BETTER CROPS WI

The Pocket Book

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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, *Managing Editor*　　SID NOBLE, *Editor*
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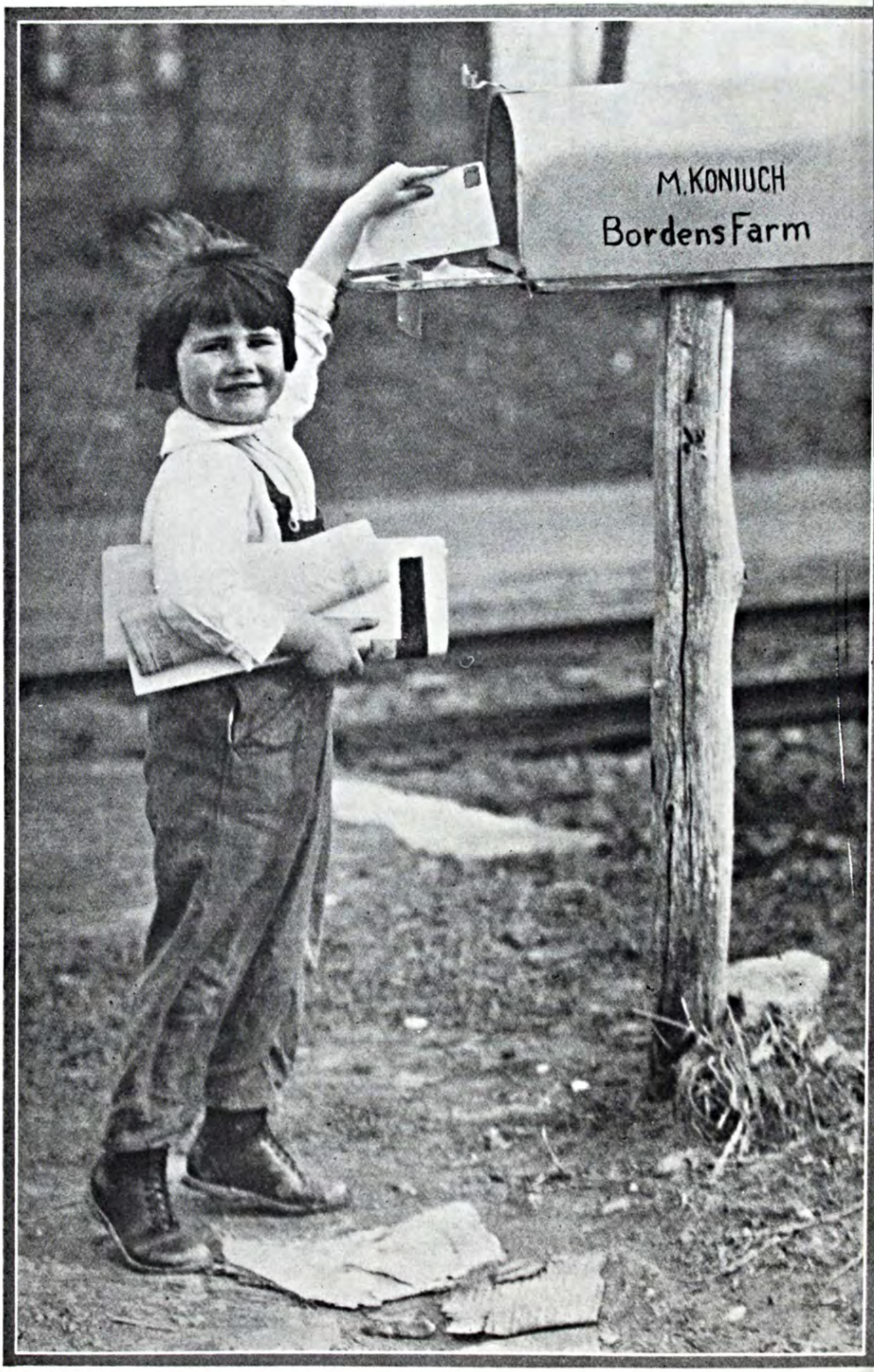

Each mind is press'd and open every ear,
To hear new tidings, though they no way joy us.

—Fairfax.

Better Crops with PLANT FOOD

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[V]OL. XII NEW YORK, JANUARY, 1929 No. 1

[L]ook out, says Jeff, or your [re]solutions will become —

Obligations

By Jeff McDermid

AFTER thinking it over as the Unknown Year opens, I am inclined to be brave and exclaim, "Much obliged for my obligations! Bring on all your [...]d bothers and see if I care! I'll either make a betterment or a botch of 'em."

And that is the proper way to feel about it perhaps. If we take all our [ob]ligations and ourselves included too seriously and "owlishly" I am pretty sure [th]at our better halves will have still more cause for divorce. This applies to [bo]th men and women. There is no neuter in this and no need to be neutral. [O]bligations should not be bogies.

But let none of my lax brethren [m]isapprehend me and regard this as a [si]gn to burn their ledgers for the sake [of] avoiding financial fretting. For [m]y grocer informs me that there are [pe]ople in our own locality who might [st]retch their sense of obligation a [tr]ifle to cover the human filling sta[ti]on as well as the auto refreshment [st]and. He says the reason Chinamen are so prompt with their debt settlement on New Years is that none of them ride in motors on the "deferred-payment-and-ultimate-disaster" plan. They prefer to pay for their soap and sustenance and forget the mileage instead of doing it our way.

All of which reminds me that many of our material obligations nowadays have arisen through excessive production and powerful advertising. If I am behind in my installments on the radio, it is because somebody was away ahead on persuasion.

Production plus persuasion are the twin screws of our ship of state. The most of us pay for the coal that goes into her boiler fires. You are analyzed on the basis of mass buying power, whether you know it or not. Then your obligations increase in proportion to the size of your family and the length of your endurance. In the zeal of production and persuasion you sometimes misjudge your actual buying power and overstock your place with many mortgaged lares and penates.

But why criticize the system? Hasn't my neighbor, the collection lawyer, a right to meet *his* obligations by seeing that *you* meet *yours?*

BACK in the flush days of the nursery stock, liniment, and lightning rod salesmen, our best means of sales resistance were the pitchfork and "Old Towser." If those defenses both failed, we hollered, "Oh, Min!" She was always ready to defend her butter and egg money from those soft spoken business banditti.

Our obligations in those peaceful times consisted of salt pork, mush and milk, a feather bed, the bi-annual hair cut, six pounds of horseshoe plug, and one change of underwear. We had a surplus of food and nobody stopped to worry about it, not even George Piek or Senator McNary.

Our trouble with this extra food business came, strange to say, with our obligation to feed many times more people. This happened because the exchange value of our surplus of hog and hominy went far below our new fangled obligations. In other words, the busy boys had magnified our provincial buying power with the lens of prosperity. Old farm supply had to meet a new demand under new standards, and so both shoes pinched—and squeaked, too.

Hence the erstwhile primitive forn of sales resistance have vanished wit the self-sufficing industries. Tl pitchfork has given way to the ha hoist, the dog has become a Shetlan pony, and Ma subscribes to forty-leve persuasive periodicals. The bush leagu peddler has now become a mechanic demonstrator or even a "contact man. His game is more refined but no wh less devilish, and the way he can yan the yen is indeed a marvel.

As I said before, let's be resigne and resolve to be much obliged fo our obligations, for we are obliged t be anyhow.

Eating and sleeping—and existin between times—used to be a rath simple affair. Science has helped u to enjoy our lives by showing us ho to experience them more fully an deeply and to lengthen them as well.

From this newer knowledge com many of our newer obligations, an the rise in the standard of living ma be an equal gain in the salvation c life.

I know, of course, that Moses an Methuselah were as long on life an whiskers as we are on vitamins an bridge whist, but I am persuaded aft careful examination of the records th neither of them enjoyed the prophe business like Hank Mencken or Be nard Shaw relishes his. The highe standard of living has some compen sations to offset the higher costs an penalties, as this indicates.

THUS far our rambles have bee concerned only with individu obligations in the material sense. I the other field of collective or publi obligations there seems more want c cautious thrift than in the balancin of family budgets.

I believe we are led into most ex pansive public projects by educatio and invention. The more educated w become, the faster we invent ways t

(*Turn to Page* 61)

'ertilizer produced an increase of about 100 pounds per acre, with a value of $40. The fertilizer applied cost $10.50.

Fertilizers *for* Pecans

By J. J. Skinner

Senior Biochemist, Bureau Chemistry and Soils, Washington, D. C.

IN this day of intensive tillage, cultivation, and fertilization of crops, he pecan has not been neglected. Aethods of growing this delicious nut ave kept pace with those used in the roduction of annual high-priced arm crops. In the beginning, that is n the early days of pecan growing, here was no cultivation and ferilization of pecan orchards. The pean tree was looked on as a forest ree. When the young industry was tarted in Florida, Georgia, and Alaama but little attention and care vere given to young orchards. In 'exas, Louisiana, and Mississippi the ecan is a forest tree growing wild in he lowland and on stream bottoms, ut always in rich moist soil well suplied with organic matter.

It required a few years' experience for the Eastern orchardist to realize that the growing of this queen of nuts was a different problem than it is farther west. The improved, thin-shell, high-bred varieties which were set require good soil, thorough cultivation, and fertilization for normal tree growth and nut production. It has been demonstrated that proper fertilization of the pecan tree is very important, and today all successful pecan growers are using commercial fertilizers.

Preceding 1918, when the Federal Department of Agriculture and some of the state experiment stations undertook a series of fertilizer experiments in commercial orchards and on Government-controlled land, only a few of the pecan orchards in the South were fertilized, and in these no systematic fertilizer practice was followed. The experiments were conducted in the southeastern states on the principal soil types which are used for pecan growing. Various fertilizer formulas and the principal fertilizer materials were used, together with varying cultural methods and different types of green-manure crops. Hundreds of trees were involved.

Fertilize for Profit

Laboratory studies have gone hand in hand with field investigations. It was deemed as important to determine the influence of soil type and plant nutrients on the size and filling quality of the nut and the influence of these factors on the color, oil content, and keeping and eating quality of the kernel as it was to determine their effect on tree growth and nut production.

It was realized in the beginning that pecan growers would be interested in commercial fertilizers only if applications of the right materials would give sufficient increase in yield to pay all expenses and also a good profit. Even in the early years of the experiments it became apparent that best results can be expected only when the mixture applied is properly balanced and only in soils which contain a good supply of humus. The growing of summer cover crops of leguminous plants and of winter crops of legumes and of small grain is necessary in young orchards, as well as the use of commercial fertilizer. Cultivation of the soil, the growing of green-manure crops for soil improvement, and the use of commercial fertilizers go hand in hand to build up and maintain the soil's fertility and store of organic matter, both of which are required for successful pecan growing in the southeastern pecan belt.

Results of experiments conducted on several soil types in Georgia and Florida since 1918 are interestin
The work was planned to show wh
fertilizer formula or what combin
tion of nitrogen, phosphoric acid, a
potash gives best results on a pa
ticular soil type for pecans.

In a block of 5-year-old Succ
trees on Greenville sandy loam whi
received no fertilizer and serves as
check, the trees gained in circur
ference as an average, in their fif
year, 1.5 inches; sixth, 2 inches; a
seventh, 2.75 inches. The fertiliz
trees in the orchard gained in circur
ference as an average, in their fif
year, 3 inches; sixth, 3 inches; a
seventh, 3.25 inches. The unfe
tilized trees produced no nuts in t
fifth and sixth years and an avera
of 3 pounds per tree in the seven
year.

It is interesting to note the influen
of several fertilizers of different con
position on the pecans during t
early years of this experiment. A fe
tilizer consisting of phosphoric ac
and potash may be compared with o
containing phosphoric acid and pota
and 3 per cent of nitrogen (NH
and with one containing phosphor
acid, potash, and 9 per cent nitrog
(NH_3).

Bearing Trees Need Food

In the first year of the experimen
the tree growth was the same for eac
fertilizer. In the second year, how
ever, trees receiving the no-nitroge
fertilizer gained 1.75 inches, those r
ceiving the 3 per cent nitroge
(NH_3) fertilizer gained 2.25 inche
and those the 9 per cent nitroge
(NH_3) fertilizer 2.75 inches. In t
third year, the trees receiving the n
nitrogen fertilizer gained 2.1 inche
those receiving the 3 per cent nitr
gen (NH_3) fertilizer gained 3.2
inches, and those the 9 per cent n
trogen (NH_3) fertilizer 4.75 inche
All of the variously fertilized tre
bore a few nuts in the first two yea
of the experiment. In the third ye
the trees receiving the no-nitroge

'he pecan orchard on the right has been fertilized regularly with a 4-8-4 mixture since the orchard was set. The section on the left has received no commercial fertilizer.

ertilizer produced an average of 3.5 ounds per tree, those receiving the 3 er cent nitrogen fertilizer produced .9 pounds, and those receiving the 9 er cent nitrogen (NH_3) fertilizer ielded 6.0 pounds. Since that year he relative yields from the variously ertilized trees have become even nore marked and accentuated. The esult is typical of that secured in ther experiments on young trees on his and related soil types and has led o the conclusion that nitrogen is very nportant in the fertilizing of young rchards. An excess of nitrogen may ause succulent growth subject to vinter injury, and for this reason a omplete fertilizer is advised for use n young orchards. A mixture conaining all three fertilizing constitunts, nitrogen, superphosphate, and otash, analyzing at least 6 per cent itrogen should be used.

A number of experiments indicate hat the requirement of orchards 12 o 15 years old, when cover crops ave been grown and plowed under rom the time of setting, is for a fertilizer containing less nitrogen than is needed for trees in their early bearing period. The results secured show that complete fertilizer mixtures are required for most soils and that each constituent, nitrogen, phosphate, and potash, plays a part in tree vigor, nut production, and quality of the nut.

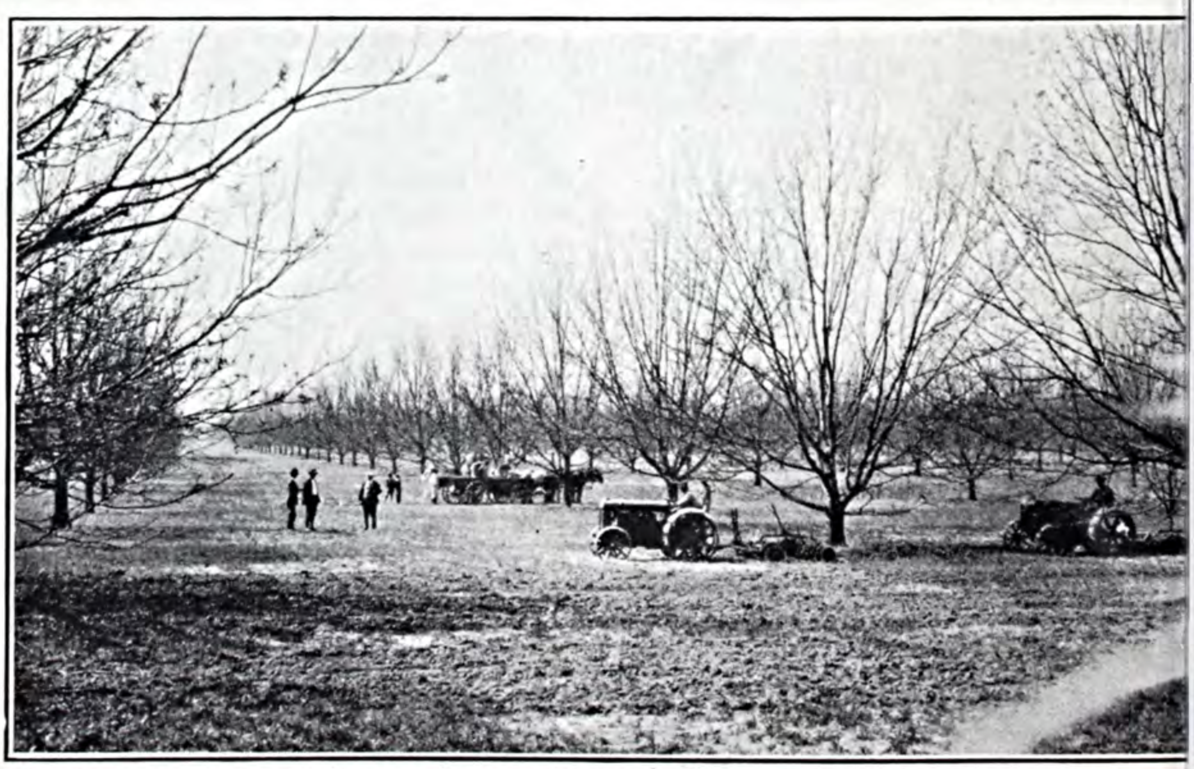
In an experiment on a 10-year-old orchard on Orangeburg sandy loam some very marked results, which will be of interest here, were secured. Fertilizer applications were first made in 1918 and have been continued annually since. Groups of trees were left unfertilized, and their yields have been compared with other groups which received various fertilizers differing in composition. The yield data show that fertilizers high in nitrogen have produced a larger yield over the entire period than have fertilizers high in phosphate or potash and low in nitrogen. After the fertilizer applications had continued for four years, the average yield per tree of a group of 36 trees of the Schley variety receiving complete fertilizers, but

epresenting the average yield per tree of 7-year-old Stuart pecan trees in plots fertilized differently on Greenville sandy loam. No fertilizer (check), 4 pounds; P-K fertilizer, 5.9 pounds; K-N fertilizer, 7.5 pounds; P-N fertilizer, 9.4 pounds; P-N-K fertilizer, 11.5 pounds.

