituted all the elements carried in manure.

Yields and quality of tomatoes are closely associated with the amount and kind of plant-food material available in the soil on which they are grown. If it takes a certain amount of plant-food material to produce a

This picture illustrates the growth made by tomato plants when shifted from a complete nutrient solution when 8 inches high to one having one of the elements left out as indicated. Left to right: lacking calcium, nitrogen, potassium, phosphorus, magnesium, and a complete solution.

10-ton crop of tomatoes and that amount is not available in the soil, then the grower must supply the missing material or take a smaller yield. That seems an easy accomplishment, but if the average yields are any criterion of how well the grower has supplied the missing material he has done a poor job, because yields and quality are too low to pay for the fertilizer, to say nothing of his other expenses. What then is the difficulty?

Manure Not Enough

There are, of course, weather conditions, such as rain and wind storms, which destroy a large percentage of the crop and which have nothing to do with crop fertilization. Dry weather in certain localities reduces yields each year. Insects and diseases likewise take their toll. However, such agencies take a heavier toll of poor fields than good fields. This leaves us with the conclusion that growers have not supplemented the manure with the right kinds of chemicals.

Many cultural practices may affect yields adversely. Poorly grown plants set too late in the season, or not cared for after they are set, will not produce a good crop with the best kind of fertilizer. However, we are safe in saying that a soil well prepared and properly fertilized will go a long way to minimize the harmful effects brought about by weather conditions or unsatisfactory cultural practices. Plants growing on a "growth supporting soil" will make a rapid comeback even when whipped and soaked by an August storm of a week's duration which growers often experience in the tomato areas of New Jersey. Fields improperly fertilized fail to recover following these deluges. What then is a substitute for manure?

A 10-ton application of manure to an acre of ground would supply approximately as much nitrogen, phosphoric acid, and potash as would be supplied in 1 ton of 5-3-5 mixed fertilizer, provided fresh manure, including liquids, is put on the soil. If the manure was exposed to rains, much of the nitrogen and potash may have been lost, so that the figure might be a 3-3-2. However, there are still some advantages in this manure. It is in such a form that it is not all available to the plants at any one time. It becomes available as the plants need the food material. If soil moisture reaches a low level, only a small amount of salt is present in the soil, and the effect of dry weather is minimized.

Manure has other ingredients. It has calcium in large quantities. It has magnesium, sulphur, boron, manganese, iron, copper, and many other materials. So one might ask, how far has the grower gone in substituting all these plant-food materials with chemicals which he formerly supplied with manure?

Soil Test Helpful

The quick soil test has come to the aid of the grower in determining the level of the various essential elements needed by the tomato plant. By standardizing such tests with crop growth it has been possible to set up arbitrary standards or requirements for the various crops. Growers can determine how closely they have substituted nutrients by means of chemicals for those formerly supplied in manure. The organic matter added to the soil in manure must not be overlooked.

A soil survey, showing plant-nutrient levels on a number of farms in one county in New Jersey where much of the soil is of a sandy nature, showed that more than 60% of the farms were too low in calcium, phosphorus, potash, organic matter, and nitrogen to support even a low yield of tomatoes or other vegetable crops. This survey also showed that those growers who had obtained good yields of tomatoes had fertility levels of high calcium, medium phosphoric acid, and medium to high potash readings with an organic matter content above

2%. Furthermore, some of these growers were getting good yields with all chemical fertilizers and no manure. What, then, is a good substitute for manure? We must do more than supply a substitute for the ingredients in manure. We must supply those ingredients so that plants have access to them as they do with manure.

Many tomato fields on the lighter soils in New Jersey made an excellent growth early during the past season, but stopped growing rather suddenly. There was plenty of moisture in the soil due to a number of fairly heavy rains. Where the fertilizer was applied previous to setting the plants, the moist weather made it possible for the plants to take in abundant plant food, with the result that they became very soft and succulent. Apparently the available nitrogen which had not been used by the plants was removed from the vicinity of the roots through leaching by the heavy rains, with the result that the plants suddenly stopped growing and in many cases showed nitrogen and potash deficiency smyptoms.

Where the fertilizer was applied in several applications as side-dressings, this condition did not occur. Apparently on the lighter soils, it is necessary to feed according to rainfall because nitrogen and potash do seem to be leached away, and unless it is replenished the plants show the effects of deficiency very quickly, particularly if the weather turns hot and dry. Irrigation does not help much unless more fertilizer is applied.

Soil fertility surveys on farms in certain localities indicate that growers are trying to grow tomatoes with insufficient lime. Calcium and magnesium are as necessary as nitrogen, potash, and phosphates for the growth of a big tomato crop. If lime has not

(*Turn to page* 44)

Showing the effect of too little potassium on tomatoes. As soon as the fruit was formed on the plant on the left, which received 5 p.p.m. of potassium, the leaves began to show deficiency symptoms, while the plant on the right which received 50 p.p.m. of potassium, never showed these symptoms.

The Committee on
Fertilizer Application
Meets in Chicago

RESEARCH work has shown that the proper placement of fertilizer, in relation to the crop, is of the utmost practical importance if maximum returns are to be secured from the use of the necessary fertilizers. With changes in the use of fertilizer, new problems of application are coming up for solution. In 1937, experiments were conducted in 28 states. By no means, however, have the answers been secured to all the problems of fertilizer placement confronting the farmers today.

It was, therefore, with considerable interest that the National Joint Committee on Fertilizer Application held its thirteenth annual meeting on November 29 in Chicago. The meeting was well attended by visitors and cooperators from most of the states where fertilizers are used. Following the report of the general secretary, the scope of fertilizer placement research activities in 1937 was reported. Following this were reports on methods of fertilizing fruits, experiments comparing granular and ordinary fertilizer, improvements in fertilizer distributing machinery, experiments involving the plowing under of fertilizers, comparison of fertilizer distributors, and a summary of fertilizer placement experiments on specific crops. Topics on extension work, publicity, and future work, concluded the program.

The committee has been working on the problem for many years, starting with hand placement of fertilizers. In 1929, however, due largely to the cooperation of Mr. G. A. Cumings and his staff of the U. S. Bureau of Agricultural Engineering, experiments in the machine application of fertilizers were inaugurated. This work has been conducted every year since, giving records of nine years of field work with the machine applications.

In view of the importance of this subject, the report of the committee is given here. Complete reports on the topics discussed will be made available in the near future.*

SCOPE OF FERTILIZER PLACEMENT RESEARCH ACTIVITIES —1937

Fertilizer placement research activities increased greatly during the 1937 season; major changes have occurred in the research programs; and further progress has been made in the survey of available fertilizer distributing machinery. These three features briefly cover the progress made by the committee in 1937, and are used as the outline of this report.

(1) Volume of Research Activities Increased.

Fertilizer placement studies have been continued for nine years, the volume of work increasing each year. In 1929 four experiments on cotton and corn were started in three states. In

*Reports will be compiled by the General Secretary of the Committee, H. R. Smalley, 616 Investment Bldg., Washington, D. C.

1931 studies on potatoes and beans were added. In subsequent years the list of machine-placement-of-fertilizer experiments has been gradually increased, until in 1937, 119 experiments were conducted at 62 locations in 28 states on 22 crops: alfalfa, lima, snap, string, wax and white beans, cabbage, cauliflower, celery, collards, corn, cotton, kale, lettuce, onions, blue grass pasture, peanuts, peas, Irish potatoes, sweet potatoes, soybeans, spinach, sugar beets, tobacco, tomatoes, and wheat.

The continued expansion of the work is shown in the table below and the location of current and past experiments on the map following. Among these experiments are several in which the trial of fertilizer depositing equipment was the primary consideration.

(2) Major Changes in the Research Program.

An important purpose of this report is to call to your attention the major changes that have occurred in the research program, which are three:

(a) The increased number of placement experiments already noted.

(b) The recent inclusion of granular fertilizers.

(c) Emphasis on more profitable placement studies; that is, having established side placement as among the best practices, how can this method be modified to secure still better results. Also, as on cotton, different methods of obtaining side placement.

Amplifying these three topics somewhat, the majority of the older experiments were continued, but because in some cases the work had progressed far enough and was no longer found to be necessary, the experiments were discontinued on potatoes in Maine, New Jersey, and Ohio; on Henderson bush lima beans in Maryland and Virginia, and on carrots in New York. Also there was some reduction in the number of experiments on corn in Indiana.

Out of the total of 119 experiments in operation in 1937, 48 on fertilizer placement and 9 on fertilizer particle size in combination with placement have not been previously reported. In most cases these new studies were inaugurated in 1937, but a few were

MACHINE APPLICATION OF FERTILIZER EXPERIMENTS
1929 TO 1937

Year	Number of States	Number of Locations	Number of Experiments	Crops
1929	3	4	4	Cotton, corn
1930	2	4	4	Cotton, corn
1931	13	19	23	Cotton, corn, *potatoes, beans*
1932	21	29	36	Cotton, corn, potatoes, beans, *sugar beets*
1933	19	33	37	Cotton, corn, potatoes, beans, sugar beets, *tobacco*
1934	19	40	54	Cotton, corn, potatoes, beans, sugar beets, tobacco, *tomatoes, cabbage*
1935	16	39	50	Cotton, corn, potatoes, beans, sugar beets, tobacco, cabbage, tomatoes, *peas, kale, spinach*
1936	16	41	68	Cotton, corn, potatoes, beans, sugar beets, tobacco, tomatoes, cabbage, peas, kale, spinach, *carrots, celery, onions*
1937	28	62	119	Cotton, corn, potatoes, beans, sugar beets, tobacco, tomatoes, cabbage, peas, kale, spinach, onions, *cauliflower, celery, collards, pastures, alfalfa, lettuce, peanuts, sweet potatoes, soybeans, wheat*

previously in progress but were not on the records of the committee. Your subcommittee, with other members of the Joint Committee, have been instrumental in organizing most of the new projects.

Some of the newer work is on the same plan in a number of states. For convenience these are called "general studies." Among such was a study with blue grass pasture in Indiana, Michigan, and Ohio, and on alfalfa in Michigan. Investigations were undertaken with sweet potatoes in Delaware, Maryland, and Virginia. In these experiments various placements of fertilizer were obtained by means of special fertilizer depositing equipment.

Another study of a general nature covers the comparisons of different sizes of fertilizer particles in connection with placement and was conducted with cotton in North Carolina, South Carolina, and Georgia, with potatoes in Michigan, New York, and Virginia, with tobacco in Pennsylvania, and with peas in New York.

Other projects not previously reported are as follows: alfalfa in Vermont, Fordhook lima beans in Georgia and California, cabbage in Virginia, cauliflower in New York, collards in Virginia, corn in Illinois, Kentucky, North Carolina, Iowa, and California, cotton in Alabama, lettuce in Arizona, onions in Texas and Virginia, peanuts in North Carolina, peas in Wisconsin, potatoes in New Hampshire, West Virginia, and Montana, soybeans in Ohio and Mississippi, tomatoes in Massachusetts, and wheat in Illinois.

Several of the previous investigations have been expanded and they now cover additional experiments with celery in New York, cotton in North Carolina, and sugar beets in Colorado.