This is the largest pecan orchard in the world, and its owner is the world's largest pecan grower. H uses several hundred tons of fertilizers annually as the result of the U. S. Department of Agriculture' experiments.

high in phosphate and low in nitrogen and potash, was 25 pounds, against 28 pounds per tree for a similar group which had received annually for four years a complete fertilizer, but high in nitrogen and low in phosphate and potash, and 23 pounds for a group which had received a complete fer tilizer high in potash and low in ni trogen and phosphate. The unfer tilized group yielded an average of 2 pounds per tree.

With the Stuart variety on th same soil type the average yield fo



The picture at the top of the page shows a winter crop of rye which will be plowed under for soi improvement. The picture above shows the fertilizer being applied and disked in after the winter cro was plowed under.

Table 1—Effect of fertilizer on pecan tree growth on Bladen fine sandy loam.

Variety	Fertilizer	Average gain in circumference per tree in 1922	1923	1924	1925	Total
		Inches	Inches	Inches	Inches	Inches
	NH_3-P_2O_5-K_2O					
Curtis	9—3—3	2.57	2.69	2.88	1.92	10.00
....	3—9—3	1.56	2.25	2.47	1.63	7.91
....	3—3—9	1.77	2.00	1.74	2.02	7.53
....	No fertilizer	2.16	1.44	2.03	1.56	7.19
Schley	9—3—3	3.50	2.12	3.28	2.28	11.18
....	3—9—3	2.49	2.23	2.18	2.35	9.25
....	3—3—9	2.76	2.62	1.90	1.40	8.68
....	No fertilizer	1.65	1.63	2.07	1.45	6.80
Stuart	9—3—3	2.53	2.09	2.48	2.66	9.76
....	3—9—3	1.53	1.03	2.41	1.69	7.26
....	3—3—9	2.14	1.60	2.74	3.16	9.64
....	No fertilizer	1.32	1.59	2.19	1.42	6.52

unfertilized trees was 11 pounds per tree, for the phosphate-potash group 18 pounds, for the potash-nitrogen group 25 pounds, and for the phosphate-nitrogen mixture 26 pounds.

Results secured with fertilizers on another soil type, Bladen fine sandy loam, a dark soil occurring in the lowlands and on which a number of pecan orchards are set in North Florida and in the coast section farther north, are somewhat different from those just recorded.

In this experiment, three fertilizers were used—a high nitrogen mixture, a high phosphoric acid mixture, and a high potash mixture. The orchard was 8 years old when the test was begun.

The average gain in circumference per tree and the yield per acre for four years are given in Tables 1 and 2.

It will be noted that each fertilizer produced a larger increase in tree circumference than took place in the unfertilized trees. Trees fertilized with

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Table 2.—Effect of fertilizer on yield of pecans on Bladen fine sandy loam.

Variety	Fertilizer	Yield per acre of pecans (20 trees) in pounds 1922	1923	1924	1925	Total
	NH_3-P_2O_5-K_2O					
Curtis	9—3—3	58	630	0	1105	1793
....	3—9—3	61	491	0	612	1164
....	3—3—9	211	486	69	1141	1907
....	No fertilizer	175	328	36	770	1309
Schley	9—3—3	10	40	0	246	316
....	3—9—3	14	14	0	124	161
....	3—3—9	19	19	0	582	644
....	No fertilizer	21	21	0	169	206
Stuart	9—3—3	48	49	5	231	333
....	3—9—3	5	13	0	238	256
....	3—3—9	147	56	12	273	488
....	No fertilizer	57	10	2	242	311

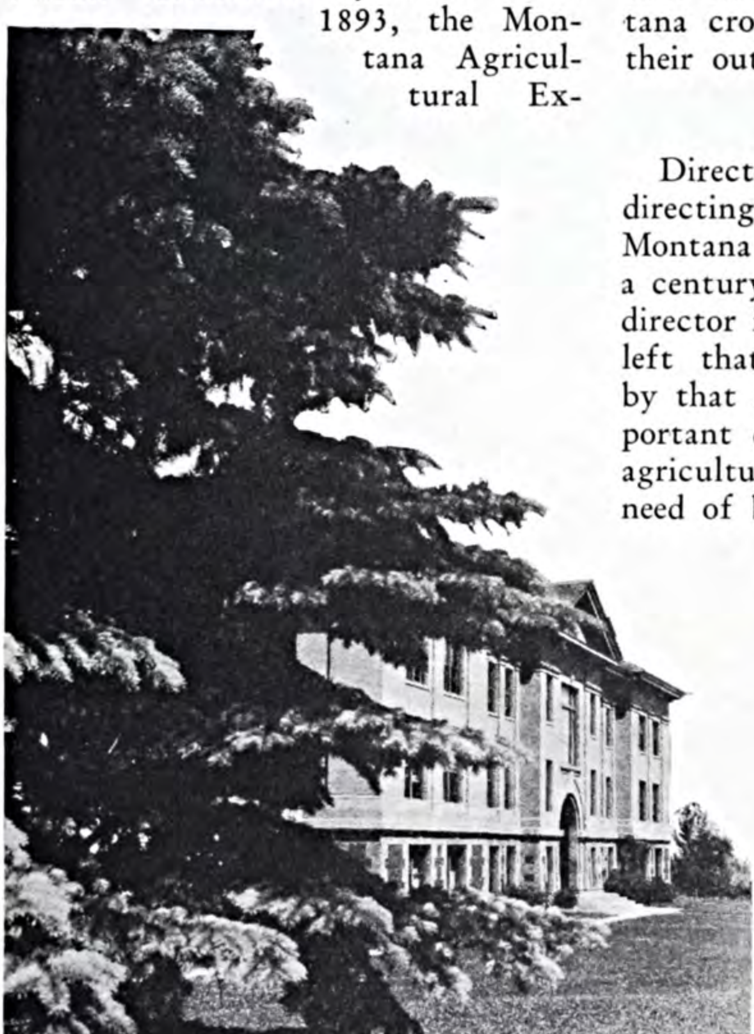
MONTANA

Experiment Station

By R. B. Bowden

Editor, Montana State College

THE Montana Agricultural Experiment Station, judged from the age standard of eastern stations, is still a young organization in a young state, but from the standpoint of Montana history it is a veteran institution that has grown up and kept pace with the agricultural development of this third largest state of the Union. Established by state act in 1893, the Montana Agricultural Experiment Station functioned during the last years of the old "cow country" days, saw cattle ranging flourish and then wane to give place to sheepmen and the "nesters" and "honyokers" of the homesteading period, directed a way through the great period of transformation from 1910 to 1921, and now still holds its important leadership in a day when Montana crops are nationally known for their outstanding qualities.



Agricultural Hall, home of the Montana Agricultural Experiment Station.

Broad Vision

Director F. B. Linfield has been directing the investigational work in Montana agriculture for a quarter of a century, becoming the third station director in 1903 when Samuel Fortier left that institution. Mr. Linfield, by that fact, has been the most important directing force in Montana's agriculture and a man who has had need of broad vision to keep the station's work ahead of the swift changing agriculture in Montana. When he first took over the charge of this work, Montana still was "cattle country," although sheepmen were contesting with the "cattle barons" over the use of the range. From 1907 to 1916 came the great wave of homesteaders, who forever broke up the old free ranges and who fenced and ploughed the dry land areas of the

Director F. B. Linfield of the Montana Agricultural Experiment Station addressing a group of farmers during a tour of a special livestock train through the southern section of the state.

northern Great Plains section. Cattle ranging on a broad scale died out practically by 1912, although for a decade later there was hope among stockmen that the ploughed land would revert to range sooner or later as the homesteaders found they could not farm it successfully.

How nearly the hope of the stockmen was borne out is shown in the story of dry land distress from 1917 to 1922, when the state experienced five years of unprecedented drouth. But the ploughed land did not revert to native range, and the struggling homesteaders somehow adapted their methods and practices, with the help of this same experiment station, to emerge from those bad years into an era of average weather and good crops at good profits. Today Montana has been rated for more than a year as one of the clearest spots on the American economic map.

Director Linfield and his associates in Montana early recognized the advantages and disadvantages in the state. Distance from markets, lack of long-time information about soil and climate, variable seasons, and absolute necessity of developing an entirely new "Montana system of agriculture" were all vexatious problems. But the climate and soil were capable of producing crops of unusual quality, commanding market premiums. "Produce quality stuff" was the cry of the experiment station, and today Montana has adopted that idea as the central theme of its agriculture. Montana certified potato seed brings a premium in southern markets; Montana McIntosh apples bring a premium over all other apples on the New York market; Montana's spring wheat shows a higher proportion of premium commanding protein than the wheat from any other state; Montana cattle can hold their own with the best on the Midwestern markets. And so it holds with many other crops. Montana has learned to produce crops which, by reason of their quality, can command a premium to offset the higher freight rates.

Practically every strain of wheat grown successfully in Montana has been developed and improved at the experiment station. Montana-36, one of the best known, was developed by Alfred Atkinson, formerly agronomist for the experiment station and now president of Montana State College. The strains of oats, barley, and rye used generally throughout the state are strains first tested and later recommended by the experiment station.

A Long-time Program

There have been more than a few spectacular developments in this rather prosaic work of agricultural investigation. It was the Montana station that developed the sunflower as an important silage crop, sunflower silage being now widely used and compared, by many feeders, with corn silage in quality. When the Montana stockmen were discouraged by the prevalence of a disease that cost them hundreds of thousands of dollars annually—the disease of goitre in new born animals—it was Dr. Howard Welch, an experiment station veterinarian, who worked out the cause and the cure. Now by the investment of a few cents per head in the treatment of the pregnant mother animals, new born sheep, pigs, calves, and colts are entirely free from this disease. In the control of insect pests, in the problem of poisonous weeds on the ranges, summer fallowing, and many other matters the agricultural experiment station has given valuable service to Montana.

State college, experiment station, and extension service have cooperated closely in Montana in the recent building of a long-time agricultural program for the state. This new program for Montana's agriculture is based upon the findings of the experiment station, combined with the experiences of extension workers and the farmers and stockmen of all sections of the state. With this definite program before them, all agencies of the state are cooperating in one of the most concentrated jobs of state agricultural development that the coun-

(*Turn to Page 53*)

Staff members of the Montana Agricultural Experiment Station: (Left to right) top row—W. E. Joseph, animal husbandry; Sherman Johnson, agricultural economics; John Lewis, grain laboratory; LeRoy Powers, agronomy; J. E. Norton, agronomy; Barbour Herrington, chemistry; Louis Vinke, animal husbandry; William DeYoung, agronomy; Edwin Jungherr, veterinary science; V. D. Young, agricultural engineering; second row—C. C. Starring, horticulture; William Hay, grain laboratory; Ralph Kenck, agricultural engineering; Leonard Gieseker, soils; Elwood Morris, botany and bacteriology; J. W. Barger,, agricultural economics; William Cook, entomology; Paul Young, botany and bacteriology; Miss Erlene Jacobs, home economics; Jesse Green, chemistry; Arthur Post, agronomy; bottom row—J. R. Parker, entomology; Edmund Burke, chemistry; Clyde McKee, agronomy; Howard Welch, veterinary science; M. L. Wilson, agricultural economics; Director F. B. Linfield; H. W. Vaughan, animal husbandry; F. M. Harrington, horticulture; Jessie Richardson, home economics; H. E. Murdock, agricultural engineering.

¶ *It pays, even in poor years, to—*

Fertilize Potatoes

By C. A. LeClair

St. Louis, Missouri

THE worth of any product or method can best be tested when the system employed is subjected to adverse as well as favorable conditions. It is then that the effect of unfavorable influences can be most accurately observed. During the past season the potato industry found itself in extremely trying circumstances, for everything that could possibly happen to discourage the growers prevailed.

To begin with an abnormally large acreage was planted throughout the United States. One might conclude that this was entirely due to a lack of foresight on the part of the legitimate growers. Such was not wholly the case, however, for although many bona fide potato growers planted more than their usual acreage of potatoes last spring, those who in reality had no business to be growing the crop were largely responsible for the 1928 debacle. Having observed the good prices potatoes commanded in 1926 and 1927, many plunged into the business of potato growing in 1928 in an unprecedented manner on rented acreage. Their aim was to get rich outside of their legitimate profession only to pay dearly for the experience to the ultimate advantage of the industry for several years to come, at least.

Circumstances like this have occurred before and always with the same disastrous effect on the prosperity of the legitimate grower. In some years, when fools rushed in where even wise men hesitated to plant, the growing season conditions were such as to counteract more or less the effect of an abnormally large acreage. However, in 1928, potatoes grew exceptionally well from Oklahoma to Florida and Maine to North Dakota. This resulted in the harvest of one of the biggest crops of potatoes on record with returns to the average producer in inverse ratio. If there ever was a year, therefore, when the practicability of employing commercial fertilizers and investing in spray materials could be measured it was in 1928.

Reduces Production Costs

More up-to-the-minute application of the latest scientific agricultural discoveries is practised by farmers in growing America's potato crop than perhaps on any other staple crop. The successful potato grower of today is a high type of specialist. He is able to detect and knows how to combat the many complex diseases and insect pests which attack the potato through the employment of treatments that have been thoroughly tested. The size of seed pieces and the best distance to separate them in the hills for maximum production have likewise been determined. Each year new economies in the cost of raising potatoes are being practiced.

Consequently, wherever potatoes are

extensively grown in humid sections of this country, commercial fertilizers are generously used. Through application of as high as a ton and more to the acre of a complete fertilizer, yields are today obtained which would not be believed possible 10 years ago. As a result, harvests of 500 bushels to the acre are not infrequent, and as many as 800 to 1,000 bushels have been produced on a single acre.

"Because year in and year out our aim must be to grow the largest yield economically possible, if we are to be assured of maximum returns for our labors in good years and bad, it becomes necessary to employ commercial fertilizer in growing potatoes," is the unqualified statement made by one of the most extensive and prominent growers of the country. He has demonstrated this theory to his own satisfaction and it is the plan followed by the most intelligent growers everywhere.

The Reason

Let's consider the reason why! It is true that those who follow scientific methods of production materially help to increase the total surplus in seasons of plenty and thus proportionately contribute to a minimizing of the average market price of the commodity. Yet, the apparent unfavorable effect of a surplus crop operates more in a general way than specifically. Quality products always demand more or less of a premium over the going market price. The premium paid for quality potatoes over the average run is greater in seasons of plenty. Thus, when big crops reduce the bushel price offered, the farmer who has invested in commercial plant food to insure a big yield, not only tends to increase proportionately his returns by being able to harvest more bushels; but because of the better quality which is always associated with big yields, he enhances his income through the top price his superior product demands.

To illustrate how these factors work, a farmer in Marinette county, Wisconsin, who applied 500 pounds of commercial fertilizer to the acre to produce his 1928 potatoes and who invested heavily in spray materials to prevent disease and insect injury to the crop, was able to market his potatoes at double the prevailing price at harvest time. He risked an investment amounting to approximately $80 per acre in fertilizer, spray materials, seed, and labor to accomplish this result; but it paid big. His yield was 200 bushels of sound No. 1 potatoes more to the acre than were harvested by his neighbors, who failed to apply fertilizer or adequately spray their crops. This farmer received in addition, the advantage of a premium of 32c a bushel for his tubers. His total yield per acre was 350 bushels. On the basis of the top price he received for his entire crop, his returns show that although it cost him $80 per acre to grow the crop, the net profit was at the rate of about $95 per acre.

A majority of the other farmers in the same county who did not adequately fertilize their potatoes or carefully spray them, got yields around 150 bushels to the acre at a production cost of about $40 per acre. Their gross returns were around $30 an acre and they consequently suffered a loss at the rate of $10 an acre for this season's work.

Between these two types of potato growers, there are those who practise only half-way measures. For instance, they start out with good intentions by carefully selecting their seed stock, they plant on well prepared and adequately fertilized soil, then in mid-season reports begin to be broadcast that a big crop is in prospect and potatoes are going to be cheap. They then lose heart, become negligent in their late cultivations, and perhaps dispense with late spraying entirely. The result is that although their initial investment in commercial fertilizer provides a yield which avoids actual loss

Potatoes grow rapidly when properly nourished. Note the spindly foliage of the center row which was grown without fertilizer as compared to the healthy vines at the right which received 500 pounds of complete fertilizer to the acre.

for the effort, the subsequent neglect of the crop prevents it from yielding any measure of profit.

Typical of this is the story of a grower in Minnesota. He planted 90 acres of potatoes in a most thorough manner last spring. Soon the bumper crop news began to spread. He got cold feet and decided to cut down the cost of maturing his crop after it was evident that prices were going to be low. He discontinued late Bordeau spraying on about half his acreage with the result that the late blight ravished the crop on that part of the field. At harvest he dug and field pitted his potatoes and when the pits were opened for shipment of the stock, the shrinkage from rot was as much as 50 per cent in the case of the tubers which had not been properly sprayed. His investment in commercial fertilizer gave him a big enough yield, despite the shrinkage caused by late blight owing to discontinuance of his spraying program, to just about break even and he thus avoided the loss incurred by some of his neighbors who neither fertilized nor sprayed their crop. However, failure to invest in late spray protection prevented him from making a possible profit. A few figures may help to illustrate this man's typical mistake.

Seed, labor, and other costs—$35. Yield 100 bushels at 20c per bushel, $20 returns. Loss, $15 per acre.

Seed, labor, *fertilizer,* and other costs—$45. Yield 360 bushels at 20c per bushel with blight shrinkage 30 per cent, making marketable yield 250 bushels at 20c per bushel, $50 return, or $5 per acre profit.

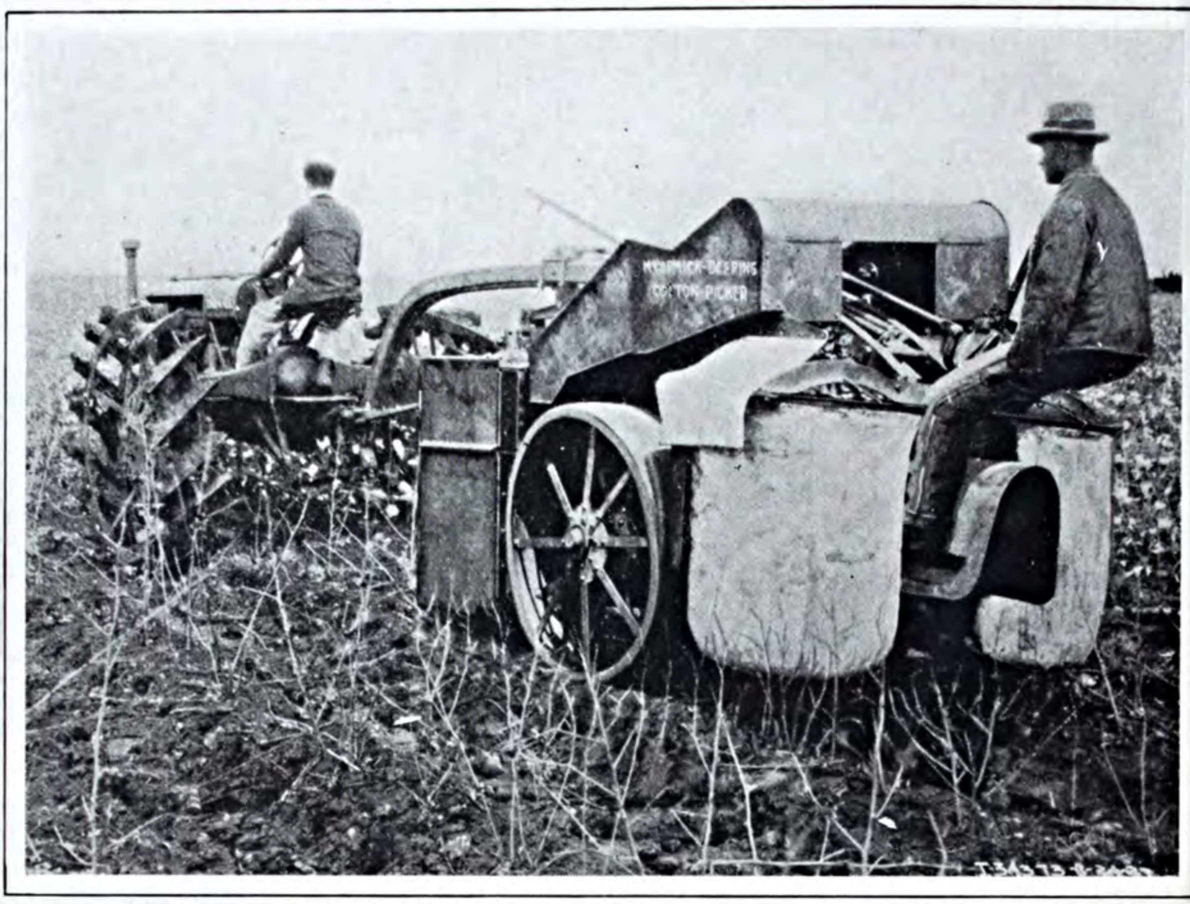
Seed, labor, *fertilizer, spray materials,* and other costs—$55. Yield 360 bushels at 20c per bushel, $72 return, or a profit of $17 per acre.

More Proof

However, startling as the above figures are, the actual conditions the respective growers face actually increase the difference of their loss or profit over the figures indicated above. This is because the unfertilized or neglected crop incurs extra grading expense while the quality crop pays for this and more by demanding a premium. It is the poor quality stuff dumped on the market that depresses demand and lowers price.

Warehouse after warehouse in the great potato buying sections of the country was empty at digging time

(Turn to Page 54)



New type of cotton picker for use in the eastern part of the Cotton Belt.

Agriculture Today

III. Plant Industry

By Frank George

NUMEROUS agricultural surveys have shown that farmers who make their business profitable are usually those who obtain large yields per acre. These farmers have solved the problem of low production costs through increased efficiency in the use of modern machinery, fertilizers, better seed, more productive varieties, and effective combat against plant insects and diseases.

Plant insects and disease, it is estimated, take an annual toll of more than one and one-half billions of dollars of crops. The wheat crop alone, declares Dr. W. A. Taylor, chief of the Bureau of Plant Industry, is probably reduced by some 97,000,000 bushels a year, on account of diseases such as rusts, smuts, scab, root rots, and others; the potato crop is reduced a similar quantity by blights, rots, scab, and virus diseases. The apple crop is cut an average of 32,000,000 bushels a year by diseases like scab, bitter rot, blotch, cedar rust, blight, black rot, and various cankers, leaf spots, and root troubles.

To be sure, agriculture always will be burdened with the cost of combating insects and disease, and that cost will be a large item in the total cost of crop production. The reduction of that cost, however, can be secured by the use of efficient control measures as part of a general program of improvement of cultural practices. The improvement of cultural practices in its widest sense, Dr. Taylor says, includes the breeding and adaptation of varieties for different regions as well as more efficient and economical cultural practices, and is particularly important in the case of such plants as fruits and vegetables, tobacco, cotton and other fiber plants, and cereals.

Major Activities

Three major activities of the Bureau of Plant Industry to meet present day production problems, cited by Dr. Taylor, include the identification of plant diseases and development of methods of control, improvement of cultural practices for more efficient crop production, and the establishment of new crops by introduction, breeding, and selection.

The first of these problems is being attacked by trained plant pathologists, mycologists, and bacteriologists at Washington and at field stations. These scientists demonstrated recently that "western yellow blight," which often destroys whole crops of tomatoes in some of the western states, is caused by the virus which is responsible for curly top of sugar beets, and transferred from plant to plant by the leaf hopper, *Eulettix tenella.* Enlightened by this new information, the prospect of securing a control measure for this disease which has baffled pathologists for a quarter of a century is much nearer at hand.

Recent experiments have demonstrated that a large amount of neck rot of onions can be prevented if the bulbs are artificially dried within two or three weeks after harvest, and some of the important onion set sections are beginning to use artificial drying as a standard crop-handling practice. Similarly, it has been shown that oiled wrappers and shredded oiled paper in packages of apples may be used to control apple scald. It is generally estimated that shredded paper adds 20 to 25 cents a barrel to the cost of packing apples, but the increased returns may be anywhere from 50 cents to $3 a barrel.

There are many examples of control by the development of resistant varieties. Of most recent date is the work in connection with brown blight, a new disease of lettuce, which has appeared in the Imperial Valley of California and in several localities in Arizona. Dr. Taylor estimates that probably the average loss in the Imperial Valley the last four years has been somewhere between one and five per cent of the crop, and he says that the best lettuce land is rapidly becoming infested beyond the possibility of growing satisfactory crops.

The disease is caused by a soil organism which has not yet been identified. Plants that are attacked when small become stunted, show yellowish

Washing fruits to remove poison residues is now extensively practised.

Applying dust in a Georgia pecan orchard during scab control experiments.

and brownish discoloration, and often die. Attacked after maturity, the outer leaves of the plants show irregular dry, dead, brown scars and blotches. Selection and breeding work by bureau representatives in California has resulted in the development of several good commercial strains of the New York and Iceberg variety, two of which strains seem to be immune. Several hundred acres of the resistant seed were planted in 1927, and the strains give promise of relief to the lettuce growers of the Imperial Valley from a situation which threatened to wipe out their industry.

Among current improved cultural practices worked out by the Government scientists is the use of the furrow drill for sowing wheat in parts of the west, especially in Montana, and winter oats in the South. This practice holds drifting snow and drifting soil, with the advantages of providing more snow cover and additional moisture in the dry-land area where snow usually blows off the fields into ravines and valleys, and prevents injury to young plants by blowing soil, which either may cut them off or partly bury them.

Better cultural practices in plowing for summer fallow and in the tilling of summer fallow in the West are being developed in cooperation with State extension services. It is shown that early spring plowing of stubble for summer fallow increases subsequent wheat yields, as compared with late spring or early summer plowing. More effective types of tillage implements for summer fallow have cut the cost of maintenance and decreased the weed crop and moisture loss. Similarly, early seeding of flax not formerly practiced and believed by many farmers to be injurious has been shown to increase yields and prevent heat canker.

Flax production in the United States is much below national needs. The bureau is recommending the growing of flax in a mixture with wheat as a means of increasing flax production in humid areas, and also of increasing crop diversification. This practice is inducing some farmers to grow flax, who otherwise probably would not produce it.

Another activity is the development of improved methods of rice culture to make it possible for California growers to control the very troublesome and injurious water weeds which have been reducing yields and threatening the whole rice industry in that State. The principal control practice is deep submergence at time of seeding. Investigations regarding "straighthead" in the Gulf States rice fields have shown this condition to be caused by unfavorable soil factors, and that if discovered in time the trouble can be controlled by draining and drying the rice fields for two or three weeks, and then applying water.

Search for Economy

The bureau's investigations support the general evidence that under many conditions production costs in connection with small grains and grain sorghums, as well as for soybeans and other crops, may be lowered by the use of the combine. These investigations ow that the average harvesting loss th combines is 2.6 per cent of the tal yield as compared with 3.3 per nt for a header, and 6.1 per cent for binder. The actual loss of grain cut th the combine averages 32 pounds r acre, as compared with 40 pounds th the header, and 74 pounds with e binder. The average threshing s with combines is 1.9 per cent of e grain threshed, as compared with 2 per cent for the stationary resher.

The steadily increasing consumer de-nd for new food products and the ed for economy in crop production sts are emphasizing the search for w crops by both the plant explorer d the plant breeder. The most strik-g phase in this work is in the field breeding for disease resistance. Some the serious diseases of melons, cot-n, cowpeas, tomatoes, and a num-r of plants grown under glass have en overcome by breeding resistant rieties, and this line of work has w become more or less a feature a number of branches of the Bureau of Plant Industry. Extensive breeding work is also being carried on in connection with cereals, especially in an effort to secure disease-resistant and especially rust-resistant varieties of wheat and other grains.

Two outstanding examples of crop breeding deal with citrus improvement by bud selection in California and with improved cotton production in the southeastern portion of the United States. The California citrus bud selection work has resulted in revolutionary changes in the industry of that state and in other states and in other countries where citrus is grown. Production has been increased and non-productive and non-paying citrus trees have been eliminated.

A number of superior varieties of cotton have been produced as a result of cotton breeding, the Acala cotton, a fine upland variety, being an example of introduction and selection work combined. The Acala cotton is proving a valuable variety for California and the Imperial Valley district

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A potato digger operated with a gasoline engine.

LIMING SOUR SOILS

I. *The Value of the Different Forms of Lime*

By J. W. White

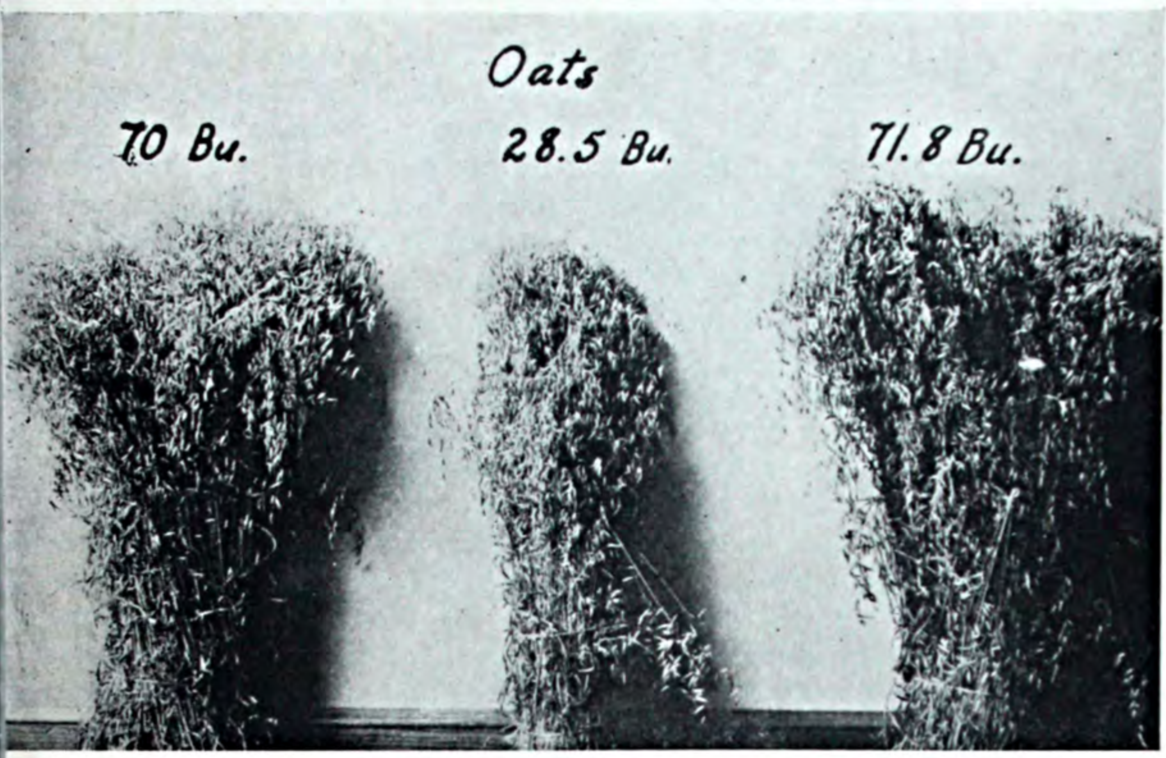
Soils Research Chemist, Pennsylvania State College

A NEW church was nearing completion on a lot just back of my home in the Old North State. Preparations were being made to apply the finishing coat of plaster. A hole about eight feet in diameter and five feet deep had been filled to the level of the ground with lime paste or cream of lime. Returning from the post-office rather hurriedly one summer day, for my girl was waiting for me around the corner, I took a short cut across the church lot and walked into this pit of lime paste and sank to the base of my three-inch collar. I thus got a baptism in lime and became more intimately associated with it even at an early age than any one of my generation.

A few years later I found myself a member of the Experiment Station Staff at Penn State, in a land abounding in sour soils, and at the same time the greatest limestone produci state in the Union. The abundance limestone in this section is illustrat from the fact that my house and stone retaining wall 350 feet long a four feet high we made from hi grade limestone s cured from t excavation. M baptism in crea of lime and lat my permaner house construct of limestone lea no avenue escape from mc or less consta thought concer ing the propert and value of lir as an importa step toward pe manent agricu ture.

Heavy yields of Kentucky blue grass produced with complete fertilizers and agricultural slag.