New Fertilizer Equipment. In addition, the new studies include the study in South Carolina of commercial equipment for applying fertilizers to cotton; the studies in Montana and South Dakota relative to grain drill fertilizer equipment; the study in Ohio of fertilizer depositors combined with vegetable seeders; and the study in Montana of liquid phosphoric acid

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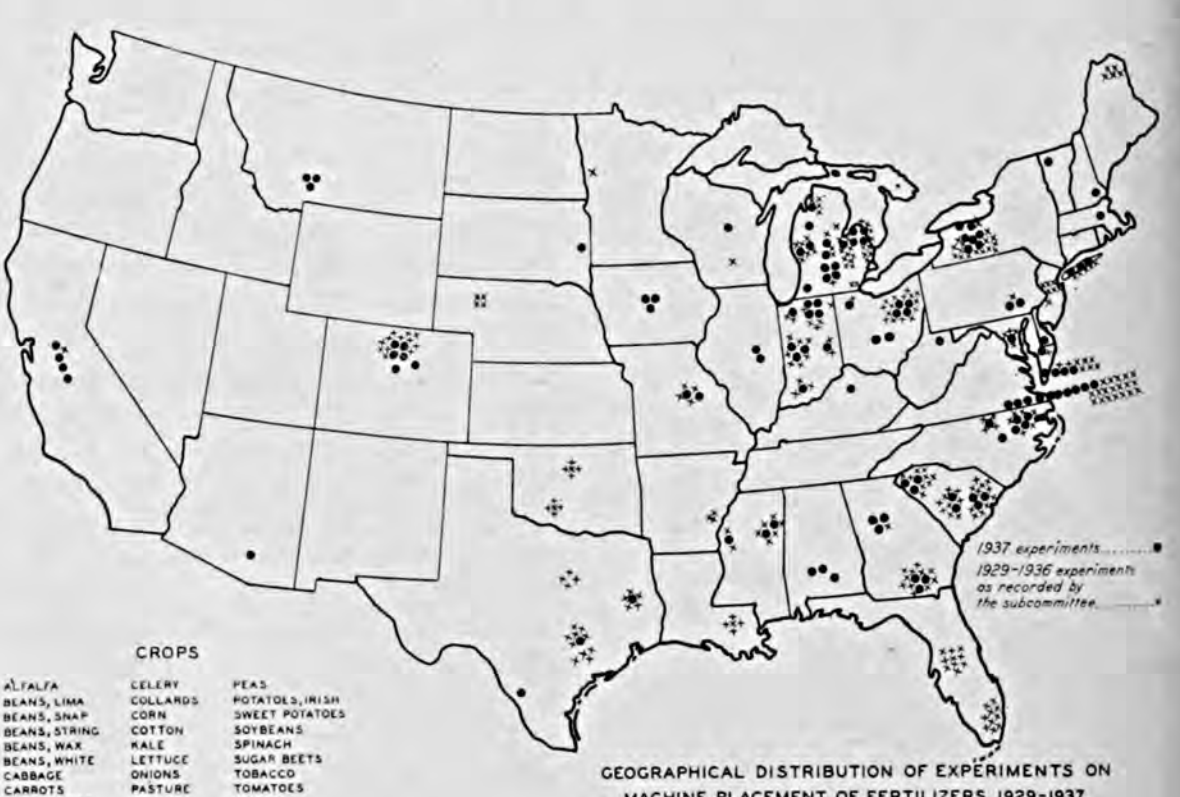

GEOGRAPHICAL DISTRIBUTION OF EXPERIMENTS ON MACHINE PLACEMENT OF FERTILIZERS 1929-1937

This fine harvest of Johnson grass hay grew on a Black Belt farm in Dallas County.

Crops & Fertilizers in The Black Belt Section

By L. O. Brackeen

Editor, Agricultural Extension Service, Auburn, Alabama

EXTENDING nearly across the middle of Alabama and almost one-third across Mississippi from east to west lies a section of land known as the Black Belt, sometimes referred to as the "Prairie Belt," and at other times as the "Clover Belt." It covers part or all of 11 counties in Alabama and 12 counties in Mississippi, and is known as the Black Belt because of its fertile, black soil and not because of its dense negro population.

Before boll-weevils hit it several years ago, the Black Belt was a leading cotton section, easily producing a bale of cotton per acre. Since that time it has been pointed to as an excellent livestock-producing area, growing excellent hays, pastures, and legumes. It also is a leading honey-bee section, shipping more honey-bees and queens into northern United States and Canada than any other similar area in the United States.

Many statements, some true and some false, have been written and spoken about its black, fertile soils, its once extensive cotton fields, its potential possibilities as a livestock-producing section, its aristocracy, and its dense negro population, but until recently, very little was known about the crops and fertilizers best adapted to its peculiar soils.

Seven years ago the Alabama Experiment Station established the Black Belt sub-experiment station at Marion

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Mississippi "Sweets" Need More Potash

By F. J. Hurst

Extension Editor, Mississippi State College, State College, Mississippi

THE value of potash in increasing yields of marketable sweet potatoes was impressively demonstrated in 1937 in field tests conducted by county agents and the state extension horticulturist in cooperation with growers in 14 Mississippi counties.

The fertilizer tests formed part of a 5-year program inaugurated by the Mississippi Extension Service and the Mississippi Experiment Station. The purpose of this program was the development of sweet potatoes as supplementary cash crop in areas where they were being grown on a commercial scale by improving the quality and increasing the yield of marketable potatoes through the use of approved cultural, harvesting, and marketing methods.

The program was organized in 5 areas embracing 14 hill counties. Under the plan each producer agreed to plant a minimum of 2 acres, and each community not less than 25 to 50 acres to assure production in carlot quantities.

The extension horticulturist prepared recommendations for growers covering soil selection, fertilizer usage, disease-free plants, and other cultural practices in an attempt to secure economical production of high quality potatoes.

The fertilizer tests were conducted on 18 farms in 14 counties. This report summarizes the data on 15 of these tests in which the potatoes were graded into No. 1 and No. 2 grades. In three of the tests the potatoes were not graded. For that reason, the data on these tests are omitted.

In the tests each farmer planted one acre on which he applied the kind and amount of fertilizer he commonly used in growing sweet potatoes, while on a second acre he added muriate of potash at the rate of 200 pounds per acre, except in one instance in which only 100 pounds were used. Most of the growers used from 400 to 800 pounds of 4-8-6 or 4-8-8 on the check acres.

Increased Yield

The value of potash on the great majority of the farms in the tests is seen in the average increase of 60.1 bushels of sweet potatoes per acre when 200 pounds of muriate of potash were added to the regular fertilizer. The average yield on the test farms from the regular potato fertilizer was 228.1 bushels per acre; the average yield when 200 pounds of muriate of potash were added was 288.2 bushels per acre.

Yields on some of the farms were low because the plants were set late and the crops suffered from drought during the latter part of June and during July and August. There was a slight decrease in yields from the potash plots in three of the tests. The decreases were on Susquehanna clay loam soil in the flatwoods section of the state, which is a very poor type of soil and ordinarily does not respond to potash fertilizer.

The increase in production resulting

from the addition of potash to the regular fertilizer was not the only gain obtained. The increase in production was largely a gain in production of No. 1 potatoes. Of the 900.8-bushel total increase on the potash plots, 727 bushels were No. 1, and 171 bushels were No. 2 potatoes.

Results of Tests

L. R. Brown, Bogue Chitto, produced 487 bushels on one acre, the highest yield in the tests. The potatoes were grown on Ruston silt loam soil. The check plot, fertilized with 600 pounds of 4-8-6, yielded 354 bushels. The use of 600 pounds of 4-8-6 and 200 pounds of muriate of potash produced 487 bushels, an increase of 133 bushels per acre. The potash added $66.50 to the value of the crop at 50 cents per bushel.

G. B. Northington of Belmont produced 452.6 bushels per acre for the second highest yield. Mr. Northington planted his potatoes on some of the best hill lands in the state. He used 800 pounds of 4-8-8 per acre on the check plot which yielded 419.8 bushels. The potash plot produced 452.6 bushels, an increase of 32.8 bushels. However, there was an increase of 63 bushels in No. 1 potatoes, showing the effect of the added potash on the quality of potatoes produced. It is interesting to note also that the plants in this test were not set until the first week in June. The yield doubtless would have been higher if the plants had been set earlier. The plants were set 10 to 12 inches in the drill in 3-foot rows.

Using 200 pounds of muriate of potash and 400 pounds of 4-8-6, W. A. Whitten of McCool made 393.8 bushels per acre, the third largest yield. The addition of potash in this test gave an increase of 115.2 bushels per acre, the second highest increase in the tests, and an added value of $57.60.

One of the best returns from the use of potash was obtained by W. D. Massey, Carthage. The application of 400 pounds of 4-8-8 gave him a yield of 227.7 bushels. But the acre which received 400 pounds of 4-8-8 and 100 pounds of potash produced 342.4 bushels, a gain of 114.7 bushels per

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A sample of sweet potatoes from Mr. Northington's extra-potash plot showing the remarkable set and uniformity.

In 1938--Better Farming And Better Country Life

New Year Resolutions

As suggested by A. B. Bryan

Clemson Agricultural College, Clemson, South Carolina

1. *Resolved:* that I will think beyond the present year in planning and executing my farming business.

2. *Resolved:* that having planned my work, I will work my plan so that I will not reap merely "a harvest of barren regrets."

3. *Resolved:* that I will follow wise George Washington's advice to "keep an account book and enter therein every farthing of receipts and expenditures."

4. *Resolved:* that I will not stake everything in one cash crop, whether it be cotton, wheat, corn, or something else.

5. *Resolved:* that realizing that a worn-out soil means a worn-out man, I will not rob my farm of its fertility.

6. *Resolved:* that I will raise home supplies to the fullest extent consistent with my land and conditions.

7. *Resolved:* that I will market as much of my farm produce as possible in the form of livestock.

8. *Resolved:* that if I swear at all I will swear at scrubs and swear by purebreds.

9. *Resolved:* that I will not expect other farmers to produce feeds for my livestock.

10. *Resolved:* that I will buy more farm machinery and make better use of it to enable me to save time for more work and more leisure.

11. *Resolved:* that I will terrace all of my land that needs terracing and will build up the waste places.

12. *Resolved:* that I will save money and time by taking better care of my farm machinery, tools, implements, and my livestock.

13. *Resolved:* that I will fertilize my crops intelligently and liberally for more economical returns from each acre.

14. *Resolved:* that I will plant more legumes and cover crops to help maintain the fertility of my land.

15. *Resolved:* that I will read and think more this year and thus learn to help reduce the high cost of ignorant farming.

16. *Resolved:* that I will provide more conveniences and comforts for the farm and home to make it more livable and more attractive for my family and my friends.

17. *Resolved:* that I will make the premises more beautiful by paint, shrubbery, trees, and flowers.

18. *Resolved:* that I will treat my woodland as a "field" and my growing timber as a "crop" and so "farm" it as to get needed timber and fuel by such handling as will improve and not injure the woodland.

19. *Resolved:* that I will join my neighbors in cooperative marketing to provide orderly sale of my crops and help prevent glutted markets.

20. *Resolved:* that I will be generous with any good farming ideas which I have by passing them on to my neighbors.