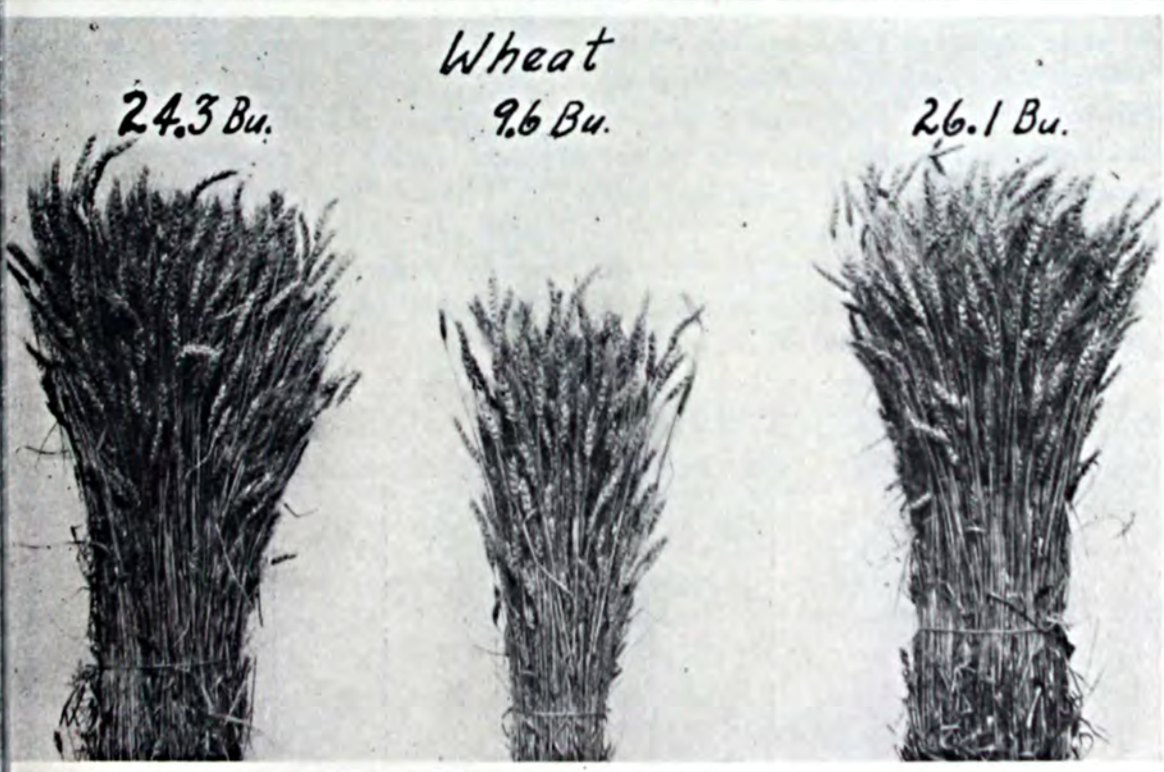
My early associ tions with the la William Frea Thomas F. Hur and also Alva Ag served to furth stimulate my inte est in lime and l to a study of t sour soils of t Keystone State a eventually to t establishment of series of field pl experiments, i



'alue of lime in the production of oats, on DeKalb soil. Left to right—hydrated lime, no lime, and pulverized limestone.

luding 279 plots designed to study the alue of different forms and amounts f lime in relation to economic crop roduction.

As a result of these field plot studies, together with a detailed lime requirement survey, it was concluded that there is no one soil condition more prevalent in the humid region and possibly none that has a greater control-



'alue of lime in the production of wheat on DeKalb soil. Left to right—hydrated lime, no lime, and pulverized limestone.

ling influence on the growth of crop-producing plants than soil acidity. This undesirable soil condition is a complex one involving many factors which tend to arrest the normal functions of the soil. The presence of toxic substances, both organic and inorganic, the absence of basic lime, and decreased availability of essential plant food constituents, no doubt, all play a part in bringing about conditions unfavorable to the best development of the chemical, physical, and biological properties of the soil. It has been shown conclusively that when some form of basic lime is applied in sufficient quantity to these sour soils the undesirable properties disappear and the soil will again become productive under proper management.

Prior to 1911, the major portion of lime sold by American producers for agricultural use consisted of burnt and hydrated lime. Since that time the trend has been toward the use of pulverized limestone to the exclusion of the more concentrated forms. Thus in 1911, 770,954 tons of burnt lime, hydrated lime, and pulverized limestone were sold by producers for agricultural use, of which 77 per cent was in the more concentrated form. In 1926, 2,147,610 tons of the three forms of lime were sold for agricultural use, of which only 13.9 per cent was in the more concentrated form and 86.1 per cent pulverized limestone.

Between these two periods the sale of limestone showed a gain of 962 per cent and the other two forms of lime a loss of 50 per cent. In 1926 a tot of 2,214,674 tons of agricultural lin were sold by producers including tl following percentages of differe forms: burnt lime 5.9, hydrated 8. oyster shells 0.5, marl 2.5, and pu verized limestone 82.6. This tonna of agricultural lime does not represe the total amount actually used for sc improvement, for a large tonnage c limestone road screenings is used, al considerable agricultural lime is sol by small unlicensed producers incluc ing by-product lime.

The keen competition in the sale c agricultural lime is shown by the fac that in Pennsylvania 102 firms a licensed for the sale of 177 brands c agricultural lime products. Agricu tural lime is largely a by-product fro industrial plants. Farmers of the Key stone State are using the following 1 different lime products: pulverize limestone, oyster shells, precipitate lime carbonate (by-products fro chemical plants), marl, hydrated lim (high and low magnesia), burnt lum lime, ground burnt lime, blast furnac slag ("agricultural slag"), gypsun and waste lime from tanneries, g plants, etc.

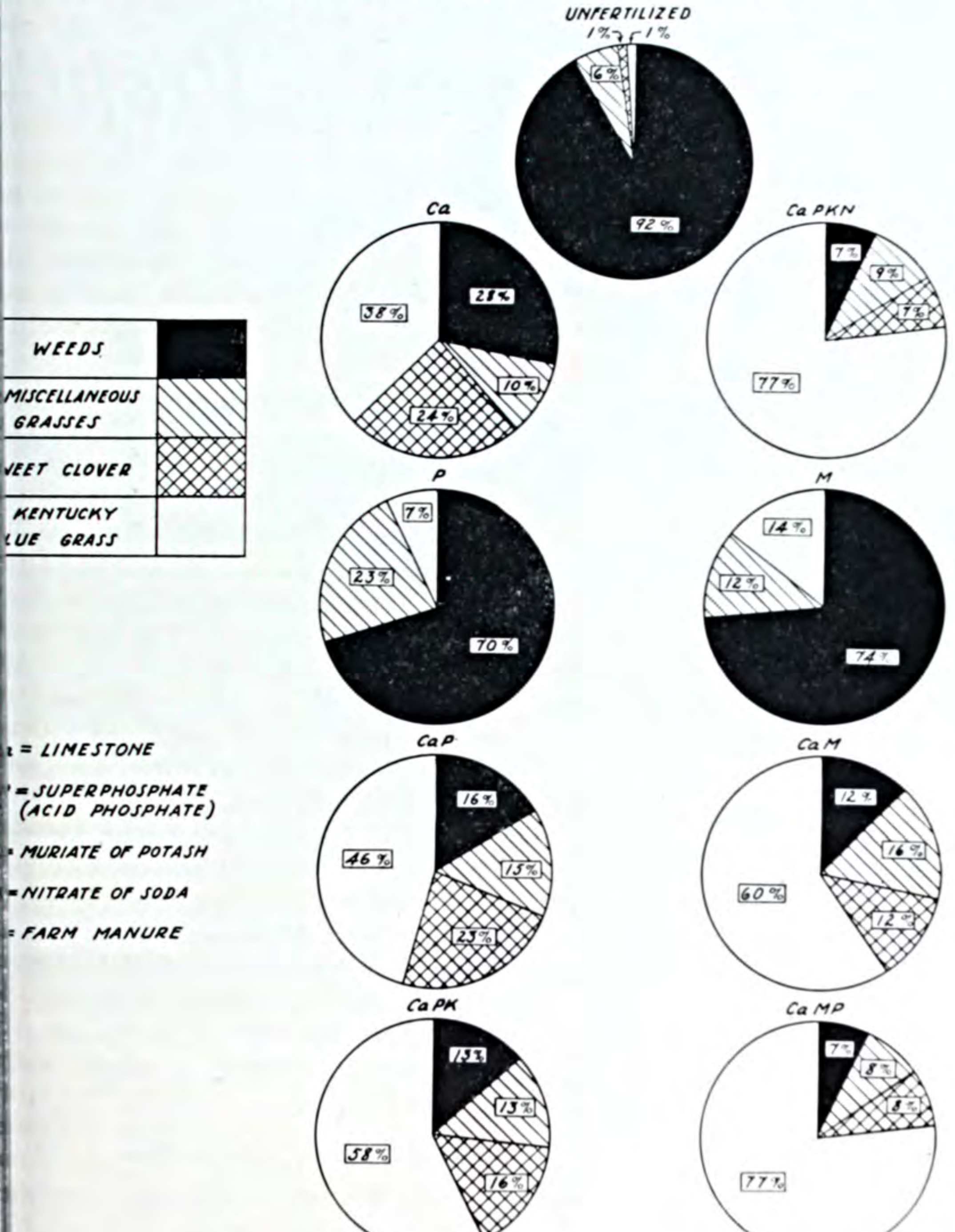
The Pennsylvania lime experimen have furnished valuable data on th importance of liming and value of di ferent forms in production of grai and hay. The following summar based on the average results of thr widely different soils serves to sho the importance of lime on easter soils.

AVERAGE ANNUAL YIELDS PER ACRE—AVERAGE THREE SOILS

	Clover and Timothy Hay	*Corn Bu.*	*Oats Bu.*	*Wheat Bu.*	*Roughage Pounds*	*Field Weight Crops*
No Lime	*1805	20.3	28.2	10.4	1399	2274
Limestone	3867	49.3	46.1	23.2	2561	4491
Hydrated Lime	3720	50.4	48.5	24.2	2603	4535
**Ground Burnt Lime	3793	49.5	37.5	23.3	2425	4281

*Weeds. **Average of two soils.

AVERAGE BOTANICAL COMPOSITION OF PASTURE VEGETATION AS INFLUENCED BY FERTILIZERS, LIME AND MANURE.
BRADFORD COUNTY – VOLUSIA SOIL – 1918 - 1927



is chart shows graphically the value of the several treatments in the development of permanent ntucky blue grass pasture on Volusia soil. Compared with the check, or unfertilized land, lime has duced the proportion of weeds from 92 to 28 per cent. Lime used with superphosphate has decreased e weeds from 70 to 16 per cent and when used with manure from 74 to 12 per cent. Complete rtilizers and the reinforced manure treatment with lime have produced a pasture which is practically free from weeds, containing 93 per cent pasture grasses and legumes.

In the lime experiment the three rms of lime are applied on the basis equal units of lime oxides in nounts sufficient to correct the initial ne requirement of the soil. All plots are uniformly supplied with the same amount of fertilizers, so lime becomes the limiting factor. The above results show that there is no significant dif-

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Crops Determine Dairymen's Profits

By H. W. Gregory

Chief of Dairy Husbandry, Purdue University

DAVIES COUNTY, Indiana, is located in the southwestern part of the state. A large portion of the soil in this county is acid and will not grow alfalfa, sweet or red clover successfully without being limed. This, however, should not prevent the dairymen in this county from feeding legume hay to their dairy herds. Soybeans and cow-peas are legume crops, which can be successfully grown on an acid soil.

In order to determine the actual conditions in Davies county, Indiana, as to the production and condition under which dairying was being conducted, a survey was made last April by the Purdue Agricultural Extension Department in cooperation with a large number of farmers and other local people interested in agriculture in this county. Data were collected from 227 different farms, in the county. Only 36 per cent of the farms, with at least five cows surveyed, had sufficient legume hay raised on the farm to provide feed for the dairy herd during the year. On those farms where all the hay fed to the cows was either alfalfa, clover, soybean, or cowpea hay, the average milk receipts per cow were $101.00 for the year. On those farms where the cows were only fed part legume and timothy, redtop, straw, or corn fodder, the milk receipts were $69.00 per year. On those farms where no legume hay was fed, the milk receipts were $54.00 per cow for the year.

Many of the farmers in the count[y] failed to recognize the value of feed[-]ing high protein feeds. The farmer[s] in the survey who were buying a[n] average of 789 pounds of high pro[-]tein feed, such as cottonseed meal[,] linseed oil meal, or mixed high protei[n] dairy feeds, per cow for the year, wer[e] receiving at least $150.00 per cow from the milk receipts. The amoun[t] of high protein feed purchased by th[e] farmers receiving $150.00 per cow from milk receipts, was just thre[e] times the amount purchased by th[e] farmers who received only $90.00 pe[r] cow from milk receipts, for the year[.]

There were 36 farmers with five o[r] more cows who did not feed any con[-]centrate with a protein content a[s] high as 15 per cent. These farmers[']milk receipts per cow were onl[y] $40.00 per year.

Affects Production

While we cannot definitely say tha[t] the feed was the entire cause of th[e] low returns per cow, for a farme[r] that is giving considerable thought t[o] proper methods of feeding and to sup[-]plying the right kind of feed is no[t] likely to overlook the fact that ther[e] is considerable difference in the abil[-]ity of cows to produce, there is n[o] question but what the proper kin[d] of feed was a big factor in the return[s] per cow found in the Davies count[y] survey.

A very similar difference was foun[d]

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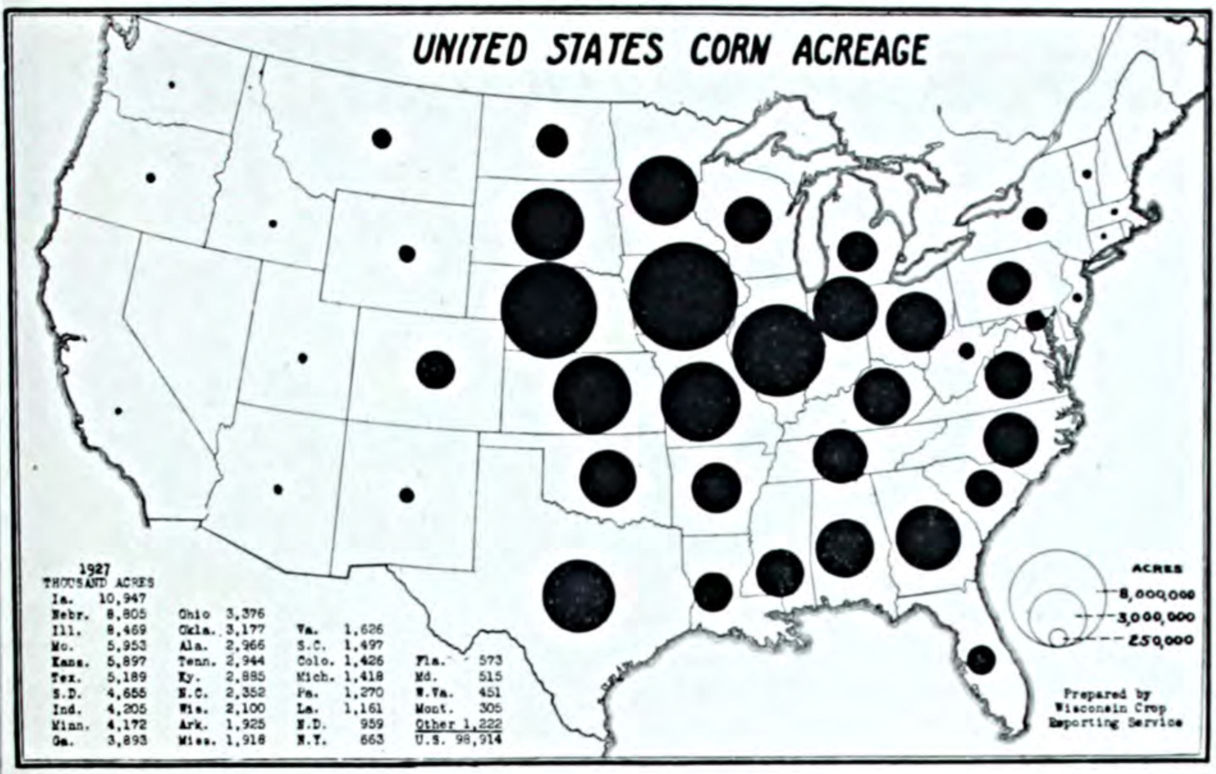

CORN

Second of a new series on crop statistics

By Walter H. Ebling

Agricultural Statistician, Wisconsin

CORN is a grain of American origin, and about 55 per cent of the 1926 acreage was grown in the United States. It is the most important crop in the United States, and nearly 23 per cent of the crop acreage is devoted to it. It thrives best in regions having a warm and moist summer climate with warm nights as well as warm days, the Upper Mississippi Valley being especially suitable for its production.

It is a rapidly growing crop, some varieties maturing in 80 days. A fertile soil is essential. About three-fourths of the farms in the United States grow corn, but the bulk of the crop is produced in the Upper Mississippi Valley. Over one-half of the nation's corn is usually grown in the six corn belt states: Illinois, Iowa, Kansas, Nebraska, Missouri, and Indiana.

Iowa is the leading corn state with nearly 11 million acres. Illinois and Nebraska follow with an acreage running usually between eight and nine millions. Missouri, Kansas, and Texas have acreages running between five and six millions. South Dakota, Indiana, and Minnesota usually run between four and five (*Continued on P. 54*)

Success *with* Cabbage

By A. E. Wilkinson

Vegetable Specialist, Connecticut Agricultural College

THE profitable marketing season for Connecticut-grown early cabbage is so short that one must go at the business of early cabbage raising with the determination of maturing heads at the very earliest period. This period commences generally about June 15 and does not extend much beyond June 20 to 25.

This statement was made by C. B. Jewett, senior partner of C. B. Jewett & Son of Hampton, Connecticut, one of the most successful early cabbage raisers in the State. From the statement one readily deducts that it is a matter of decided systematic planning if success is to be reached.

Luckily the Jewetts have a very large farm, and on this farm they have enough variation in soil and site so that they can select just the soil for early cabbage raising. They take a stony loam, rather light, in fact that type called gravelly is one that they prefer. Generally speaking, the site is on a hillside or at least on raised ground above low spots. The areas used for the crop during the last few years have been pasture land and in each instance has been fall plowed and in some instances spring plowed. Where an excellent job of plowing was performed in the fall, only spring harrowing was given.

Much of the land in Connecticut is acid and, therefore, lime has been necessary. Where stone lime has been used on the Jewett farm 2 to 2½ tons per acre have given good results, or from from 1 to 1½ tons of the hydrated lime. This lime has been broadcast and worked in. Conditions on such soil have been made correct for the proper growing of a good crop. Nothing is left to chance.

The variety selected for an early crop is not Early Jersey Wakefield, but the Golden Acre strain of Copenhagen Market. This is more desirable and is a round headed, small plant, forming good quality, extra early cabbage. A particular strain of proved merit is the only one that will be tolerated on the Jewett farm.

In order to start the plants, a greenhouse is needed and the Jewetts have a 50 x 10 ft. plant house of an even span type. This house is heated with the old-fashioned flue and is giving excellent results.

The first seeds are sown in flats about Feb. 15. The flats are small wooden boxes 18 in. long, 12 in. wide and 2½ in. deep. Especially prepared composted soil is used in these flats. From 400 to 500 plants are generally obtained from each flat, and when these seedlings are extremely small, they are transplanted into other flats so that each flat contains 13 rows of plants with 9 plants in each row, making 117 plants in each flat.

Where between 28,000 to 30,000 plants are raised in this way, they are pushed along somewhat in the greenhouse but are soon shifted to cold frames or semi-hotbeds where the seedlings grow slowly but are extra sturdy and stout. They are properly hardened before being placed in the field by being gradually subjected to outside climatic conditions. Very desirable plants are thus ready for transplanting to the field on or about Aprii 5 of each year.

Ready for market with miscellaneous load.

As previously stated, the soil has been thoroughly prepared and it only needs to be properly fertilized and marked out for transplanting. The Jewetts have a very good system of fertilizing the crop. At least one ton of 5-8-7 fertilizer is broadcast on each acre. If the land is not particularly rich, 500 lbs. more of this same fertilizer are used. The fertilizer is harrowed in and transplanting starts immediately.

On most farms, transplanting is entirely done by hand. Mr. Jewett drives a two-horse plant setter and instead of his son and another man working on the two seats in the rear of the machine and close to the ground, the son finds that he can do a better job alone. The horses are driven very slowly, and the cabbage plants are placed approximately 13 to 14 in. apart in the row. The rows are approximately 30 in. apart. It is a very short job to set out a couple of acres of cabbage in this way and where men are as familiar with the work as are the Jewetts, the work goes rapidly.

Cultivation starts as soon as the plants have been placed in the ground, the principle being not to allow the soil to pack down in between the rows, and this cultivation continues throughout the growing period every week, if possible, and not later than 10-day intervals. As soon as the plants show a small amount of growth, an application of nitrate of soda is given, using approximately 150 lbs. per acre. A small amount is placed near each plant. A little later another application is given and this, with the first fertilizing, is generally enough to carry the plant throughout the season or to a quick maturity.

It is necessary on the Jewett farm to treat the young plants with corrosive sublimate in order to control the root maggot. During the last two years only two applications have been necessary, the first on May 5 and the second 10 or 12 days later. One cupful of the corrosive sublimate mixture, which consists of 4 oz. of corrosive sublimate dissolved in 30 gal. of water,

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Freezing-up Is Correct

By A. J. Patch

Agricultural Editor, Michigan State College

DID you know that the alfalfa, wheat, or clover plants that you saw heaved up in your fields this spring were the victims of a hydraulic jack operated by Dame Nature? The new concrete pavement which was lifted and broken in some sections which were laid across low ground was damaged by the same natural force.

It is common knowledge that water expands as it freezes, and it has been generally supposed that the heaving of plants or pavements is caused by the mere expansion of the water. Recent studies by Dr. G. J. Bouyoucos and Prof. M. M. McCool of the Michigan State College soils department show that the heaving of plants is not due to the expansion of the water.

There are two types of freezing that cause damage to plants or pavements. The first type occurs when the temperature drops gradually. The water in the surface of the soil freezes, not in a solid sheet but in needle-like crystals that extend down into the soil a short distance. The growth of the crystals continues if the weather remains cold and this growth takes place at the bottom of the crystals. As this increase in length takes place, the upper end of the crystals and the surrounding soil is forced upward. Any plants present in the soil are carried along with the soil movement.

The second type of freezing, which is perhaps the more damaging of the two, occurs when the temperature drops suddenly. When this occurs, the water in the surface of the soil

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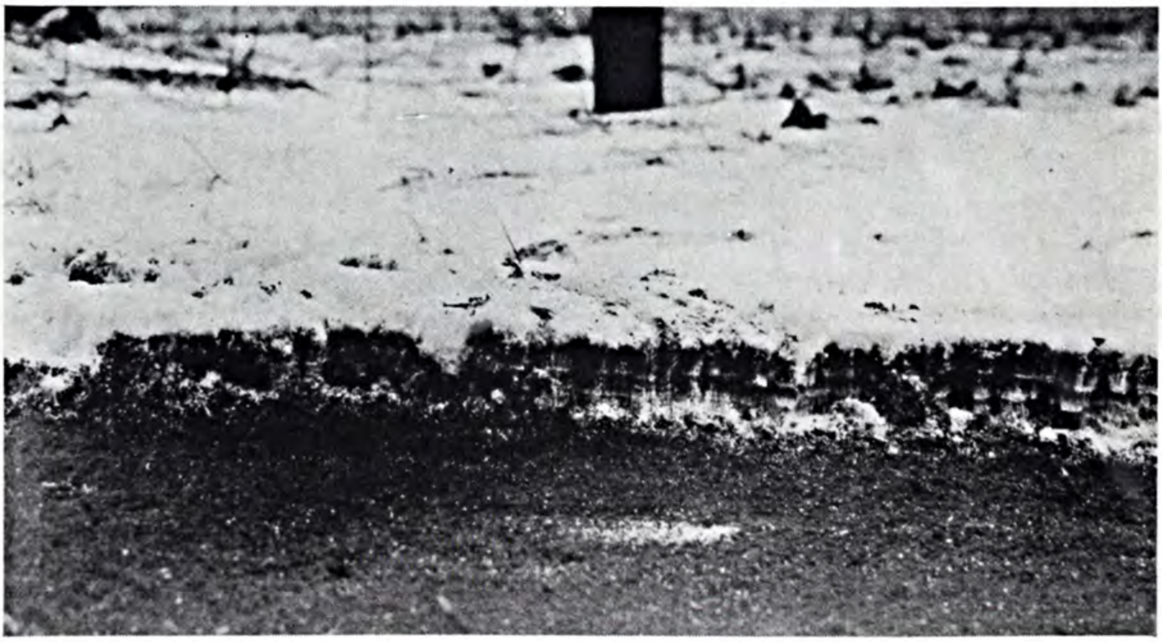

Section of soil removed to show ice formation in the soil. Each layer is forced up by the elongation of the crystals. Thawing permits the ground to subside which leaves the crowns and roots of plants exposed.

These four registered Jersey cows were bought when calves by Hinson and Sons, as a start towards developing a dairy business.

Father & Sons—PARTNERS

By M. D. Mobley

Georgia State College of Agriculture

QUITE often in the city we see such signs as John Jones & Son, over business establishments, but it is very seldom that we see a partnership between father and son in the business of farming. Why?

There are possibly many reasons, but no doubt one of the most outstanding is the fact that there is a very poor business-like relationship between most farm boys and their fathers. Very few boys are given an opportunity to earn money of their own or to transact any business until after they leave home.

A boy usually receives educational opportunities and clothing that cost as much or more than his labor on the farm, but he loses that satisfied feeling of knowing that he has earned some money of his own. The boy is denied the privilege of handling money and carrying on his small business, which would give him that much needed experience for transacting business in future years.

For a boy to handle money and transact all or a part of his business does not necessarily mean that he is to spend his money wastefully. Isn't it possible to direct to a great extent the expenditure of the money he earns?

I had the privilege recently of visiting Mr. A. G. Hinson and his two sons, Ernest and Conrad, who are

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Early Potatoes

By R. B. Fairbanks

THE importance of the early southern irish potato crop is generally recognized. While the quantity of potatoes of the northern grown stock which goes into storage the year previous has some effect on the price of the early southern crop, yet new potatoes will frequently sell for two to four times as much as old potatoes. There is something about new potatoes that makes them more in demand than the old potatoes that have gone through the winter in storage. Southern growers of this early crop realize full well, however, that the quantity of northern grown potatoes in storage will affect the prices of their early crop.

The abnormally large crop produced in 1928 will in all likelihood have the effect of slightly depressing the prices of the early 1929 southern crop. The southern growers know this and will be careful not to plant an abnormally large acreage. This is nothing but good business. They will not, however, let the large quantity of potatoes that are in storage scare them off and prevent them growing something like a normal crop. They know that in spite of all these potatoes in storage folks will want new potatoes next spring and early summer and will be willing to pay a considerably higher price for them than for the potatoes grown the previous year. This is the reason why the southern early crop continues to be one of major importance despite the increasingly large crops grown in the regular potato states of the North and West.

It is interesting to note the fertilizing methods with this early southern crop. The object being to get the new potatoes on the market just as early as possible, it is but natural that they should be forced with all possible speed. Many things enter into this matter of forcing the crop to an early maturity, among them being early and thorough preparation of the soil, and the using of a soil that contains much sand which will warm up early. However, none of these factors is so important as the matter of kind and amount of fertilizer used.

Forcing the Crop

In order to force the crop to maturity in the shortest possible time, not only are large amounts of commercial fertilizers used, but quite a high grade is practically always applied. A liberal amount of nitrogen is needed in order to force the growth, and it has generally been observed that the nitrogen should come from both the organic and inorganic sources. The leading growers prefer to have a fertilizer in which about half of the nitrogen comes from quickly available inorganic sources, such as sulphate of ammonia and nitrate of soda, with the remainder coming from the more slowly available organic sources, such as fish scrap, dried blood, cottonseed meal, etc. More and more the tendency seems to be to increase the percentage of the inorganic source, as the organic sources are so slowly available.

The use of a liberal percentage of potash is considered essential to a good yield of the early crop of potatoes.

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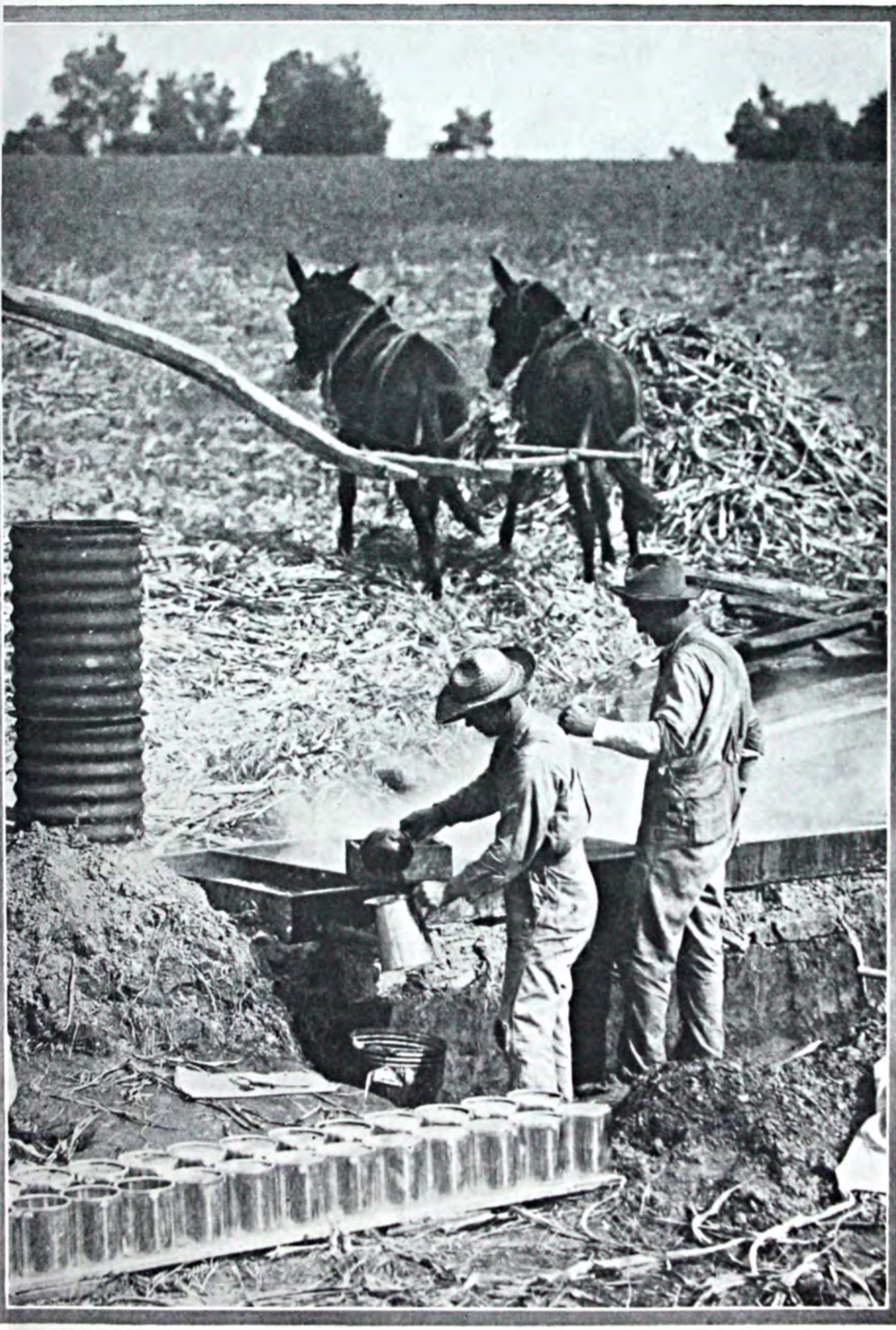
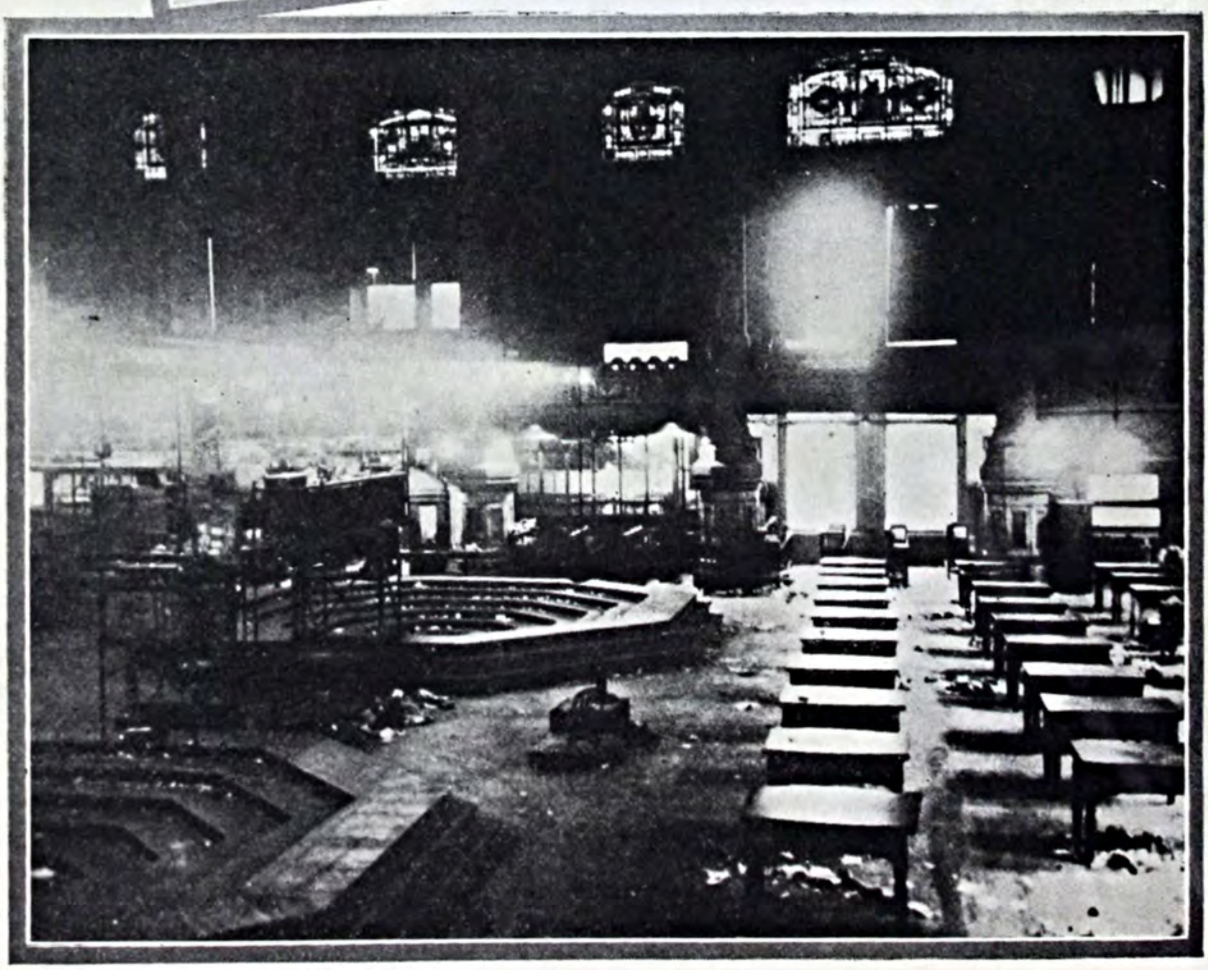