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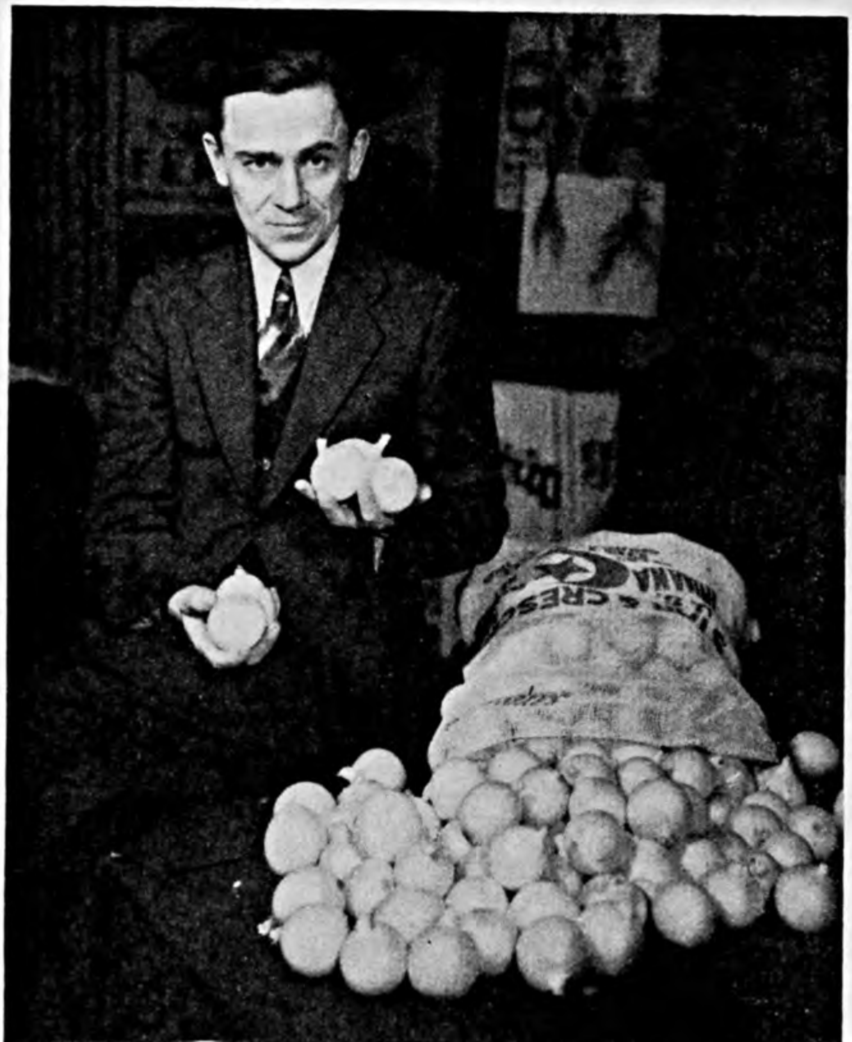
PICTORIAL

RAY HANSON, 1937 NATIONAL CORN HUSKING CHAMPION, SHOWS HIS STYLE IN THE CORNFIELD.

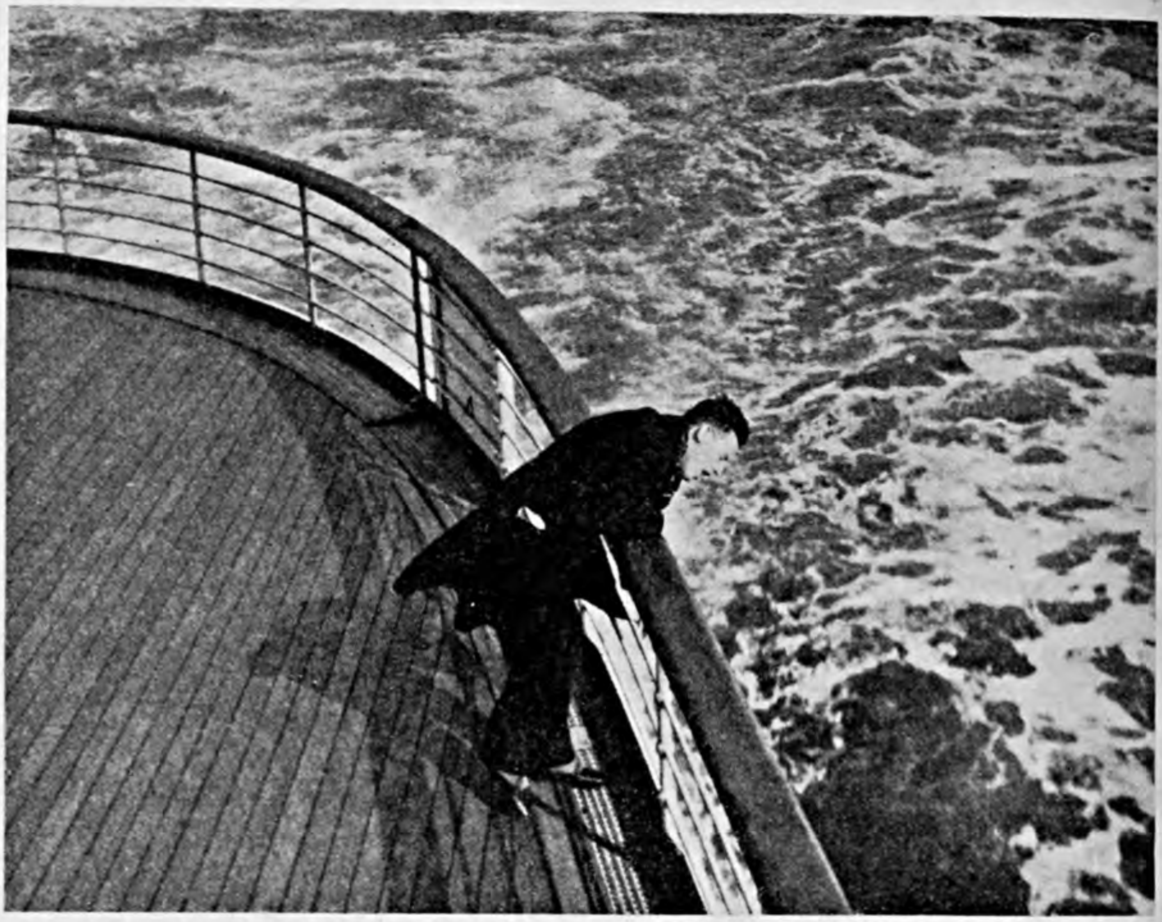


Perry Ort, Churubusco, Ind., displays a sack of Southport White Globe Onions which won 1st place in the Commercial Class at the Northern Indiana Muck Crops Show at Kendallville. He grew 70 acres of onions and used 500 lbs. of 3-16-24 fertilizer per acre.

A. F. Stephens, Agricultural Agent for the B. & O. Railroad, presents the trophy to the Champion Vegetable Judging team from Lowell, Ind. (left to right) Coach J. E. Little, Kenneth Duncan, Howard Holtz, Dick Keithley, and Jerome Echterling.

Beauty reigns annually at the Muck Crops Show. Edythe Franze, of Kendallville, Ind., Queen of the 1937 show, is pictured with her two attendents, Dona Belle Metz (left), of Albion, and Analdine Pike (right) of Hudson.

Potatoes like these justify the cost of labor and fertilizer expended in their production. This sack of Katahdins, exhibited by Louis Ruderman, of Auburn, received 1st prize in the Commercial Pack Class at the Muck Show.



Above: Three guesses—what is the difficulty?

Below: When it's scallop time in Nova Scotia.

The Editors Talk

Looking Backward

Nearly everyone of importance has written or talked about practically every phase of economics in the past quarter. The views expressed are about as varied as the viewers. Opinions vary from the theory that our economic planners face a hopeless task to the conclusion that there is no real depression and thus no task for the social economist to perform.

At any rate, it sometimes appears that nearly everyone has become so engrossed in the cross-currents of the present trend that they have overlooked the accomplishments of the past year and the fundamental facts which undoubtedly will chart our economic course in the future.

Depression or no depression farmers are scheduled to chalk up the highest cash income they have received in seven years and the greatest purchasing power in many years. Farm income is expected to reach the 8 7/10 billion mark for this year, about 15 per cent under 1929 but equivalent to more than the 1929 figure in terms of goods farmers can buy.

One feature of this year's farm record is the fact that the increase in income is not due to drought or artificially reduced production, but rather to extremely favorable weather and increased production at prices high enough to compensate the grower. Many point to the increase in cotton production and the resultant drop in cotton prices as an indication of a weakened economic position. In one sense the cotton situation may be considered as an example of the resistance of our present economic structure to bearish influences. The world supply of American cotton is expected to reach the unprecedented figure of 25,000,000 bales in the 1937-38 season. The farm price has averaged about 8 cents. In the 1931 season American production reached 17,000,000 bales, and world supplies of American Cotton were in the neighborhood of 25,000,000 bales but prices dropped to an average of 5 7/10 cents per pound for the year. In the following year with production down to 13,000,000 bales and supplies still large, farm prices averaged 6 5/10 cents. The farm value of the cotton crop in 1931 was $556,051,000 and in 1932 $483,901,000. This year the farm value of the crop will probably reach $895,000,000, about $40,000,000 less than 1936, but when the $130,000,000 in subsidy payments are added the total will exceed 1936 by nearly $75,000,000. Hardly comparable to the situation during the two forementioned depression years!

Probably the most fortunate of all farmers are the tobacco producers. After a rather bad start early in the season the tobacco crop, enhanced by favorable weather, made splendid progress and stands to produce an income for the growers in the neighborhood of $260,000,000, approximately $35,000,000 more than last year.

Even though there has been an appreciable decrease in wheat prices, production in most areas more than offset the lower prices, and the purchasing power of this year's crop will exceed last year's short crop by nearly 33 per cent.

The corn belt farmers have harvested a bumper crop which is selling at greatly reduced prices on the cash market. However, this should cause no serious alarm, as long as live-stock prices remain at their current favorable levels. It is estimated that nearly 90 per cent of the crop is consumed on farms and little more than 15 per cent of the crop ever leaves the county in which it is produced. Ordinarily about 40 per cent of the crop is fed to hogs. The cash income from the corn crop thus depends to a large extent upon the prices received for live stock. In view of the ample supplies of feed, corn-belt farmers are winding up the year in a very favorable position.

With the increased income in the farmers' pockets and the larger purchasing power which it has brought, it is hard to understand how the country can go into an economic tail spin that cannot be checked before we crash into another depression. True it is that industrial activity has dropped about 20 per cent within the last quarter, but there are no figures that show that the consumers' purchases have fallen in any such proportion. For the year as a whole we are ahead of 1936 in nearly every department. Still it is said 1937 will end in a recession. Maybe our psychology is wrong. Who knows?

The Value of Farm Records

December is the month to bring out and go over the farm records and accounts of the year drawing to a close. Only with a clear picture of the results of the plans so carefully made at the beginning of the year, which only conscientiously kept records can provide, will the most intelligent programming for the next year be made. The past year's records should be studied with the idea of improving upon profitable practices and discarding those which have proved unprofitable.

Many State Extension Services are this month particularly emphasizing the value of farm records. "If production has been low and has been due to improper cultivation, planting, fertilization, or pest control, a farmer can change his operations for better results," says the Florida Extension Service. "If the quality of his products has been low and prices have been none too high as a result of this, he can take measures to produce higher quality crops. If his returns have been low because of inefficient marketing operations, he can get together with other farmers and try to work out a system that will increase his income and the income of his group."

The Minnesota Extension Service reports several instances of benefits which farmers derived from keeping farm records. One farmer, by increasing the acreage of his sugar beets and sweet corn, eliminating his hog enterprise and increasing his poultry, stepped up his earnings $1,400 per year. Another farmer increased his returns over feed from hogs by $1,051 in 2 years, after adopting swine sanitation. "While these cases illustrate how farmers have used records to increase their earnings," the Service explains, "records alone do not accomplish results. They do, however, reveal facts which make it possible for farmers to follow more profitable practices."

Farmers as a rule do not like too much "book work." However, they should be encouraged by all farm advisers in the keeping of at least fairly accurate accounts and records and inventories. There is a value in these records accruing beyond that to the personal advantage of the individual farmer. Each farm is in reality a test plot for the community. No test plot attains its full purpose unless its records disclose the feasibility of the practices involved.

REVIEWS

This section contains a short review of some of the msot practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

A broad understanding as to the nutritive demands of apple trees is derived from New Jersey Agricultural Experimental Station Bulletin 626, entitled "Nutrition of Apple Trees," by M. A. Blake, C. T. Nightingale, and O. W. Davidson. This publication contains a wealth of constructive information concerning the effects of various nutrient deficiencies upon the growth of apple trees, and suggests sound principles of orchard nutrition. Adding to the wide usefulness of the contents are the colored illustrations denoting the definite symptoms of nutrient deficiencies in the apple leaves. The controlled investigations included detailed studies of tree responses to a complete nutrient solution in which all essential elements were supplied in proportions favorable to good growth and other treatments, each with respective deficiencies of calcium, magnesium, nitrogen, phosphorus, and potassium, but having all other essential elements.