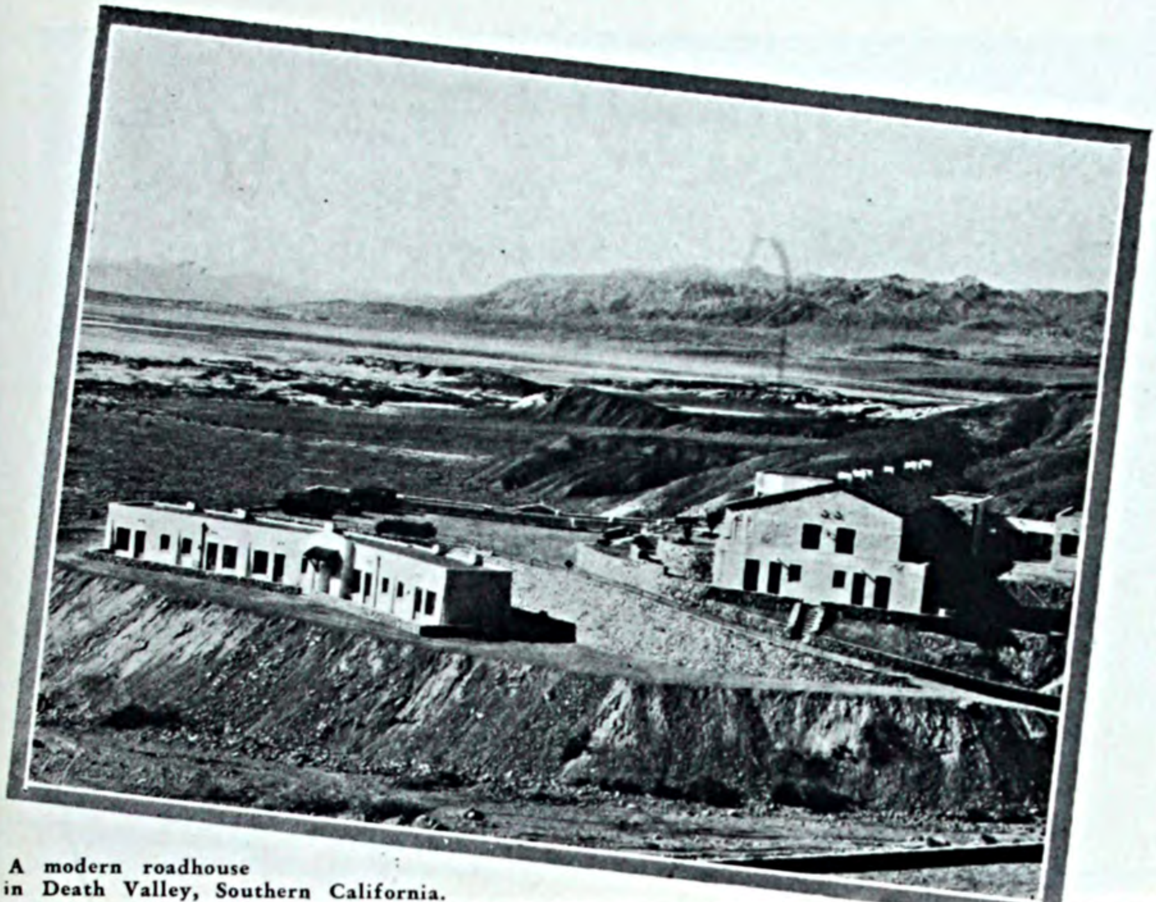
Down in the Sunny South jes a-makin' some of dat good ole sorghum 'lassus.

PICTORIAL

A Malay cart on one of the modern roads out of Singapore.



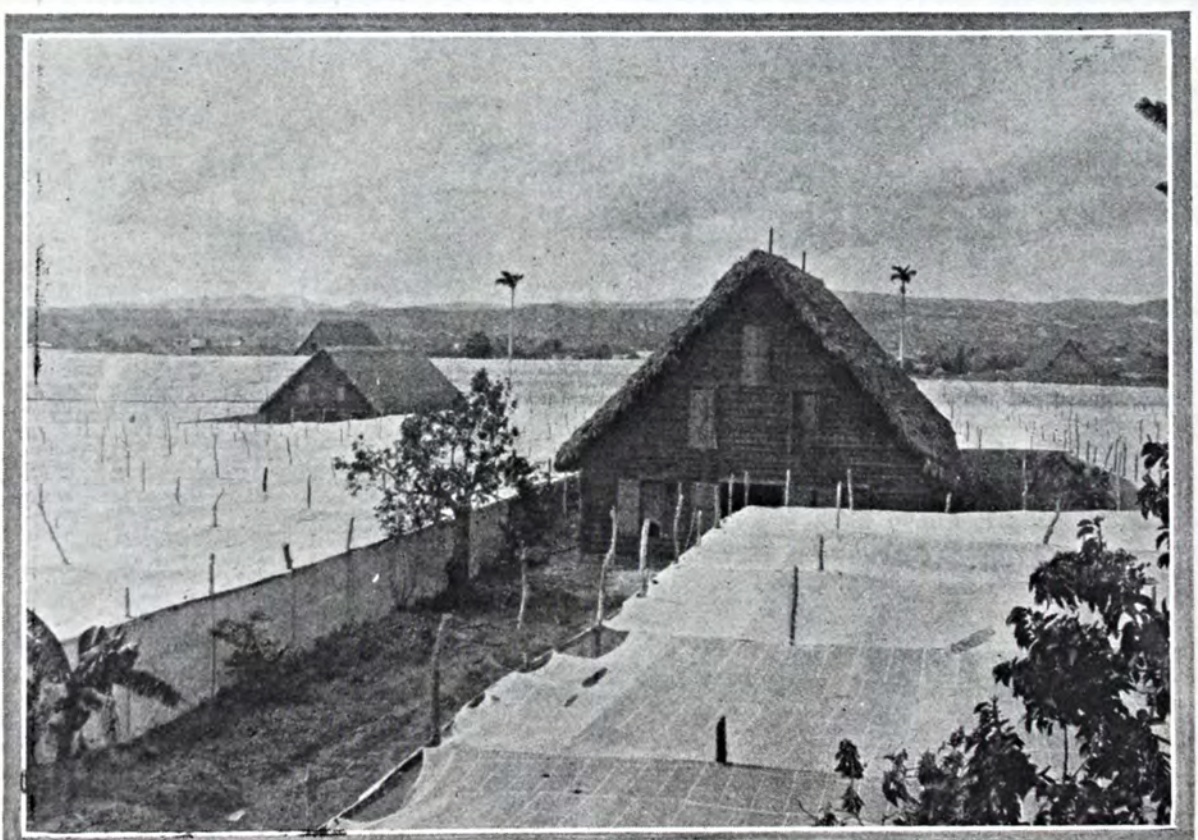
After the last wild demonstration in the old grain pit, Chicago, which is to be torn down to make way for the new Board-of-Trade skyscraper.



A modern roadhouse
in Death Valley, Southern California.

A bird's-eye view of one of America's great industries—a cotton mill in the South. Aeroplane photography is fast becoming an important industry.

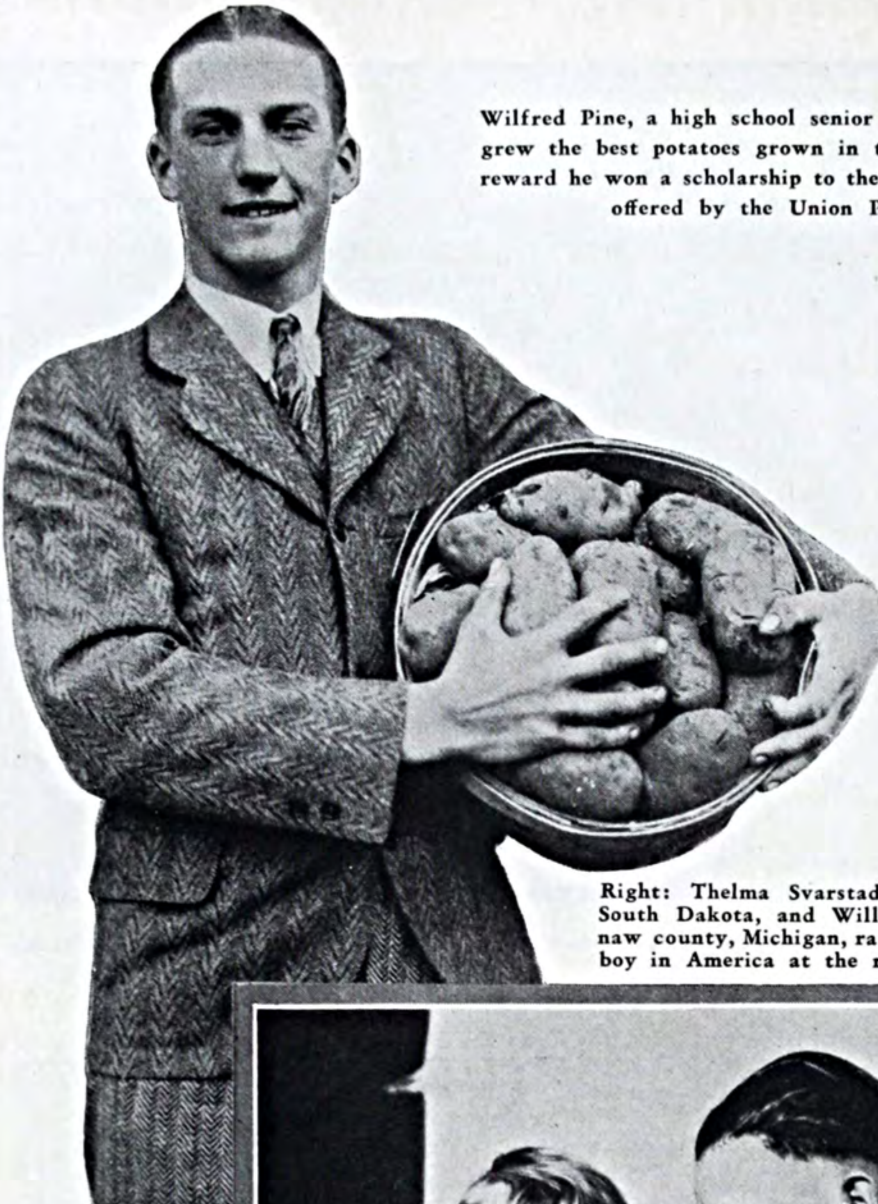
A study in black and white—piccaninnies and cotton on the farm of B. L. Redwine, Newman, Georgia.



A view of tobacco barns and tobacco fields under shade in Cuba.

Lewis Gardner, for twenty years a guide in Mammoth Cave, Kentucky, going to mill on his old mule.

Stringing Georgia tobacco to hang in the barn for drying. Most of this tobacco goes into cigarettes.



Wilfred Pine, a high school senior of Lawrence, Kansas, who grew the best potatoes grown in that State last year. As a reward he won a scholarship to the State Agricultural College offered by the Union Pacific Railroad.

Right: Thelma Svarstad, 17, of Brown county, South Dakota, and William Tobias, 15, of Saginaw county, Michigan, rated the healthiest girl and boy in America at the recent contest in Chicago.

The Editors Talk

The Agricultural Outlook

Optimism is the keynote in the agricultural outlook for 1929. The present situation is better than at any time since 1920, according to Secretary Jardine after summing up the past year. He finds fewer distress areas, and his report that the gross income of American agriculture from all products for the crop year 1927-8 will be larger than that of the preceding crop year bespeaks a sounder basis for the American farmer which will carry over into the new year.

Many branches of the agricultural industry have made new gains in efficiency and production and in the adjustment of supply to demand which will continue in the 1929 programs now being formulated. There is hope to be placed in the increased interest which the American farmer is taking, not only in more efficient production, but in the marketing and distribution of his products. In the past 10 years, the number of cooperatives has grown from 5,424 to 11,400. The membership has increased five times.

The world's population is increasing; the United States' population is increasing, making the long-time outlook for agriculture very favorable.

More stable money conditions are contributing to the progress of Europe. The return to the gold standard is being reflected in a bigger demand for agricultural products than there has been at any time since the World War. This economic recovery is also illustrated by increased standards of living in Europe. Each year since the war has seen more countries on a gold basis. A stable monetary basis eliminates many difficulties and is a decided stimulant to world trade.

A more definite outlook regarding American agriculture in both domestic and foreign markets during the coming year will be reported on January 28 by the Bureau of Agricultural Economics of the United States Department of Agriculture, in cooperation with other bureaus of the department, following a Washington conference of leading agricultural economists. The report will aid farmers in adjusting production to meet market demands. Agricultural economists and extension workers from practically every state will attend the conference to discuss the agricultural situation and needs in the various States and to use the national outlook report in formulating local agricultural programs for the ensuing year.

This issuance of an outlook report is of value to every farmer and agriculturist in the country. Begun by the Bureau in 1923, these reports have been issued annually since that time and have met a popular demand among farmers. Nearly every State now has some form of organization for the dissemination and interpretation of the outlook material along State lines, since the outlook statement must be interpreted in terms of local conditions to be of greatest value to farmers. This year the work has been further extended by means of additional funds provided by Congress.

We agree with Secretary Jardine who says that timely information of this character is essential to balanced production and orderly marketing, and is helpful not only to farmers but also to the general public. Modern agriculture can not prosper without economic information as a guide to production and marketing. When the department's outlook and intentions-to-plant reports are better understood and more generally used by farmers, an important step will have been taken toward the stabilization of agriculture.

Farm Experiments

As is well known, the National Fertilizer Association with the assistance of salesmen and agricultural agents of fertilizer companies during this past summer conducted a survey on the consumption of mixed fertilizers. We are indebted to this survey for information pointing to the fact that more and more American farmers are learning the science of agriculture by becoming practical scientists themselves.

Of the 48,000 farmers who replied to the question, "Have you ever made any comparisons with or without fertilizer?" 37.1 per cent, or nearly four out of every ten farmers interviewed, replied that they had made such comparisons. A smaller percentage, 30.3, said that they had made tests of different kinds and amounts of fertilizer.

Charles J. Brand, executive secretary and treasurer of the National Fertilizer Association, in commenting upon the replies, points out that fertilizer manufacturers, farm papers, and agricultural extension services generally encourage farmers to make tests. He states that manufacturers know from experience that the farmer who tests fertilizer on his own farm learns more accurately the analysis of nitrogen, phosphoric acid, and potash in complete fertilizer that his soil may need to produce the most profitable yields. When a farmer makes a test, usually the increase in yield, the hastening of maturity, or the improvement of quality so impresses him that he thereafter uses more and better fertilizer.

Experience is and always has been the best teacher. In adapting scientific principles to local conditions by actual experimentation on his own farm, a farmer is not only reaping the advantages of experience, but is becoming a research worker for his own community.

The survey is very interesting from the soil fertility standpoint and because it sounds a definite note in the improvement of agriculture.

Changing Management

Not every one likes a managing person. Not every one fills the role of a manager. But somebody has had to do it whether they are liked or not.

First of all, management has been individualistic in small units, in the home, the one-man farm, and shop. Then as credit and banking facilities grew, management was enlarged to relatively small companies until with the growth of commerce and manufacturing, industrial management under one man or group, has now grown to world-wide dimensions. It has become the one force that makes or unmakes the stability of large numbers of the world's population.

So vital is management in the present age that it has a philosophy of its own, but a philosophy still in the making. As one frank soul confesses, "Less is known comparatively of management than any other division of business activity. Judged purely by results, management in the average understanding of the term is a failure the world over. . . . The science of management has yet to rise to the technique of an approach to scientific method. It is in its infancy."

Again, as Sheldon says in effect, management has to deal with new and changing forces, particularly the march of labor and science. It has to deal with new and reinvigorating standards; with new social contacts and responsibilities. There is a growing morality of business as well as the economics of business, both daily growing more complex.

The danger of management as Sheldon again points out, is not lack of activity but lack of a plan of action; a definite goal. In the elaborate planning of detail, there is danger lest the trees should blind us to the forest.