It is to be realized that numerous factors must be considered in order to properly interpret the plant-food needs of orchard trees. Therefore, considering that practical use of the fundamentals of nutrition involves the soils, their natural fertility, seasonal conditions, moisture supply, temperature, light, stage of growth of the trees, and varietal properties, it is little wonder that many problems associated with this important phase of commercial orcharding exist. It is a common knowledge that a great majority of commercial apple orchards in New Jersey as well as other Northeastern States, are located on soils that are not very fertile. The authors point out that theories and recommendations of orchard fertilization have too often been founded upon observations and data accumulated under local and exceptional environmental conditions. They state that it is unfortunate that such views and recommendations too often have received general interpretation and application.

Since the days of Dr. Voorhees, Director of the New Jersey Experiment Station from 1893 to 1911, this station has consistently recommended complete fertilizers for fruit trees as a basic principle. Voorhees maintained that a fundamental of successful orchard practices was to make sure that all of the necessary nutrients were present in the soil in the proper proportions. He believed that it was a sound practice and good insurance to be liberal in the use of such nutrients as calcium, phosphorus, and potassium, rather than to run the risk of a deficiency, and to apply nitrogen according to the needs of the tree. Apple trees do not thrive well unless the soil is moderately fertile, with a proper balance and an adequate supply of nutrients and organic matter. That the fundamental principles of orchard fertilization advocated by Voorhees more than 40 years ago were sound, has been proven by subsequent research and the wide adoption of orchard fertilization practices based on the specific nutrient requirement of individual orchards. This bulletin might well be regarded as a memorial to Voorhees as an individual and a challenge to sane thinking in the planning of a sound orchard fertility program wherever fruit trees are grown.

Liberal quantities of plant food are necessary for tomato production, according to Bulletin 676 of the Cornell (N.Y.) Agricultural Experiment Station, "Tomato Fertilizer Experiments on Long Island," by J. D. Hartman, Paul Work, and P. H. Wessels. This reports the results of 5 years' extensive work with tomato fertilizers. The data obtained from these experiments will provide fundamental facts governing the most economical fertilizer application for tomatoes to be grown on a number of soils on Long Island. The results showed that a basic application of about 50 pounds of nitrogen, 150 pounds of phosphoric acid, and 60 pounds of potash per acre should be used for tomato production on Sassafras silt loam and soils of similar properties. When any one of these nutrients was omitted from the fertilizer, the yields were greatly reduced. Since the soils of Long Island vary widely, the bulletin states local conditions must be taken into consideration in applying the above or any other recommendations. Additional nitrogen as a side-dressing may often prove profitable on lighter soils, for instance, and liming soils for tomatoes may favor indirectly the value of cover crops. The suggestions offered in this publication may be applicable for market tomatoes on similar soils elsewhere than on Long Island.

"Fertilizer Recommendations," Agr. Ext. Serv., Newark, Del., Inform. Card 36, Oct. 1937, C. A. McCue, Director.

"Potash and Phosphorus in Relation to Organic Matter in New York Orchards," New York State Agr. Exp. Sta., Geneva, N. Y., Bul. 679, Sept. 1937, R. C. Collison.

"The Agricultural Value of Specially Prepared Blast Furnace Slag," Agr. Exp. Sta., State College, Pa., Bul. 341, Mar. 1937, J. W. White, F. J. Holben, and C. D. Jeffries.

"Effect of Superphosphates in Conserving Nitrogen in Cow Manure," Agr. Exp. Sta., Burlington, Vt., Bul. 419, Apr. 1937, A. R. Midgley and V. L. Weiser.

Soils

"The Liberation of Plant Nutrients from the Soil as Affected by Alfalfa" is the title of Virginia Agricultural Experiment Station Technical Bulletin 60 by H. H. Hill. The investigations conducted in this work included the determination of the percentage of soil moisture, the accumulation of nitrate nitrogen in the soil, soil reaction under the different methods of treatment, the amount of water leached from 2-foot lysimeters, reaction values of the leachings, and the outgo of nitrate nitrogen together with the several plant nutrients carried away in the leachings from the soil treated with green and mature alfalfa. The experimental results presented cover a 4-year period with the employment of 14 lysimeters. The results showed that alfalfa added to the soil reduced moisture losses by bringing the soil into a good crumb structure and by increasing the amount of collodial material which retains water. Nitrification was found to be very active when the alfalfa was used either as a mulch or incorporated with the soil. Slight increases in soil acidity were observed immediately after the organic matter was applied, but it is significant that the acidity increases were only for a short duration. The soil treated with green alfalfa, mulched or turned, showed less nitrate in the leachings than when it received the corresponding treatments with mature alfalfa. The author found that the treatments with green alfalfa gave greater leaching values for calcium than any of the other plant nutrients. The magnesium outgo from the soil treated with organic matter was considerably greater than from the soil left in a fallow condition. Soil treated with organic matter showed substantial losses of potassium. In general, the incorporation of alfalfa in the soil or applied to the surface soil as a mulch results in an increased loss of plant nutrients as shown by analyses of the leachings. It is stated, however, that if a growing crop is present, these losses may be largely avoided by the utilization of the nutrients by the crop.

"Liming Kansas Soils," Agr. Exp. Sta., Manhattan, Kans., Cir. 185, Sept. 1937, H. E. Myers, A. L. Clapp, and F. E. Davidson.

"Colloidal Properties of Soil Organic Matter," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 267, Oct. 1937, L. D. Baver and Nathan S. Hall.

"Loss of Plant Nutrients From Peat Soil," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Mem. 206, July 1937, B. D. Wilson and E. V. Staker.

"Combining Heat and Formaldehyde for Soil Treatment," Agr. Exp. Sta., State College, Pa., Bul. 348, May 1937, Kenneth G. Beachley.

"Reducing Soil Erosion Losses on Pennsylvania Farms," Agr. Ext. Serv., State College, Pa., Cir. 191, Aug. 1937, J. B. R. Dickey and Frank G. Bamer.

"Chemical Composition of Soils of Texas," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 549, July 1937, G. S. Fraps and J. F. Fudge.

"The Effects of Certain Lime Materials on the Leachings from Frederick Silt Loam Soil," Agr. Exp. Sta., Blacksburg, Va., Tech. Bul. 61, Sept. 1937, W. B. Ellett and H. H. Hill.

"Soil Survey of McDuffie County, Georgia," U. S. D. A., Washington, D. C., Ser. 1931, No. 28, Aug. 1937, G. L. Fuller and A. H. Hasty.

"Anchoring Farmlands in the Ohio Valley Region," U. S. D. A., Washington, D. C., Soil Conserv. Serv., Region 3, 1937, J. S. Cutler.

"Soil and Water Conservation in the Northern Great Plains," U. S. D. A., Soil Conserv. Serv., Region 9, 1937.

"The Nichols Terrace, an Improved Channel-type Terrace for the Southeast," U. S. D. A., Washington, D. C., Farmers' Bul. 1790, Oct. 1937, Jerome J. Henry and M. L. Nichols.

Crops

A number of pertinent queries concerning the growing of winter legumes in Louisiana are logically answered in Circular 171 of the Louisiana Agricultural Extension Division, entitled "Winter Legumes—Today and Tomorrow," by R. A. Wasson. The combined planting of vetches, Austrian winter peas, bur clover, and Melilotus Indica in this State in 1936 amounted to approximately 200,000 acres, or an increase of 60 per cent over the previous season's planting. It is expected that an additional 100,000 acres of winter legumes will be planted this fall. Only 80 per cent of the winter legumes planted could be called successful. The principal causes of failures given are improper inoculation, planting too late, failure to plant deep enough, poor drainage, and grazing during the growing period. Lack of proper liming and fertilization might well have been included by the author, judging from observations and frequent reports received.

The information in the circular is presented mostly in a question and answer form. These are simple statements which will clarify 25 common questions bothering most farmers. The concluding question, or the 26th, answers itself: "Had one rather look upon bare, unsightly cotton, corn, and cane fields from October to April, realizing that these soils are getting more unprofitable and uncertain each year; or isn't it far better for everyone to look upon dark-green, luxuriant acres of winter legumes, pleasing to the eye, beneficial to the soil and a dependable guarantee of larger yields and greater profits?"

The author recommends that phosphates and potash should supplement the cover crop for succeeding crops. On upland soils it is advised that the phosphate and potash fertilizers be used ahead of the cover crop, so that its growth will be increased and its success more certain.

A noteworthy publication stressing the characteristics of 24 kinds of our major potted plants and their culture is G. H. Poesch's Ohio Agricultural Experiment Station Bulletin 587, "Greenhouse Potted Plants." The bulletin is based upon the best accepted commercial practices in producing plants of the highest quality, together with the results of several years' experimental work at the experiment station and the Ohio State University.

Proper equipment and arrangement should be given much thought and planning for the economical production of potted plants. Successful management after the equipment requirements have been taken care of involves considerable attention to watering and syringing, ventilation, temperature, soils and their reaction, fertilizers, symptoms of nutrient deficiencies, environmental grouping of plants and the like. Placing of seedlings or larger plants in pots and shifting plants from one size container to another entails much skill. These operations are said to be the most important mechanical phases in the commercial pot range.

Directions that facilitate acquiring the soil and fertilizer needs of the various pot plants are easily interpreted in the tables included in this publication. It is impossible to produce good-quality plants without supplying the proper nutrients in the soil. Nitrogen, phosphorus, and potassium are used by the plants in large amounts, and are, consequently, often lacking. A number of the minor elements are essential and should be supplied for proper plant growth when they are not contained in the ordinary fertilizer mixtures.

The best results obtainable may be had by following the simple formula of knowing plants, their requirements, and their enemies. A few rules for this formula include having a good-textured soil with sufficient nutrients applying fertilizers when light is abundant so that the necessary processes of food manufacture within the plant can take place, using concentrated fertilizers when the soil is moist and the plants are turgid, and taking caution against over-fertilization. Frequent nutrient tests of the soil to correlate the results with the condition of the plant before applying the fertilizer is another good rule, as is also the determination of soil acidity. Manure should be used only if it is well-rotted, its primary function being as a soil conditioner rather than a fertilizer. The author points out some generalizations which many plants exhibit when certain nutrient deficiencies appear. Definite deficiencies of the different nutrients are usually noted by the color of foliage, size and texture of stem and leaves, abnormal flowers, condition of root systems, and growth of plants.

"Chemical Investigations of the Tobacco Plant VI. Chemical Changes That Occur in Leaves During Culture in Light and in Darkness," Agr. Exp. Sta., New Haven, Conn., Bul. 399, Aug. 1937, Hubert Bradford Vickery, George W. Pucher, Alfred J. Wakeman, and Charles S. Leavenworth.

"Factors Affecting Easter Lily Flower Production in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 312, Aug. 1937, William B. Shippy.

"Power in Soil Conserving Crops," Agr. Ext. Serv., Athens, Ga., Cir. 273, Apr. 1937, E. D. Alexander.

"House Plants and Their Care," Agr. Exp. Sta., Manhattan, Kans., Cir. 184, Sept. 1937, Walter B. Balch.

"Soybeans and Cowpeas in Kentucky," Agr. Ext. Service., Lexington, Ky., Cir. 292, Mar. 1937, E. J. Kinney.

"Commercial Strawberry Growing in Kentucky," Agr. Ext. Serv., Lexington, Ky., Cir. 295, Apr. 1937, W. W. Magill.

"The Lespedezas in Kentucky," Agr. Ext. Serv., Lexington, Ky., Cir. 297, May 1937, E. J. Kinney, Ralph Kenney, and E. N. Fergus.

"Legumes in Cropping Systems," Agr. Exp. Sta., Lexington, Ky., Bul. 374, Aug. 1937, George Roberts.

"Annual Report for the Year Ended December 31, 1936," Agr. Ext. Serv., Lexington, Ky., Cir. 300, May 1937.

"Fifty-second Annual Report of the Maine Agricultural Experiment Station, 1935-1936," Agr. Exp. Sta., Orono, Maine.

"A Histological Evaluation of Low Temperature Injury to Apple Trees," Agr. Exp. Sta., Orono, Maine, Bul. 388, Aug. 1937, F. H. Steinmetz and M. T. Hilborn.

"The Massachusetts Commercial Vegetable Grower," Agr. Ext. Serv., Amherst, Mass., Vol. 1, No. 7, Nov. 1937.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. 20, No. 2, Nov. 1937.

"Duluth Bush Fruits Thru Three Seasons (1934-1936)," "Duluth Field Crops Thru Three Seasons (1934-1936 inclusive)," "Duluth Hay Crops Thru Three Seasons (1934-1936 inclusive)," "Duluth Orchards Thru Three Seasons (Jan. 1937)," "Duluth Rutabagas Thru Three Seasons (1934-1936 inclusive)," "Duluth Sunflower Tests Thru Three Seasons (1934-1936 inclusive)," and "Duluth Vegetable Crops Thru Three Seasons (1934-1936)."

Agr. Exp. Sta., University Farm, St. Paul, Minn., Mimeo. Summary of An. Rpt. of Northeast Exp. Sta., M. J. Thompson, Supt.

"The Composition of Corn Fodder Grown in Drouth Years," Agr. Exp. Sta., Columbia, Mo., Bul. 390, Oct. 1937, L. D. Haigh and A. G. Hogan.

"Biochemical Studies of Photoperiodism in Plants," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 268, Oct. 1937, A. E. Murneek.

"A Research Program, The Forty-third Annual Report of the Montana Agricultural Experiment Station, July 1, 1935 to June 30, 1936," Agr. Exp. Sta., Bozeman, Mont., F. B. Linfield, Director.

"Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1936," Agr. Exp. Sta., Reno, Nev., 1937.

"Comparative Physiology of Actinomyces in Relation to Potato Scab," Agr. Exp. Sta., Lincoln, Nebr., Res. Bul. 92, Aug. 1937, Mitrofan M. Afanasiev.

"The Influence of Various Soil Factors Upon Potato Scab Caused by Actinomyces Scabies," Agr. Exp. Sta., Lincoln, Nebr., Res. Bul. 93, Aug. 1937, R. W. Goss.

"Annual Blugrass (Poa annua L.) and Its Requirements for Growth," Agr. Exp. Sta., New Brunswick, N. J., Bul. 630, Sept. 1937, H. B. Sprague and G. W. Burton.

"Intensive Pasture Management," Agr. Exp. Sta., New Brunswick, N. J., Bul. 633, Sept. 1937, C. B. Bender.

"Apple Measles," Agr. Exp. Sta., State College, N. Mex., Bul. 251, June 1937, R. F. Crawford.

"Greenhouse Potted Plants," Agr. Exp. Sta., Wooster, Ohio, Bul. 586, Sept. 1937, G. H. Poesch.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXII, Nos. 188 and 189, Sept.-Oct. 1937 and Nov.-Dec. 1937.

"The First Fifty Years of the Oregon Agricultural Experiment Station 1887-1937," Agr. Exp. Sta., Corvallis, Oreg., Sta. Cir. 125, Aug. 1937.

"Filberts," Agr. Ext. Serv., Corvallis, Oreg., Ext. Bul. 503, Apr. 1937, C. E. Schuster.

"Orchard Soil Covers," Agr. Ext. Serv., Corvallis, Oreg., Ext. Bul. 506, Aug. 1937, O. T. McWhorter, E. R. Jackman, and Arthur King.

"Growing Strawberries in Pennsylvania," Agr. Ext. Serv., State College, Pa., Cir. 181, Mar. 1937, J. Lupton Mecartney.

"Potato Grading," Agr. Ext. Serv., State College, Pa., Cir. 190, Aug. 1937, R. B. Donaldson and J. B. R. Dickey.

"Vocational Interests of Rural High School Pupils in Pennsylvania," Agr. Exp. Sta., State College, Pa., Bul. 342, Mar. 1937, C. S. Anderson.

"More Dollars for the Cotton Bale," Agr. Ext. Serv., Clemson, S. C., Cir. 158, Sept. 1937, C. V. Phagan and B. E. G. Prichard.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 354, Nov. 1937.

"West Virginia Pastures: Type of Vegetation, Carrying Capacity, and Soil Properties," Agr. Exp. Sta., Morgantown, W. Va., Bul. 280, June 1937, W. H. Pierre, J. H. Longwell, R. R. Robinson, G. M. Browning, Ivan McKeever, and R. F. Copple.

"Corn Production on the Campbell County Experiment Farm," Agr. Exp. Sta., Laramie, Wyo., Bul. 223, Sept. 1937, Paul K. Thompson.

"Report of the Secretary of Agriculture, 1937," U. S. D. A., Washington, D. C., Henry A. Wallace, Secretary.

Economics

During the coming months farmers and business men will plan their operation for 1938. In order to provide a sounder basis for such planning, representatives of the State agricultural colleges and the Bureau of Agricultural Economics, U. S. D. A., cooperate in preparing an annual outlook report for agriculture. In view of the current talk of another recession this year's report is especially interesting.

The prospects for agriculture during the coming season point to a fairly well-maintained economic condition. The domestic demand for farm products in 1938 probably will not be quite so favorable as it has been during the past year, but it is noted that conditions during the second half of the year probably will be better than in the first half. In spite of effects of military operations in the Orient and elsewhere, the foreign demand for American farm products may show some slight improvement. The general level of wholesale prices in the United States is expected to follow a downward curve and average slightly lower in 1938 than in 1937. Farm prices also are expected to follow the same course, and prices received by farmers will be on the average lower than last year.

In contrast to the expected decrease in wholesale prices, costs of production are expected to show some increase, and because of this, farmer demands for short-time credit will probably be greater than during 1937. The supply of funds for this purpose apparently will be ample, and interest will be at low rates. The increase in cost will be due largely to higher wages, increasing prices of building materials, machinery, and possibly fertilizer.

The cotton situation has taken on an entirely different aspect since the beginning of the current season (August 1). At that time the world was carrying the smallest stock of cotton in 7 years. The world carry-over of American cotton had declined by about 700,000 bales, more than off-setting a 400,000-bale increase in the carry-over of foreign cotton. However, favorable weather, improved cultural methods, and other factors have resulted in the largest American crop on record, which means that the supply of cotton for the current season is the largest that has ever been recorded. The production of commercial cotton in foreign countries in 1937-38 is expected to total about 20,000,000 bales, or around 1,800,000 larger than the previous year's crop which was the record high up to that time, and is about an 84% increase over the average between 1928 and 1932. The increase in the foreign crop has largely occurred in China, Russia, Brazil, India and Egypt.

The level of mill activity in the United States, Japan and China is expected to fall off somewhat during the coming season, while on the other hand, increases are anticipated in Europe, India, and possibly a few other countries. World consumption of cotton is expected to attain the levels of 1936 and 1937.

In view of the anticipated carry-over and the world cotton situation, American cotton producers should use a great deal of caution in next year's plantings.

While the American wheat growers have been able to sell a fairly large crop on a strong market during the past season, the export situation may not be so favorable in the year beginning next July. World wheat acreage is still large, and with average yields the prospects are for lower prices next season.

The fortune of the tobacco growers rests largely in their own hands. In other words, the tobacco situation depends largely upon the ability of the growers to keep their 1938 production from getting out of line with consumption.

The outlook in the fruit industry is for heavier production, especially in the citrus belt. In view of this, it is indicated that the citrus producers should not expect much improvement in the prices of their product. However, the apple, pear, and peach growers may enjoy some improvement in prices. It is noted that the increase in citrus production in recent years has tended to offset the declines in apples and grapes. Strawberry production is likely to be larger in 1938 than it was in 1937. The October reports indicated an acreage for picking about 12 per cent larger than last season, and beds are reported to be in good condition in most areas, with the largest increase occurring in the intermediate States, late States, and second early States, with only a 3 per cent increase in the early States.

Another large output of commercial truck crops is expected for next year with a possibility of lower prices. The sweet potato acreage is expected to be increased, and with average yields a large crop will be produced and sold at a lower price. The acreage of truck crops has been increasing since about 1919, and during most of the period prices have tended downward. Apparently vegetable production has been taking the place of field crops in many cases where the latter have proved unprofitable, and the point has been reached now where growers should exercise careful thought to the higher cost and greater risks involved before shifting to commercial vegetable crops. The acreage planted to white potatoes in 1938 is expected to be about the same as planted this year, and in view of the lower prices received during the past season, the acreage in the early and intermediate States may be decreased somewhat, which will probably be offset by slight increases in the late States. If present acreage intentions are carried out and average yields are recorded, the crop in 1938 will be about 365,000,000 bushels, or about 2 per cent below the average, and 9 per cent less than the crop of last season. Based upon prospective demand conditions, a crop of this size would result in prices and returns to growers somewhat larger than received for the large crop harvested in 1937.

The feed outlook is more favorable from the standpoint of the livestock producers than it has been in recent years. A much larger supply of corn and other feed grains than last season is on hand, whereas the number of animals to be fed is smaller. Larger quantities of mill feed will be available, and the hay crop is ample with exceptions of parts of the West.

Hog supplies will be smaller, but the weights will be heavier during the next season. The pig crop will probably be larger in 1938, and increases in slaughter supplies will begin to show by the end of next year in 1939. With more feed on hand, larger numbers of well-finished cattle will come to market in 1938, with a likelihood of some decline in these prices. The number of cattle at the beginning of next year is expected to be slightly smaller than this year and will probably represent a low point in the cycle of cattle production. Lamb feeding has increased, and more feed lambs will come to the market this winter than last. There probably will be fewer sheep and lambs from sources other than feed lots. It is not anticipated that the country as a whole will see any marked change in the sheep numbers during the next few years. This winter is expected to be a fairly favorable one for the dairyman, with prices of dairy products up somewhat and feed cheap. The short-time dairy outlook is favorable, and the longer-period outlook is moderately favorable.

Agricultural conditions during the coming year are expected to average from about the same as 1937 to slightly below. In general, however, it does not appear that we should anticipate any marked agricultural recession.

Deviating somewhat from the usual procedure in the Annual Report of the Secretary of Agriculture to the President, Secretary of Agriculture Wallace has set forth what he feels the past 5 years have demonstrated in the way of economic principles. In the words of the Secretary, "Federal legislation has given expression both to agricultural and to urban group-solidarity. Something more, however, remains to be done. It is necessary to obtain in legislation not only a more effective expression of various group interests, but also more adequate recognition of the interdependence of the major economic groups."

The report begins with "an analysis of the community of interest that exists between farmers and city dwellers," for it is "on this foundation . . . that we can begin to build security for the farmer and consumer." It is impossible, over the long run, for any economic advantage to accrue separately to either agriculture or to city dwellers, since the prosperity of one must be dependent in a large measure upon the relative prosperity of the other. A decrease in the purchasing power of the farmer results in a narrower market for industrial products and loss of work to the wage-earners, whereas extremely high agricultural prices without corresponding increase in consumer purchasing power results in a loss of market for agricultural products, which operates to the disadvantage of the farmers in the long run. Thus, extremely high wages are contrary to the long-time interest of wage earners; at the same time, very high farm prices are contrary to the best, long-time interest of agriculture. It is of utmost importance that the agricultural program be based upon principles that will add to the general welfare rather than simply promote limited farm objectives.