If this is true of management in industry as a whole, it is doubly true of management in agricultural industry. Agricultural industry has a multitude of stimuli in the form of government research stations and other scientific efforts set up by the state to see to it that its agriculture is properly developed. At the same time, because agriculture is fundamental to the life of the nation, the state sees to it that as far as possible agriculture is conducted for the benefit of the nation, which puts a heavier responsibility on agricultural industry.

To bring over this scientific effort of the state into agricultural industry and harmonize such effort both in its organization and in the results of its findings, is one of the great problems of management so far as agricultural business is concerned. The next decade will undoubtedly witness more progress and more changes in this field than have occurred in the last hundred years. Happy is management if it sees the picture clearly in advance. This is the urgent need.

Exchanging Ideas

IT is always useful to exchange ideas especially regarding the methods and results of research and experimental work. As is well known, many research workers in Europe are busily engaged in projects that are of importance, not only to the thought of Europe but to other countries as well. The same, of course, is true of American research work.

In order to be of some assistance to agricultural workers in the United States, we shall be very glad to supply translations of some recent papers, relating to work conducted in Europe. The first releases relate particularly to work conducted in Germany. From time to time however we hope to add translations regarding work in France and possibly other countries.

The first list of translations available include references to the famous work of Dr. E. A. Mitscherlich on the Law of Growth. This law is of course a vital topic of discussion and the paper, "For or Against the Law of the Effect of the Growth Factors," is a stimulating discussion on the subject.

Another very practical and interesting paper which deals in part with Mitscherlich's law is a discussion by Dr. A. Jacob on "The Law of Minimum in New Forms."

"How Shall I Fertilize?" is a growing and important question in the United States; hence a paper on the determination of fertilizer requirements by Dr. Vageler is of value and interest.

Another excellent paper along the same line is "Studies on Continuous Cropping with Regard to the Neubauer Method," by Prof. Dr. Roemer. The Neubauer method is, of course, attracting attention in the United States. This paper by Dr. Roemer is therefore of interest to many workers.

Diseases are represented by a paper on the "Clearing Disease or White Pest, a New Soil Disease," by I. Hudig and C. Meyer.

A final paper is on the question of "Controlling Rust in Winter Wheat," which is of great practical importance in the United States.

These papers are listed in detail in another part of BETTER CROPS WITH PLANT FOOD. Knowing the interest that is growing among research workers regarding work done abroad, and also knowing that many workers are so busy that the time for making translations is extremely limited, we will be glad indeed to send free of charge copies of any or all of these translations to any one requesting them.

Cooperators in the Soil

Cooperation as a remedy for business ills is frequently urged. Especially has it been recommended to farmers to help them surmount their business depression. The recent favorable trend of agriculture indicates that the cooperation used has been valuable.

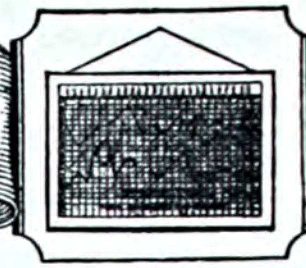
Most of the cooperation has been among farmers or groups of farmers. A type of cooperation sometimes overlooked or unrecognized is that among the various factors in crop production. Some factors cooperate of their own accord, while others must be helped along by the farmers.

A cooperation that frequently must be aided, is that between fertilizers and lime. There are frequent cases on record where one or the other applied alone was not beneficial, or only slightly so. When both were applied, large increases in yield resulted. There is not much use in making the soil sweet if there are no nutrients in it to nourish the plant. Neither is it economical to apply fertilizer to a soil under such conditions that plants cannot use it, which appears often to be the case when the soil is acid. These facts are brought out well by the work of Thorne (Ohio Bulletin No. 381), when he found that fertilizer alone in a 5-year rotation increased the yield of corn 17.51 bushels per acre over the untreated plot. The lime alone increased the yield 12.37 bushels over the untreated plot, while a phosphate and potash fertilizer added to the lime further increased the yield 21.24 bushels over the limed plot.

White (Pennsylvania Bulletin No. 195), in his pasture experiment at Snow Shoe, found that lime alone increased the yield of blue grass and sweet clover 162 lbs., while a phosphate and potash fertilizer added to the lime further increased the yield 2,993 lbs.

These results illustrate the facts found on many crops in many localities, namely, that best results are secured only by using lime and fertilizer in cooperation with each other.

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

MARK MR. MILLER

It isn't so much nowadays to grow a ton litter of pigs, although only good farmers do it. But to grow 8 ton litters all in one season is still a great accomplishment. In fact, only one man is known to have accomplished this feat in pork making. He is Mark E. Miller of Enfield, White county, Illinois. More remarkable still, Mr. Miller made this record with 8 out of only 9 litters farrowed on his farm the past season. Mr. Miller's section of the State, the southern part, is not usually considered a leading hog raising section. He used stock with good blood lines and followed the advice of the agricultural college as to sanitation and feeding. The 9 litters fed by Mr. Miller contained 93 pigs and fed to a total weight of 20,610 or an average of 2,290 pounds for the 9 litters. The receipts from the 9 litters amounted to $2,323.17.

WORSE THAN QUACKGRASS

Quackgrass and the Canada thistle have long been listed as about the worst curses one farmer could wish on another. But our farmers are always on the lookout for better things, and now they have a weed that is even better as a weed than the old-time leaders. This new one is Austrian field cress, and the most recent reports of its presence have come from Minnesota, where it was found occupying a quarter-mile strip along a roadside in Lyon county. It was first noticed in a field of the Wisconsin Experiment Station at Madison, where it probably grew from seed brought in with farm crop seeds from Europe. Two years later it was found near the State line between New Jersey and New York, and in 1926 was found near Rochester, Minnesota. Even after ground has been kept clear of vegetation for two years the roots of this weed will send up shoots, and experience caused specialists at Wisconsin to describe the weed as "more persistent than quackgrass or Canada thistle." It belongs to the mustard family. It is so difficult to eradicate that Minnesota farmers who have had experience with it believe the State should use general funds or make a special appropriation to kill out the infestations.

MOTORIZED SOIL TESTING

The portable soil testing laboratory of Ohio's extension service has many advantages, says Earl Jones, soils and crops specialist of that service. From the middle of March to the first of November, excepting harvest season and time out for the State Fair, the laboratory was working steadily, testing 5,348 samples of soil. The specialists with the portable soil equipment held 163 meetings in 29 counties. One great advantage of the method is the direct observation that can be given the fields and the methods in use on the farms from which the samples are taken. Jones says "we see actual demonstrations that otherwise would remain unknown to us; we get the reactions of farmers to the use of fertilizers; and we get the results of liming and of different drainage systems."

ALUMINO-SILICIC ACID

The old, old question, "What makes soils acid?" has been solved by three scientists at the University of Wisconsin. They say the typical acid reaction is produced by alumino-silicic acid, and now the way is open to the solution of the question, "What can be done about it?" The men who did the work are Emil Truog, of the agricultural staff, inventor of the Truog soil tester, who was in charge of the work; H. W. Kerr, a government student from Australia; and J. A. Chucka, of Marinette county, Wisconsin, a graduate student. They have been able to separate large quantities of the acid from soils. The acid is said to be very common in the soil and in a rock called "bentonite." Truog says it has as much power for good as for bad.

Not all the diggers are "ditch diggers."

BIRDS BRING HONOR TO BIRD

C. M. Bird, of Meyersdale, Penn., President of the International Turkey Show, was recently awarded a silver loving cup by a publication devoted to turkeys. Mr. Bird and another "Bird," his brother, have a world-wide reputation as breeders of Bronze turkeys and are said to have won more turkey prizes than any other at the Madison Square Garden Poultry Show.

"BUG" VERSUS BORER

Dr. Tage Ellinger of Chicago, research director of the International Corn Borer Investigations, says that disease-producing bacteria and natural immunity developed in the corn plant may possibly help a great deal in reducing the menace of the corn borer. He says investigators of the Pasteur Institute of Paris have found that infested plants developed immunity and that there are in Europe a certain varieties of corn entirely free from borer infestation. In calling attention to the bacterial enemies of the borer, Doctor Ellinger says that spraying with fluids containing these bacteria may become an effective means of wiping out the pest. Anyway, these are nice things to think about while carefully turning under corn-stalks and weeds.

INTEREST IN IODINE

Iodine as it enters into the content of feeds, soils, and water has been the subject of considerable interest in South Carolina. Of the vegetables analyzed spinach, mustard, lettuce, and sweet potatoes carried the most of this element. Vetch, alfalfa, Austrian winter field peas, soybeans, and oats were the livestock feeds highest in iodine. The top six inches of soil were shown to be lowest in iodine; there was more in the next six inches; and the third half foot had a still higher content. City water supplies were found to lose much iodine in the purification process. Rivers showed a varying content—two to six parts in a billion.

WASTED FERMENTATION

Don't waste fermentation on feeds like hay, corn stover, and straw, says the University of Illinois after investigating this method to see if it would make the roughages more effective. This "converting" of feeds which has been advertised to Illinois farmers along with materials called "converter" is said to be a decided flop. Results of Canadian experiments are quoted to show that the processed feed was no better than corn silage and that cows fed the dry unprocessed roughage gave just as much milk as those getting the so-called "converted" feed. And there was a great difference in the cost, for the "converter," consisting of salt, slaked lime, and vegetable matter, is not given away.

European Universities

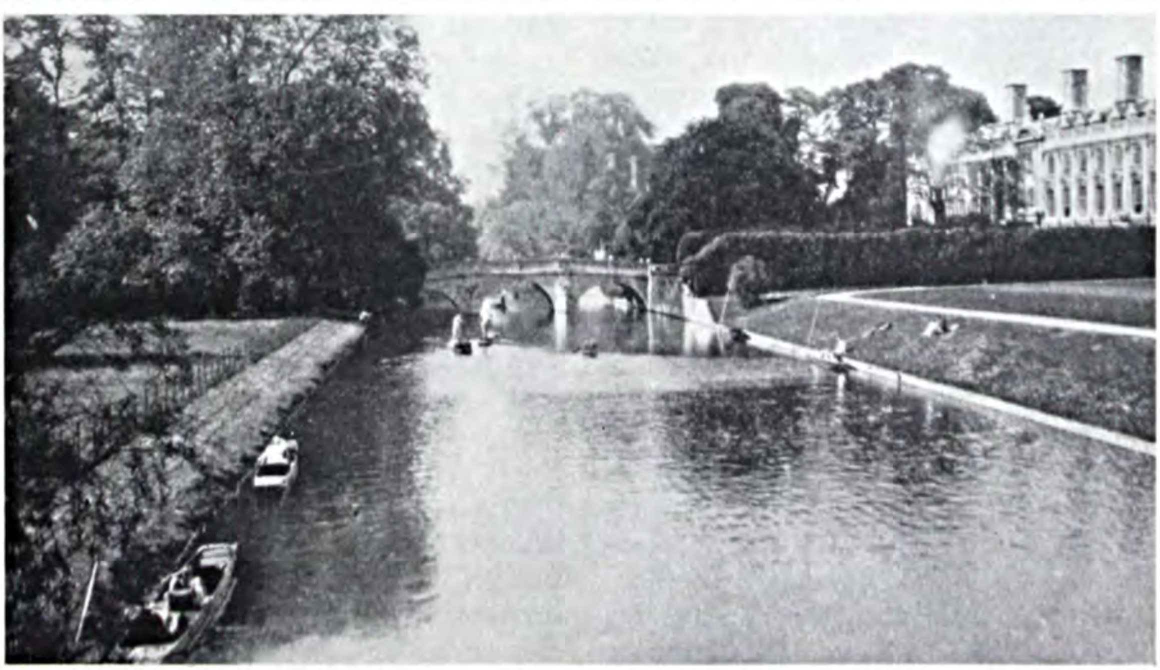
By Rodney Fox

Ames, Iowa

"THE universities are able to get information to the European farmer much more easily and with less 'bally-hoo' than in America," says Dr. E. W. Lindstrom, professor of genetics at Iowa State College, Ames, who has just returned from a year spent abroad, and explains that the farmers of northern Europe have a much higher level of education than American farmers. Dr. Lindstrom worked during the past year with the Educational Board of the Rockefeller Foundation which has for its purpose the development of international relations along the lines of science and education.

The board works through the exchange of fellowships for students of the advanced type, about 120 men being placed each year. It is required that fellows study in a foreign country because the administrators feel it is the duty of the home government to educate its own students. Because America is not outstanding in many lines of science, only about 20 per cent of the students are placed here.

The foundation also has millions of dollars invested in universities and research stations in England, Holland, Sweden, France, Italy, Switzerland,



The "Backs" at Cambridge, England.

Belgium, and Roumania. The most recent gift is that of three and a half million dollars to Cambridge University in England for the benefit of agriculture and biology. Dr. Lindstrom's work of inspecting the colleges and examining students for fellowships took him into every leading university in Europe.

Respect Education

"The traditional respect for education in the old world dignifies the college training in the eyes of the students," says Dr. Lindstrom. "Competition is so great that only the best men survive as teachers and experimenters, and although investigation is done on a smaller scale than in America, many valuable results are obtained."

The people are trained in the elementary and folk schools which, though they have a touch of the practical, are largely cultural and much more thorough than American schools. European colleges do not tie up closely with practical agriculture. Professors are not required to limit themselves to experiments that have an immediate commercial value, and they have the opportunity to develop projects of the greatest importance. On the other hand, the colleges get out of contact with the farmers and suffer a resultant loss of their practicability.

In general, the agricultural schools are supported by the state or ministry of agriculture. Experiment stations are not connected with the universities but are under the agricultural ministry or are maintained by farmers' organizations of which there are a great many in Europe.

The war left the Europeans with the problem of obtaining an adequate food supply, and they have solved it partly by the application of scientific agriculture. They breed for performance rather than for appearance, and the European farmers easily beat American farmers in production.

The students in the old countries are serious, hard-working, and undemonstrative. Only the wealthy class can afford an education, and there is no chance for a student to work his way through school. Working is considered undignified, and the studies do not allow much time for other activities. Because of the traditional respect for education, much attention is given scholastic attainment, and the city population turns out to attend a doctors' examination. The candidate must be prepared to debate his thesis with anyone in the audience.

Only 10 per cent of the administration of an American university is necessary in the European college. There is only one professor in a department, and he has complete charge of planning his course of study and of directing his staff of assistants. The office of dean is rotating, one professor holding the position for several years and then passing it on to the next one in line.

Professors Are Noted

Dr. Lindstrom met a number of famous agricultural and scientific leaders, among them such men as Sir John Russell of the Rothamsted Experimental Station; Sir Daniel Hall, director of the John Innes Horticultural Institution; and J. B. S. Haldane, reader of Biochemistry at Cambridge and also connected with the John Innes Horticultural Institution.

"Mr. Haldane is a brilliant scientist, a genius of the eccentric type who specializes in genetics and human physiology," according to Dr. Lindstrom. "He will seal himself into a chamber or inject chemicals into his blood until he faints, but he is a man of considerable physical vigor."

Dr. Lindstrom thinks the four most impressive colleges in Europe in the order of their importance are Cambridge, England; Dohlem, Berlin, Germany; The University of Copenhagen, Denmark; and Wageningen at Stockholm, Sweden.

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 Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. 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 influence of various nitrogen fertilizers on availability of phosphate and potassium in a number of soils was studied by J. F. Fudge, in "The Influence of Various Nitrogenous Fertilizers on the Availability of Phosphate and Potassium," Bulletin 327 of the Agricultural Experiment Station, Auburn, Ala., July, 1928. Acid-forming fertilizers caused a marked decrease in phosphate availability and an increase in water soluble potassium, at the expense of the potentially available supply. Basic fertilizers caused an increase in phosphate availability and a reduction in water-soluble potassium, but tended to conserve the potentially available supply.

Several bulletins dealing with cotton and other important crops in Mississippi were received this month. The several authors show that cotton usually does best with a complete fertilizer, 6-8-4 and 6-8-8 (NPK) analyses being recommended at 500 to 600 pounds per acre. The higher potash fertilizer is especially necessary where rust is prevalent. A complete fertilizer is also recommended for tomatoes, cabbage, and sweet potatoes. These bulletins are as follows:

"Cotton Production (Central Station) 1927," Agr. Exp. Sta., A. and M. College, Miss., Bul. 249, Jan., 1928, J. F. O'Kelly and W. W. Hull.

"Cotton Fertilizer Experiments," Agr. Exp. Sta., A. and M. College, Miss., Bul. 250, Jan., 1928, C. B. Anders and W. W. Hull.

"Cotton Experiments, 1927," So. Miss. Exp. Sta., Poplarville, Miss., Bul. 251, Dec., 1927, E. B. Ferris.

"Report Raymond Branch Experiment Station, 1927," Raymond, Miss., Bul. 252, Dec., 1927, H. F. Wallace.

"Report Holly Springs Branch Experiment Station, 1927," Holly Springs, Miss., Bul. 253, Dec., 1927, C. T. Ames and Otis B. Casanova.

What happens to potash when it is added to the soil?