It is the opinion of the Secretary that it is time for the farmers of the United States to "begin to build for the longer future." The nation is better equipped today, with the experience of the Agricultural Adjustment Act and the Soil Conservation Act to draw upon, to devise "a farm program that will keep the agricultural industry on an even keel." "This program must guard against shortages as well as surpluses. Our agricultural supply situation is very different now from what it was 4 or 5 years ago. Supplies of most foods and feeds are not excessive, and the continued assent of consumers to farm programs designed to give farmers a fair and stable income will depend on the willingness of the farmers to produce enough to keep the granaries full." It is on this principle that the theory of the "ever-normal-granary" is based. It will provide benefits not for the farmers alone but for industry and labor as a whole. The principle probably will work with the greatest degree of usefulness on corn and wheat. However, in a different manner it may be applied to cotton.

"This year's large production of wheat, corn, and cotton has reemphasized the necessity for a permanent crop-adjustment policy. It is again obvious that in years of normal weather our farmers can produce more of certain leading products than the market will absorb at prices remunerative to the growers." This truth was lost sight of temporarily as the result of the droughts of 1934 and 1936, but again we are aware of the fact that we are dependent upon an export market to absorb a considerable proportion of our cotton, tobacco, wheat, hog products, dried fruits, and many other commodities.

"The great problem is to discover how adjustment may promote balanced expansion, so that labor, capital, and natural resources can be employed and at the same time conserved." A suggested formula runs as follows: "Our national economic goal must be increased balanced production of the things that people really need and want (1) at prices low enough so that consumers can buy but high enough so producers can keep on producing, (2) with income so distributed that no one is shut off from participation in consumption, except those who refuse to work, (3) with scrupulous regard for the conservation of our remaining natural resources, and (4) by means characteristic of our traditional democratic processes."

In commenting on the current cotton situation and the marked expansion in foreign production, the Secretary points out that "among the forces that have stimulated the consumption of foreign at the expense of American cotton . . . must be included the disposition of cotton-consuming countries to buy cotton where they could sell manufactured goods in exchange. This country's high tariff made it practically impossible for them to do so here. Accordingly, as supplies became available they turned to Brazil, Africa, and India for larger quantities." It became more profitable to grow cotton than to grow coffee in Brazil and grains in India, Egypt, and Argentina. Relief for the cotton farmer must include an adjustment of our foreign trade policies. In the case of cotton the ever-normal-granary type of loan may not be exactly applicable, since in some circumstances it is best to move the supplies at a loss rather than allow them to accumulate. It may be necessary, if we are to minimize the effect of low world prices, to continue the use of some sort of adjustment payments.

Under land planning it is noted that the fundamental purposes in land policy are: "(1) To maintain the income of farmers from efficient, properly adjusted production; (2) to improve the land-tenure system and give land operators more security in their jobs; and (3) to safeguard resources."

"A Sociological Analysis of Relief and Non-Relief Families in a Rural Connecticut Town," Agr. Exp. Sta., Storrs, Conn., Bul. 219, July 1937, Nathan L. Whetten and Walter C. McKain, Jr.

"Quarterly Bulletin," St. Bd. of Agr., Dover, Del., Vol. 27 No. 2, for Quarter Ending June 30, 1937.

"Minnesota Farm Business Notes. Using records to Increase Farm Earnings," Agr. Ext. Serv., St. Paul, Minn., Mimeo. 179, Nov. 20, 1937, Roland C. Bevan.

"Farmers' Cooperative Marketing and Purchasing Associations in Missouri," Agr. Exp. Sta., Columbia, Mo., Bul. 389, Sept. 1937, Edward G. Schiffman and Herman M. Haag.

"An Analysis of Montana Farm Prices," Agr. Exp. Sta., Bozeman, Mont., Bul. 345, Aug. 1937, P. L. Slagsvold.

"Economic Benefits of Irrigation from the Kingsley (Keystone) Reservoir," Agr. Exp. Sta., Lincoln, Nebr., Bul. 311, Oct. 1937, Frank Miller and H. C. Filley.

"An Economic Study of Land Utilization in Steuben County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca. N. Y., Bul. 674, June 1937, W. E. Keepper.

"An Economic Study of Land Utilization in Rensselaer County, New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 675, June 1937, R. S. Beck.

"The Farm Business from 1929 to 1935 on One Hundred Forty-one Ohio Farms," Agr. Exp. Sta., Wooster, Ohio, Bul. 587, Oct. 1937, J. H. Sitterley and J. I. Falconer.

"Philadelphia Wholesale Fruit and Vegetable Markets," Agr. Exp. Sta., State College, Pa., Bul. 349, May 1937, R. B. Donaldson.

"Dairy Farm Organization and Management in Southeastern Pennsylvania," Agr. Exp. Sta., State College, Pa., Bul. 350, May 1937, Thew D. Johnson and J. E. McCord.

"Commercial Fertilizers in 1936-37," Agr. Exp. Sta. College Station, Brazos County, Tex., Bul. 553, Aug. 1937, G. S. Fraps, S. E. Asbury, and T. L. Ogier.

"A Description of the Agriculture and Type-of-farming Areas in Texas," Agr. Exp. Sta., College Station, Brazos County, Tex., Bul. 544, June 1937, C. A. Bonnen and B. H. Thibodeaux.

"Commercial Fertilizers," Agr. Exp. Sta., Burlington, Vt., Bul. 426, L. S. Walker and E. F. Boyce.

"Farm Business," Agr. Ext. Serv., Burlington, Vt., Vol. 4 No. 5, Oct. 1937.

"Cotton Used in Tire Fabrics," U. S. D. A., Washington, D. C., Mimeo., Oct. 1937, R. J. Cheatham and A. Mason DuPre', Jr.

3-Galactosidylcyanidin Puts Red in Apple Skin

IF AN apple has 3-galactosidylcyanidin it blushes. If it merely has 3-galactosidylquercetin it is usually yellow. Chemical tests by United States Department of Agriculture workers indicate that 3-galactosidylquercetin is present in yellow apples such as the Grimes Golden variety, but this particular substance is not identical with or responsible for the yellow color that we see. In red varieties the unseen coloring matter is acted upon chemically and changed to red idaein, which is a simpler name for 3-galactosidylcyanidin. They have not yet identified the conditions that cause this change from yellow to red.

Color in apples is important to growers and to consumers. For the grower there is the practical advantage that well-colored apples are not nearly so subject to injury by storage scald as are apples in which the color is imperfectly developed. Buyers have a decided preference for well-colored apples, whether they are yellow or red, and are willing to pay higher prices for them. There is good reason behind the preference. For the consumer, good color is a practical and easy guide to selection of good ripe fruit.

The chemical changes that are essential to the formation of good color are the changes that are also required to bring fruit to maturity and to develop flavor, aroma, and palatability. This research does not compare the merits of yellow apples and red apples. It does bear out the popular idea that to be good, red varieties ought to be red and yellow varieties yellow.

Clover Not a Field Crop Until After Revolution

ALTHOUGH mention of red clover is found in early colonial history, it probably was not until after the Revolution that farmers planted it as a forage, hay, and soil-building crop, according to records in the Bureau of Plant Industry.

An early history of Pennsylvania (about 1730) reports that little seed of any grass was sown, as the plow seldom was used to prepare for meadows; that red and white clover were propagated only by manure. But clover had been introduced before that. It was reported in the fields of Long Island in 1679. In 1749 it was growing on the hills and in the woods of New York.

From the early history of Virginia it is obvious that the production of hay was not of any great importance. Agriculture centered about tobacco. New lands were sought rather than methods of improving worn-out soils.

Future Is Promising for Healthier Plants

PLANT disease specialists are first to admit great gaps in their knowledge of the young science of breeding disease resistance into plants. But in spite of this, what they do know has proved valuable. Dr. G. H. Coons, of the United States Department of Agriculture, estimates that 17 crops are worth about $66,000,000 a year more because disease resistant varieties have replaced older varieties. He regards this estimate as conservative. In 1935 disease resistant varieties were growing on more than 55,000,000 acres—more than a quarter of all the acreage in these 17 crops. Some of the more conspicuous examples of gains from disease resistance are found in wheat, flax, sugarcane and sugar beets, lettuce and cantaloupes. In the sugarcanes and flaxes new varieties account for practically all the acreage. Improved lettuce and cantaloupes are used almost exclusively because diseases had made the old varieties worthless.

Plow Pleased Webster More Than Public Life

DANIEL WEBSTER was a firm believer in deep tillage. A century ago, convinced that plowing was too shallow, Webster developed a plow 12 feet long from the tips of the handles to the tip of the beam, with a share 15 inches wide, according to records in the Bureau of Agricultural Engineering. The plow was designed to turn a furrow 12 to 14 inches deep. Eight oxen pulled it.

Webster was delighted with his plow, and wrote: "When I have hold of my big plow . . . in a brush covered pasture and hear the roots crack, see the stumps go under the furrow out of sight, and observe the clean, mellow surface of the land, I feel more enthusiasm than comes from my encounters in public life in Washington."

Thomas Jefferson, too, was interested in plows. His proposal to have all plow moldboards made on the same pattern has been called "an era in agriculture and the root of all real progress" in manufacturing plows. Prior to this a farmer usually bought the wooden parts of his plow from a plowwright and had the iron parts put on by a blacksmith, neither of whom seemed to know what the other had in mind.

Alfalfa Meals Supply Vitamin A for Chickens

GROWING chickens need some form of vitamin A to make satisfactory growth. Birds allowed to range about the farm during the growing season usually pick up sufficient quantities of green feed, but birds confined or unable to get green feed should have some feed that is rich in vitamin A, say poultry specialists of the United States Bureau of Animal Industry.

Alfalfa-leaf meal is one of the most economical sources of vitamin A, when all feeds must be purchased, and may serve as the sole source of this vitamin for growing chicks. Other common sources of vitamin A, in addition to green feeds, are yellow corn and milk.

The percentage of alfalfa-leaf meal required in a diet, which contains no appreciable quantity of vitamin A from other sources, depends on the ability of that diet to support growth when vitamin A is adequately supplied and on the vitamin A potency of the alfalfa-leaf meal itself. This potency is influenced by factors such as the method of preparation, variety, soil, weather, and cutting. Of these, the first is by far the most important.

The best criteria of an alfalfa-leaf meal's vitamin A potency are: Age, color, and "brightness." Unfortunately, it is seldom possible for the purchaser to ascertain the age of the meal he buys. Although the color of an alfalfa-leaf meal is a fairly good index of the meal's vitamin A content, the potency decreases more rapidly than the greenness of the meal changes.

Although as little alfalfa-leaf meal as 1.5 per cent of the total ration may supply an adequate quantity of vitamin A to maintain chicks in good health and enable them to grow, it is unwise to depend on less than 5 per cent of an alfalfa-leaf meal of unknown potency.

Make Your Fish Pond Pay Dividends

(*From page* 12)

ingly brought out by a study in Illinois which showed that the abundance of fish in ponds was directly correlated with the price of the farm land—the price, of course, being directly dependent upon land fertility.

From the above it is evident, then, that the average fish pond should be fertilized. The amount and kind of fertilizer used will depend upon the fertility of the surrounding land. If the soil is poor more fertilizer will be required. Fertilizers have been used in Europe for many years, and a great deal of experimental work has been done there. Wolgemuth reports that in tests extending over a period of 7 years, 1915-1921, the fish production in fertilized ponds always exceeded that in other ponds, and that during the years of 1918 and 1919 there was 100 per cent increase in the fertilized ponds. Fish culturists in Europe are pretty well convinced that it is a sound economical practice to use fertilizers for this purpose.

Fertilizer Requirements

There is, however, some difference of opinion as to what elements are most necessary. Naturally the type of fertilizer used will depend on the locality. Most experiments seem to indicate that best results are obtained when a complete fertilizer is used; i. e., potassium, phosphorus, and nitrogen. Experimental work done at Fairport, Iowa, in 1933 has shown that the production of black bass was increased 50 per cent through fertilization. The subject of pond fertilization is new and it is difficult to lay down definite rules. Usually, however, one can't go far wrong if the advice of county agents or agricultural demonstration agents is followed, since ponds usually require about the same type as would a garden.

Any good, complete fertilizer containing sufficient quantities of nitrogen, phosphorus, and potash may be used and should be applied at the rate of from 400 to 500 pounds per acre. The relative proportions of the above elements will, of course, vary with the fertilizer requirements of the region in which it is used. This material had best be used in the spring and early summer, and usually it is best to apply it in small amounts rather than all at once. If any fertilizer is used all at once there is danger of killing some fish because it causes a depletion of the oxygen supply. Then, too, if there is much seepage a great deal of the elements may be lost. It is probably best to scatter the material about the edges, so that rains will carry it in gradually.

It has already been mentioned that plants constitute an important link in the food cycle of fishes, but it should be understood that not all plants are desirable in fish ponds. Generally speaking the smaller, submerged plants are desirable because they furnish shade for the fish, escape cover for the fingerlings, and food for microscopic animals upon which fish feed. This is not so true of the larger plants, such as willows, bulrushes, cattails, etc. These plants take up much of the fertilizers placed in the water and also make the distribution of fertilizer difficult, since it is usually placed near the shore. Then, too, if a large amount of plant material dies and decays in the water the oxygen supply may be so depleted as to cause many fish to die. The latter is also true when too many algae die in the water as often happens in late summer, especially in ponds that are overstocked with fish.

Don't Overstock Pond

Right here is probably as good a place as any to call attention to the fact that a pond will support only so many fish. Most ponds will not yield more than about 50 black bass or about 100 sunfish or bream a year. The average is far less than this. The practice of obtaining countless thousands of fingerling fish a year from hatcheries and dumping them in small fish ponds is certainly a deplorable waste. A pond will support only so many, and the rest merely form food for the grown fish.

It might be well to consider what fish are most desirable in the farm fish pond. Generally speaking there are three which are outstanding in many respects. They are the large-mouth bass, warmouth bass, and the bluegill sunfish. The term bream is rather generally used and is applied to a great many members of the sunfish family, many of which make good pond fish. Care should be taken at all times to eliminate predacious fish, such as gar and grinnel or bowfins. If such fish are present already, the pond should be seined or drained to get rid of them.

Certain Elements Affect The Growth of Turnips

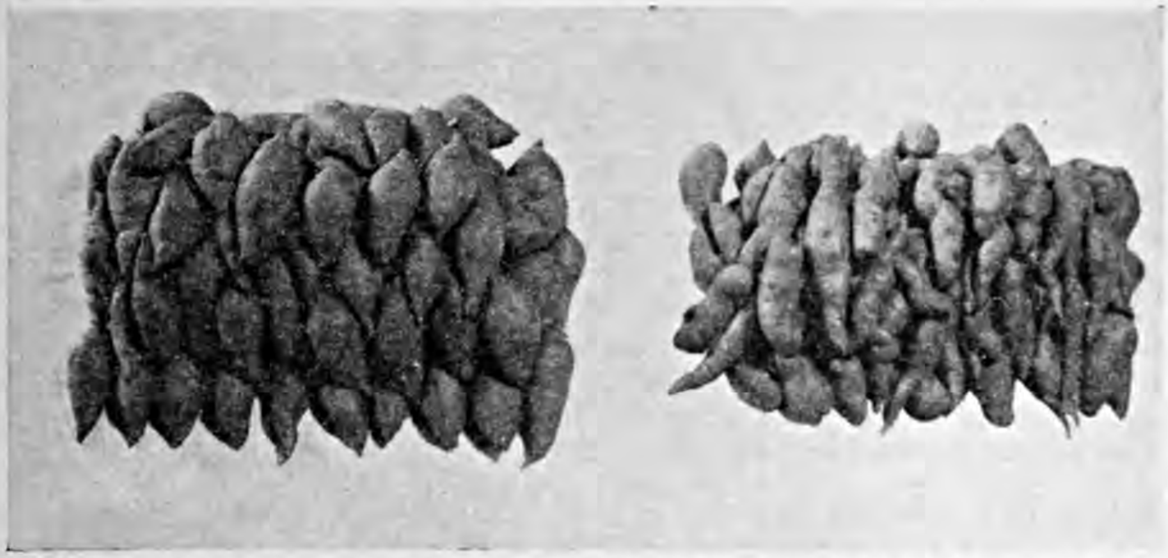
(*From page* 10)

apparently bring about a decrease in size of root development (Figure 4).

It would appear, therefore, that for the development of a satisfactory turnip, an adequate supply of nitrogen and potassium is the first or primary requisite, with phosphorus occupying a secondary but still important role, and calcium and magnesium a still less important position in the actual economy of the plant. Boron, as has already been pointed out, occupies a position of importance fully equal to that of nitrogen and potassium, particularly in the later stages of the plant's life.

Mississippi Sweets Need More Potash

(*From page* 21)



Left: High-quality sweets produced with extra potash. Right: poor type and low quality due to insufficient potash.

acre. The quality of the potatoes in this test was indicated by the fact that not a single Jumbo was found in the entire lot.

The tests were supervised by the county agents and Smith-Hughes teachers who directed the harvesting and attested to the weights and yields of the potatoes. S. W. Davis, assistant state extension horticulturist of Mississippi State College, also assisted in harvesting and weighing the potatoes.

In commenting on the tests, Mr. Davis said, "It appears that on most soils producers are using less potash than is necessary for securing the highest yields of marketable potatoes. Some soils did not respond to the added potash. These were very poor soils located in the flatwoods section."

Davis said he believed "these field tests are worthwhile and should be continued with a view of determining the potash limit for the most economical production of potatoes on soils that respond to potash and to determine definitely the soils that do not respond to potash."

Other growers who cooperated in

the tests included the following: C. H. Graves, Ackerman; Stanley Majure, Newton; E. L. Turner, Louisville; E. A. Brewer, McComb; A. C. Reeves, McComb; W. A. Boyd, Tylertown; R. E. Prestige, Summit; J. D. Fatherree, Bay Springs; J. C. Peeples, Eupora; T. S. Pigford, Kewanee; G. J. Hauser, Houston; H. E. Penick, Vardaman; G. H. Landreth, Vardaman; M. T. Cox, Smithville; Z. M. Ratliff, Sallis.

Some of the high yields obtained with increased yields resulting from added potash were as follows: Mr. Brewer, 300.3 bushels per acre, an increase of 42.8 bushels; A. C. Reeves, 287.7 bushels, a gain of 92.5 bushels; J. C. Peeples, 259.2 bushels, increase 109.5 bushels per acre; G. J. Hauser, 264.6 bushels, increase of 72 bushels; H. E. Penick, 275 bushels, a gain of 77 bushels; M. T. Cox, 257.7 bushels, an increase of 68.7 bushels.

Crops & Fertilizers in the Black Belt Section

(*From page* 18)

Junction, Ala., and an experimental field at Gastonburg, Ala., and now reports some of its findings. It has found that the area contains both lime and acid soils and that the different soil types require different fertilizers. Experiments have been conducted on two lime soils, Houston and Sumter clays, and four acid soils, Oktibbeha, Vaiden, Eutaw, and Lufkin clays.

The crops that are more generally suited to all types of soils in the Black Belt are corn, peanuts, soybeans, sorghum, and Dallis grass. Oats and alfalfa produce excellent yields on Sumter soils when properly fertilized, and oats yield well on the Vaiden soils. Lespedeza produces excellent crops on the Vaiden, Eutaw, and Lufkin soils.

The station has found that phosphate is needed on all the soil types for most of the crops tested. It has also found that there is a need for potash for most crops on the Sumter soil and for cotton and sorghum on most other soil types.

Lime is needed on all of the acid soils, especially Vaiden, Eutaw, and Lufkin, for nearly all crops. The in-

Black Belt sub-experiment station at Marion Junction boasts a well-managed pasture.

crease in yields from lime was especially large when legumes were grown.

Applications of nitrogen fertilizers increase the yield of non-legumes on all soils, however, the returns from nitrogen were not profitable except with oats on Sumter, sorghum and corn on Eutaw, and all non-legumes on the Vaiden and Lufkin.

Those interested in more details about the best crops and fertilizers for the Black Belt section may obtain a copy of Circular 78 entitled "Fertilizer and Crop Experiments on Certain Soils of the Black Belt," by writing Dean M. J. Funchess, director, Alabama Experiment Station, Auburn, Ala.

New Year Resolutions

(*From page* 22)

21. *Resolved:* that I will help to put the unity in community by taking and making opportunities to work with others to improve agricultural, economic, and social conditions.

22. *Resolved:* that I will take a vacation trip at least once during the year to see how other people farm and live in other parts of the state or country.

23. *Resolved:* that I will encourage my boys in club work and other progressive activities so that they may become better farmers than I am.

24. *Resolved:* that even in the face of discouraging experiences I will keep up my spirit and my faith that the Creator of the land and of all things animate and inanimate with which I work will not forsake the tiller of the soil.

Committee on Fertilizer Application Meets

(*From page* 18)

applications in irrigation water.

The survey on fertilizer application practices with fruit and nut trees which was started last year has been practically completed under the supervision of Dr. A. L. Schrader, and a report will be issued in the near future.

(3) Fertilizer Distributing Machinery Available.

In 1936 a report on a survey of available fertilizer distributing machinery was issued. This report listed the various manufacturers and the general specifications of the machines according to 23 different classes. As a continuation of this undertaking, all known fertilizer machinery manufacturers were requested by the subcommittee to either furnish current specifications on all fertilizer distributing equipment in production, or to indicate the changes which should be made to bring the committee's records up to date. A number of manufacturers have responded, and a revised classified list of fertilizer machinery specifications will be issued.

Summary. The scope and character of the new studies and the reorganization of previous projects will doubtless be fully described in progress reports covering individual fertilizer placement experiments to be presented in separate papers.

Fertilizer placement demonstrations and other extension activities, as well as fertilizer machinery developments, will be covered in other reports. This report is limited largely to research activities.

Substantial progress has been made in fertilizer placement research, and expansion of the work under prevailing circumstances has perhaps exceeded the expectations of the committee. Your subcommittee has no specific suggestions to offer, but it is recognized that the program on improved placement of fertilizer is now only well started and will doubtless be a continuous one. It is therefore recommended, in general, that the work and efforts of the committee be progressively expanded.

SUB-COMMITTEE ON MACHINE PLACEMENT OF FERTILIZERS.
G. A. CUMINGS, *Chairman*
H. H. ZIMMERLEY,
G. J. CALLISTER,
J. J. SKINNER,
FRED H. BATEMAN.

Growing Tomatoes With Chemical Fertilizers

(*From page 15*)

been used in the past, at least one-half ton should be used even though the pH may be satisfactory. Where a high (12%) phosphate fertilizer is used or the grower applies superphosphate in addition to his regular fertilizer, it may not be necessary to use lime as freely. One 12-acre field showed magnesium deficiency symptoms so badly this past season that many leaves dropped off the plants before a top-dressing of magnesium could be put on. It is difficult to put these materials on so that they will correct a situation quickly, unless a good rain gets the material into the soil where the roots will get it. Liming materials should be applied before the crop is set, so that they are mixed with the soil where they are accessible for the roots.

Lime and fertilizer experiments with tomatoes conducted by the Vegetable Production Department of the Experiment Station at New Brunswick for the past 3 years have shown an increase of 3 to 4 tons of tomatoes per acre in favor of lime where lime and no lime treatments were compared in each of the 3 years. Magnesium limestone has increased the yields more than high-calcium limestone by 1 to 2 tons in each of the 3 years.

Experiments have also shown that where the calcium content of the soil is raised, potash may become deficient, because the more rapid growth of the plants requires more potash. It was found that where the calcium content was maintained at a good level for tomatoes there should be at least 100 pounds of potash available per acre for the crop. This is equivalent to 1 ton of fertilizer having 5% potash or 1,500 pounds of a 7% potash fertilizer. If the season is favorable for a 12 to 15-ton crop of tomatoes even more potash may be needed. On the fertile soils, 1,500 pounds of fertilizer carrying 7% potash may be sufficient. On worn-out soils it probably would not be sufficient. For this reason abandoned fields brought into production with a liberal application of lime will often show potash deficiency symptoms.

Such fields having a low level of fertility very often will not respond to the fertilizer applied the current year. Special treatment the previous year is sometimes necessary to bring such fields into production.

Growers have access to a number of different kinds of liming material. Oyster shell commonly used is a high-calcium material, but should be very finely ground. Continuous use of this material will result in magnesium deficiency.

Ground limestone when finely ground is very satisfactory. This can be obtained in either the high-calcium or high-magnesium form. Where the soil test shows a low magnesium reading, the high-magnesium limestone should be used. Limestone is about two-thirds as effective as the hydrated or agricultural limes. These also can be bought in either the high-calcium or high-magnesium form.

The diversity of vegetable crops with their specific requirements makes it difficult in some cases to follow a definite liming program. The combination of crops having high and low pH requirements makes it necessary to maintain a high-calcium level with other materials than lime. The 16% and 20% grades of superphosphate, gypsum, or calcium nitrate help to maintain a satisfactory calcium level. Tomatoes require considerable calcium, but will not grow on as acid soils as are necessary to control pox on sweet potatoes, but some growers try to grow both crops in the same rotation. It is possible in such rotations to use superphosphate or gypsum, but the cost will be greater and the crop of tomatoes will not be as good as where more lime can be used. There are cases where the pH is satisfactory, but the calcium content is too low. Gypsum would be a satisfactory substitute for lime, but due to the difficulty of getting the material, the grower must depend on superphosphate or calcium nitrate. Superphosphate contains considerable gypsum.

Organic matter experiments conducted the past 2 years at New Brunswick showed that where the field was planted to cover crops or corn the previous year, the yield of tomatoes was increased by 4 tons per acre. Where cultivated muck was added to supply organic matter, the yield was not materially affected. Cover crops apparently build up organic plant food which breaks down when plowed under and feeds the tomato plants gradually throughout the season. The yield on all the cover crop plots averaged 14.5 tons as compared with 10 tons where only lime and fertilizer were used, and 7.5 tons where only fertilizer was used.

From these results it would seem that a satisfactory method of growing tomatoes with chemicals would be the use of at least 1,500 pounds of 5-8-7 fertilizer on soil that is well supplied with calcium. If the calcium reading on the soil is high, it may be necessary to use a 10% or 12% potash fertilizer unless the soil has a liberal supply of potash in it. If a cover crop can be grown with extra fertilizer before the tomato crop is grown, or if ammonium nitrogen and lime or similar material can be plowed under with corn stalks or similar roughage the previous fall, the yield may be increased and equal those yields obtained where manure is used liberally.

Potash and Phosphorus

Potash deficiency symptoms in the field first occur on the young leaves. They turn light or yellowish green. The plants stop growing and become hard temporarily due to an accumulation of starch. As the deficiency becomes more severe, small peppery brown spots occur on the older leaves followed by yellowing and breakdown of the leaf margins. By this time the plants have used up their starch and become soft and may show rapid growth for a short time before the plants die. It was found that plants growing on soil having 20 p. p. m. of potassium in them showed the above symptoms. In other words, the potash level for tomatoes should be medium according to the quick soil test to insure a good crop and perhaps higher if the calcium reading is very high. This is easily corrected by a side-dressing of 200 pounds of muriate of potash.


Showing detail of potassium deficiency symptoms on an old tomato leaf.

Phosphorus deficiency is shown by a hard, somewhat stunted type of growth followed by the appearance of a deep purplish pigment on the young leaves and growing tips. The entire foliage may be intensely green and show no yellowing or dying of the leaves except in very extreme cases. On acid soils this has been corrected by the application of finely ground limestone. Enough phosphoric acid was released to start growth, provided moisture was not a limiting factor. On well-limed soils some form of phosphoric acid must be supplied as a side-dressing. However, unless this is done early it may not do any good.

Nitrogen deficiency symptoms are common on light soils following heavy rains. The foliage becomes light green and the older leaves turn yellow. The plants are quite woody. This is in contrast to magnesium deficiency where the plants remain quite soft and do not stop growing. The older leaves exhibit yellow blotches between the veins instead of the uniform yellowing characteristic of nitrogen deficiency.

Calcium deficiency symptoms vary with the severity of the deficiency. Extreme deficiency symptoms do not occur very often in the field. Certain early stages, such as brown roots or light green mottling of the foliage, may occur. The plants may be soft and watery and seem to lack substance. They do not respond to fertilizer treatment unless calcium is included in the mixture. Calcium deficiency is not always easy to diagnose, because it may include symptoms caused by an over supply of any of the other ions. If plants fail to respond to nitrogen fertilizers, it is an indication that calcium may be too low. If growers wish to get the most good out of fertilizers, they must be sure that the soil is liberally supplied with calcium. Calcium has many functions in the plant and in the soil, and its presence is necessary to get the most good out of potash salts. Experiments in sand have shown that tomatoes make their best growth where the ratio of available calcium to potassium is approximately 5 to 1.

Candle Glow

(*From page* 5)

day-books, I find evidence that to her Christmas began along in gooseberry-canning time the summer previous and continued unabated of autumn evenings, as long as there was kerosene enough to light the lamps to sew by. To be sure, she didn't say right out loud in writing, but a fellow who lived along with her and noted her objectives is able to read into that old diary a heap more than her penny pencil ever dreamed she had up her sleeve.

I GUESS good mothers with healthy, careless kids are always like that, and my own wife's habit of never sitting down idly with empty hands proves that the best American women of all generations eternally think of the present in terms of our future comfort and preparedness.

Todays merge into tomorrows continually for them, and unless you save and work and plan ahead you might as well forget about wish-bones at Thanksgiving and plum-puddings at Christmas. To most men folks it only means a date on the calendar on which to sleep a little longer in the morning, but to the feminine guardians of the household it is the gracious culmination of a year's foresight and the reward of a devoted woman's unselfishness.

WE children, like all children outside of the goody-goody books, were self-centered introverts in respect to Christmas, because it was regarded as a juvenile holiday. It's rather belated to retract that attitude now, when the burdens of our parents to dole us out a slice of cheer can no longer be lightened. But a middle-aged penitent is better than none.

Though store presents were rare, our parents gave us home-craft articles which had their lives and momentary thoughts knitted or hammered into them. Weeks ahead of Christmas Mother spent her evenings after our bed-time slyly knitting stockings, wristlets, and scarves—those labors of love assumed gladly after a routine of daily tasks unknown to most women of the present era.

MOTHER'S kitchen was needlessly large, and the floor uneven and hard to keep clean. Water for cooking and for dish washing had to be carried from an outer well and a cistern pump in the "summer house." (Too often we "forgot" to fill the pails or split the kindlings.) Cooking was done over a low, cast-iron stove, with a sagging oven door and no thermometer, the pipes bubbling with dark brown creosote at joints and chimney piece. Every two or three days the half-dozen, greasy, coal-oil, table lamps had to be re-filled and the chimneys washed and polished. The parlor hanging lamp, with its purple bowl and crimson shade, circled with glass pendants, must be given the careful once-over. Chunks of firewood thumped down on the "zinc" mat near the parlor heater left more litter and dust to be gathered up. Our dogs were forever nosing and tracking in and out; and our closet floors held more duds than the wall hooks intended for them. Yet somehow out of the dear past I cannot recall ever hearing Mother bewail her lot in life, even when all she got out of Christmas was what she sacrificed to give to us!

AND I see her yet, after a long day's trudging and reaching and bending—a frail body of willowy independence, standing at the threshold of the "sitting room," pushing her dark hair from a flushed and tired face, and remarking "how cozy it is to come in here and do our darning by the fire with all my family around me, and no wandering boys to burn the lights for." Or maybe some of us would grab away her work-basket and give her a library book to read aloud, because she had such a rich, soothing, kindly voice, and she would stop and sniffle with us at the sad parts of Tiny Tim or Little Nell.

And one winter she had Father search the woods for spruce boughs and sewed them neatly on card board letters she had cut out to spell, "Merry Christmas at Home," for a decoration in the dining room. That was the same year I had lost my faith in Santa Claus, but she clung to the old tradition for childhood's sake, and sensing that I was the last one and the youngest, I sheepishly hung up my home-knits behind the old base-burner just to please her once more.

Not one word of these things appear in the day-books of my Mother, however, for she was too busy and too practical to indulge in much else except the commonplace record of duties fulfilled.

AND as for Father, his life was spent in such a race to keep ahead of debts, despair, and chilblains that any philosophy or sentiment he had was reserved for the evening circle or the holiday reunion. But he made his plans for Christmas giving also, the best he could, using old packing crates, angle irons, and tin scraps to fashion wobbly sleds; or carving pine splinters into funny, spraddling dolls for Mother to dress up in rags and remnants.

Father was denied a bookish education, but he wanted us to have a few books each Christmas, which he usually bought himself. On my shelves today are just a few leftovers from my boyhood fiction favorites. Here is one of them, bound in faded red with coarse, thick leaves, bearing the title, "Tanglewood Tales of Hawthorne;" the fly-leaf having mother's script, "Christmas 1900, from your Father, with good wishes." But on the back inner cover is left a pasted label, "I was bought at the Fair store," with a dim notation by the sales clerk, "25 cts." Pray after all, what was "25 cents" if you had a kid to educate?

Many times since then I have met these heroes of Hawthorne's classic fables, dressed in finer garb and presented in nobler folios. Yet the Golden Fleece and the greedy Minotaur, Ulysses and the crafty sires, have never stepped forth in more dramatic pageantry than they did upon our first acquaintance at Christmas thirty-seven years ago!

THAT'S one reason why I never sniff at dime stores or judge a gift by the price-tag it dangles. And to be at once thoroughly Scotch and perfectly satisfied is surely a comfortable way to greet the Yuletide.

Hoping that you are the same, I close with deep gratitude for the space extended to me and a hand clasp for my known and unknown friends. To each and all of you and every kith and kin of you, may your rafters ring with melody, your eyes be bright with candle glow, and your hearts be warmed with hope and courage! Merry Christmas!

TRUE TO FORM

A Yankee was on a Christmas walking-tour in Scotland. Snow had fallen and he was struggling along a narrow road when he met a Highlander.

"I guess, friend, I sure am lost!" he said, plaintively.

Scot: "Is there a reward oot for ye?"

American: "Nope."

Scot: "Weel, ye're still lost."

"Heah, Rastus, is that quatah I borrowed from you two years ago."

"Y'all bettah keep yo' money. It ain't wuth two-bits for me to change mah opinion of you."

Mr. and Mrs. John Smith and family have returned from an extended trip through southern California. The entire trip was made without car trouble excepting that in crossing the Teton the mud was found deep and Mr. Smith tore out his rear end.

POOR DICTION

Lady (more or less): "Doesn't that little boy swear terribly?"

Another Little Boy: "Yes'm, he sure do. He don't put no expression in it at all."

Thieves who ransacked a golf club took away every bottle of whisky and beer in the place. The other 18 holes were not touched.

Nora—"If you like his attentions, why don't you marry him?"

Flora—"Because I like his attentions."

Englishman: "I say, what are they doing?"

American: "They're dancing."

Englishman: "They get married later, don't they?"

LET'S HOPE SO

Mose: "I hear you all got a new boy at yo' house."

Rastus: "Yes, suh—sho is a fine boy, too."

Mose: "Do he look like you?"

Rastus: "Sho he look like me." (second thought) "He bettah."

At the convention you can always lead a delegate to water—but he won't like it!

Ed: While we're sitting in the moonlight, I'd like to ask you—

Co-ed: Yes, darling?

Ed: If we couldn't move over. I'm sitting on a nail.

My nose doesn't breathe;
It doesn't smell;
It doesn't feel
Very well.
I am discouraged
With my nose;
The only thing it
Does is blows.

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