It has long been known that the soil holds potash firmly enough to prevent the rapid loss by leaching of this important plant nutrient. It has also been thought that this potash held by the soil (adsorbed) could be used by growing plants as needed. This arrangement of nature was considered very convenient, as one simply threw some potash on his soil once in a while and let nature feed it to the plants in the necessary quantities. This very haphazard procedure was excused owing to the lack of definite knowledge on the mechanics of this adsorbing and releasing of potash. However, fuller information on the action of potash in the soil has been secured by J. F. Brezeale, in "Soil Zeolites and Plant Growth," Agricultural Experiment Station, Technical Bulletin 21, Tucson, Arizona, June 1, 1928.

The author points out that if potash salts are added to moist soils they are fixed or adsorbed almost instantaneously by a material in the soil called zeolite. This zeolite is really a mineral which arises under proper conditions when other soil minerals decompose. A queer thing about this zeolite is that it also apparently decomposes in soils that are depleted of their bases, such as potash, lime, magnesia, and soda. However, when these bases are added to a soil as fertilizer or lime, the zeolite again forms and adsorbs the bases thus keeping them from quickly washing away. If this were the whole story, we would not have to worry about these zeolites as they can build up as necessary, even after having been completely broken down, due to removal of all bases from the soil.

However, another interesting set of experiments by Brezeale show the danger of allowing the soil to become exhausted of its bases. He took a soil and repeatedly treated it with a potash salt until it would not adsorb or fix any more. This high potash soil was then used as a nutrient medium for six crops of wheat seedlings grown in a water culture. Each crop was grown 19 days and then analyzed. The author found that all the available potash had been removed from the soil as shown by the plants analyzed. This soil was then again treated with potash and wheat seedlings again grown with it as the nutrient medium. In comparison to this, some fresh soil saturated with potash was used for another set of plants. The results showed that the depleted soil was able to readsorb only about half of what the original soil was able to adsorb. Thus by depleting the soil of its bases he injured it more or less permanently. It is quite obvious that careful soil management requires that potash and lime be added to the soil before waiting until it becomes actually starved, as the injury may be more or less permanent.

In another experiment, Professor Brezeale took a soil and treated one part with potash, another part with soda, another part with lime, and another with magnesia. Using these as nutrient media, barley seedlings were grown on them and the plants analyzed to determine the potash they were able to use from each soil sample. The results showed that the plants were able to take some potash from the lime, soda, and magnesia soils, but only about half as much as from the potash soil. This would indicate that we have to feed the plant potash if we want it to get plenty of potash for good growth.

Although this is a technical bulletin, the methods and data are presented in such a clear way that one with only an elementary knowledge of chemistry can understand it. Other interesting experiments along the same lines as those mentioned are included, and they all go to show how research methods may be used to attack difficult and practical problems of agriculture.

"When to Use Lime for Vegetable Crops," Ext. Serv., Agr. Col., Amherst, Mass., Ext. Leaflet 52, June, 1928, Ray M. Koon.

"High Grade Fertilizers for Profit," Agr. Exp. Sta., East Lansing, Mich., Cir. Bul. 53, Mar., 1928, M. M. McCool, G. M. Grantham, P. M. Harmer.

"Value and Care of Farm Manure," Ext. Div., Michigan State College, East Lansing, Mich., Ext. Bul. 71, Apr., 1928, John W. Sims.

"Testing Fertilizers for Missouri Farmers, 1927," Agr. Exp. Sta., Columbia, Mo., Bul. 260, Apr., 1928, L. D. Haigh.

Soils

The importance of considering th subsoil as well as the surface soil in locating and interpreting fertilizer results is very clearly brought out by M. B. Hoffman and G. R. Schlubatis in their bulletin, "The Significance of Soil Variation in Raspberry Culture," Michigan Agricultural Experiment Station, Special Bulletin 177, June, 1928. This is especially true with fruit growing, since the crop is to remain in one place for a period of years and because deep rooting seems to be essential to favorable production. The area of ground reported here was of rather uniform appearance on the surface and was selected as a good field for a raspberry fertilization experiment. It was fairly level, well-drained, and apparently typical of the soils in this section devoted to raspberry culture.

Yields showed wide variations not only among the treatments, but also among duplications of the same treatment. The latter led to soil studies. A great variation in depth to a hard clay layer which caused differences in height of a perched water table was found to be the factor influencing yields more than fertilizer treatment. With a water table near the surface, soil roots were usually poorly developed and yields low, while the reverse was true if the water table was lower. The authors wonder what conclusions as to fertilizer requirements of raspberries might have been drawn from these differences in yields due to soil variation if treatments had not been duplicated and check treatments maintained.

Drs. T. L. Lyon and B. D. Wilson of Cornell have determined the effects of various green manure crops on the accumulation of nitrates in the soil. Their findings have been published in a new New York bulletin, Memoir 115, "Some Relations of Green Manures to the Nitrogen of a Soil." They found the accumulation of nitrate during the fallow period greatest following the plowing of vetch. Other crops in order of effectiveness in this respect were rye, peas, oats, and buckwheat. They concluded that not all legumes are more effective than non-legumes in producing a high content of nitrates during the main part of the growing season. Plowing under a crop in the Fall was superior to plowing under in the Spring. Liming the soil increased accumulation of nitrate nitrogen. Farmers interested in building up their soil by the use of green manure will find this bulletin full of valuable information for them.

"The Use of Alcoholic Salt Solutions for the Determination of Replaceable Bases in Calcareous Soils," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 20, May 15, 1928, O. C. Magistad and P. S. Burgess.

"Soil Survey of Iowa, Clarke County, Agr. Exp. Sta., Ames, Iowa, Report No. 51, June, 1928, W. H. Stevenson, P. E. Brown, A. M. O'Neil, L. W. Forman, H. R. Meldrum.

"Soil Survey of Iowa, Winneshiek County," Agr. Exp. Sta., Ames, Iowa, Report No. 52, 1928, W. H. Stevenson, P. E. Brown, T. H. Benton, L. W. Forman, H. R. Meldrum, R. E. Bennett.

"Soil Survey of Iowa, Appanoose County," Agr. Exp. Sta., Ames, Iowa, Report No. 53, June, 1928, W. H. Stevenson, P. E. Brown, C. L. Orrben, L. W. Forman, H. R. Meldrum, A. J. Engleborn.

"Liming the Soil," Ext. Div., Col. of Agr., Lexington, Ky., Cir. 59, May, 1928, P. E. Karraker.

"Soil Erosion and Its Control," Col. of Agr., Lexington, Ky., Cir. 120, Mar., 1928, George Roberts, J. B. Kelley, E. G. Welch.

Crops

With the increasing interest on the part of farmers all over the country to improve the appearance of their premises, more attention is being given by agricultural colleges and extension workers to helping farmers achieve this goal. In line with this movement, Purdue University has just published their revised edition of Leaflet 41, "How to Make and Maintain a Lawn," by S. D. Conner and M. L. Fisher. This leaflet will undoubtedly be in popular demand by suburbanites, as well as farmers, who are looking for sound information on fertilizing, seeding, and caring for a good lawn.

An interesting new bulletin on strawberries has been published by the Massachusetts Agricultural College under the title, "Strawberry Growing in Massachusetts," Extension Leaflet 29, by A. P. French. The author has treated well the various problems which the successful grower of this popular crop must meet and overcome.

Other crop bulletins of the month include:

"Thirty-Eighth Annual Report," Agr. Exp. Sta., Auburn, Ala.

"Agricultural Themes," Dept. of Agr., Tallahassee, Fla., Vol. 38, No. 4, Oct., 1928.

"Farming in Indiana—Then and Now," Agr. Ext., Purdue University, Lafayette, Ind., Ext. Bul. 154, July, 1928, George Ade.

"Alfalfa," Ext. Div., Col. of Agr., Lexington, Ky., Cir. 70, May, 1928, Thomas P. Cooper.

"Work in Progress at Highmoor Farm," Agr. Exp. Sta., Orono, Maine.

"Work in Progress at Aroostook Farm," Agr. Exp. Sta., Orono, Maine.

"Thirteenth Annual Report," Ext. Serv., Univ. of Maryland, College Park, Md., T. B. Symons.

"Tomato Production," Ext. Serv., Agr. Col., Amherst, Mass., Ext. Leaflet 51, May, 1928, G. B. Snyder.

"Grape Growing in Massachusetts," Ext. Serv., Agr. Col., Amherst, Mass., Ext. Leaflet 64, Apr., 1928, Fred C. Sears.

"The Breeding of Strains of A-Tester Yellow Dent Corn," Agr. Exp. Sta., East Lansing, Mich., Tech. Bul. 90, Apr., 1928, K. M. Liu.

"Annual Report of Extension Work for 1927," Ext. Dept., Miss. A. & M. College, A. and M. College, Miss., Ext. Bul. 49, July, 1928, R. S. Wilson.

"Forty-first Annual Report," Agr. Exp. Sta., Lincoln, Neb., W. W. Burr.

"Vinifera or European Grapes in New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 101, Apr., 1928, Richard Wellington.

"Fruits Recommended for New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 103, Apr., 1928.

"Grape Pruning," Agr. Exp. Sta., Geneva, N. Y., Cir. 104, Apr., 1928, F. E. Gladwin.

"Annual Report of the Board of Control for the Fiscal Year Ending June 30, 1927," Agr. Exp. Sta., Reno, Nev.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XIII, No. 6, Whole No. 135, Nov.-Dec., 1928.

"Grain and Sweet Sorghums in Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Bul. 180, Aug., 1928, A. Daane and K. H. Klages.

"Moisture in Combined Wheat," Agr. Exp. Sta., Stillwater, Okla., Bul. 183, Sept., 1928, A. Daane.

"41st Annual Report," Agr. Exp. Sta., State College, Pa., Bul. 230, July, 1928.

"Austrian Winter Field Peas," Agr. Col., Clemson, S. C., Cir. 96, Sept., 1928, R. W. Hamilton.

"Fortieth Annual Report, 1927," Agr. Exp. Sta., Knoxville, Tenn., C. A. Mooers.

"Report on the Agricultural Experiment Stations, 1927," U. S. D. A., Washington, D. C., E. W. Allen, W. H. Beal, and J. I. Schulte.

Economics

During the past few years many farmers' cooperatives have been organized. Often-times cooperatives have been organized without much thought being given to the lessons learned by other cooperatives. Bulletin 461, "Farmers' Cooperative Business Organizations in New York," by J. F. Booth, and published by Cornell University, gives a picture of the development and status of farmers' cooperative business organizations in New York State. Special attention has been placed on the reasons for the success of some associations and the cause of failures of others. This is a valuable bulletin for cooperatives.

For many years general property taxes on farm property have been increasing. In some states the cost of collecting this tax is much greater than in others. Cornell University's new Bulletin 469, "The Collection of General Property Taxes on Farm Property in the United States, with Emphasis on New York," by M. Slade Kendrick, is a study of the methods of collecting these taxes, in order to determine what methods are in use and which are the most satisfactory.

"Cattle-Ranch Organization in the Mountains of Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 342, Sept., 1928, R. T. Burdick, Martin Reinholt, G. S. Klemmedson.

"Farmers' Cooperative Buying and Selling Organizations in Michigan," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 171, May, 1928, C. F. Clayton and J. T. Horner.

"The Progress of Cooperative Marketing in Mississippi," Ext. Dept. Miss. A. & M. College, Miss., Ext. Bul. 48, May, 1928, T. M. Patterson.

Diseases

Two new tobacco bulletins from Kentucky, No. 280 "Observations and Experiments on the Control of True Tobacco Mosaic," and No. 281, "Tobacco Frenching-A Nitrogen Deficiency Disease," both by W. D. Valleau and E. M. Johnson, are welcome additions to available literature on the diseases which have caused such great losses in recent tobacco yields. While the bulletins are of a more or less technical nature, growers will find much in each which will aid them in a better understanding of these diseases.

Bulletin 262 of the Virginia Agricultural Experiment Station, "The Control of Cereal Smuts by Seed

Treatment," written by F. D. Fromme, is another weapon in the outstanding fight to control the diseases which take such great toll from annual farm profits. The bulletin is well-illustrated and detailed in describing the control methods used.

"Sulphuric Acid Spray: A Practical Means for the Control of Weeds," Agr. Exp. Sta., Tucson, Ariz., Bul. 128, July 1, 1928, J. G. Brown and R. B. Streets.

"Michigan Raspberry Diseases," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 178, June, 1928, C. W. Bennett.

"The Relation of Bacterium Vignae to the Tissues of Lima Beans," Agr. Exp. Sta., State College, Pa., Bul. 226, May, 1928, W. S. Beach.

Insects

"Cape Cod Cranberry Insects," Agr. Exp. Sta., Amherst, Mass., Bul. 239, Feb., 1928, Henry J. Franklin.

"The Fulgoridae or Plant-Hoppers of Mississippi, Including Those of Possible Occurrence," Agr. Exp. Sta., A. and M. College, Miss., Tech. Bul. 14, Dec., 1926, Herbert L. Dozier.

"Phyllophaga of Mississippi," Agr. Exp. Sta., A. and M. College, Miss., Tech. Bul. 15, J. M. Langston.

"Cotton Flea Hopper Studies of 1927 and 1928," Agr. Exp. Sta., Clemson College, S. C., Bul. 251, Oct., 1928, C. O. Eddy.

Translations

THE following translations of papers on scientific subjects published abroad are valuable to agricultural workers, particularly in the agricultural experiment stations and colleges, who may be interested in the subjects mentioned. We shall be glad to send copies free of charge.

"For or Against the Law of the Effect of the Growth Factors"	Prof. Dr. E. A. Mitscherlich, Konigsberg, East Prussia	Zeitschrift fur Pflanzenernahrung u. Dungung. Teil B. VII. No. 8, Aug. 1928, p. 345.
"The Law of Minimum in New Forms"	Dr. A. Jacob, Berlin.	Die Ernahrung der Pflanze. XXII Jahr. No. 16, Aug. 15, 1927.
"How Shall I Fertilize?"	Dr. Vageler, Konigsberg.	Die Ernahrung der Pflanze, XXIII, Nr. 17.
"Studies on Continuous Cropping with Regard to the Neubauer Method"	Prof. Dr. Th. Roemer, Halle A. S.	Die Ernahrung der Pflanze. XXIV, No. 11, June 1, 1928.
"Clearing Disease or White Pest, a New Soil Disease"	I. Hudig and C. Meyer, Groningen	Zeitschrift fur Pflanzenernahrung u. Dungung. Teil A, Band VIII, 1926/27, No. 1, S. 14. Verlag Chemie.
"Question of Controlling Rust in Winter Wheat"	Dr. Engelmann, Leipzig	Die Ernahrung der Pflanze, XXIV, No. 7, April 1, 1928.
"The Life Work of Liebig"		Die Ernahrung der Pflanze, No. 10, 1928.

Early Potatoes

(*From Page* 30)

Six to eight per cent of superphosphate is generally considered necessary and about an equal amount of potash. The 7-5-5 analysis or 7-5-6, that is, 7 per cent superphosphate, 5 per cent nitrogen, and 5 to 7 per cent potash, is generally considered about right.

In the Wilmington, North Carolina, commercial potato section a 7-5-7 is ordinarily used. In the Charleston, South Carolina, section the 7-5-5 and 7-5-6 are commonly used. In the Elizabeth City, North Carolina, commercial section a 7-5-5, 7-6-6, and 7-6-7 are the analyses generally used. On the very sandy soils, growers raise the percentage of nitrogen from 5 to 6 per cent and the potash from 5 to either 6 or 7 per cent.

In Virginia the tendency seems to be to get the analysis more nearly to a 7-6-7 than to continue to use the old 7-5-5. The additional amount of potash has been found profitable. Many believe that in this race for getting the potatoes to market at the earliest date possible, that the standard analysis will soon be a 7-7-7, or equal percentages of these three fertilizer ingredients.

Not only are high grade materials used, but liberal quantities of them. The standard amount used in the Southeast is one ton per acre. Some use a few hundred pounds less and many a few hundred pounds more. Some of the best growers use as much as 2,500 pounds per acre. That it pays to use these large quantities of high grade fertilizer is not a question. These growers have tested it out to their own satisfaction over a long period of time. Usually a fine crop of corn, cowpeas, soybeans, or other feed crop follows the irish potato, and whatever portion of the fertilizer remains in the soil is used by these feed producing crops.

In some sections, growers insist that the potash come from sulphate of potash in preference to the muriate. When the muriate is first applied to the soil it produces ammonium chloride, a substance which seems to be somewhat poisonous to the potato. However if the muriate of potash is applied at least two weeks before the potatoes are planted usually this ammonium chloride will be dissolved by the moisture in the soil and no harmful effects will result. The South Carolina Experiment Station, as a result of a six-year test, using the various kinds of potash, has arrived at the conclusion that it makes little difference from what source. the potash is obtained. However, it was noted that the plots receiving muriate of potash produced 30½ bushels more potatoes than where no potash was applied, thus showing very conclusively that potash is essential. This point, however, is no longer questioned by the growers.

Cabbage

(*From Page* 27)

is poured quickly on the center of the plant. The liquid runs down around the stem and in turn to the roots and is very effective in killing the maggots.

As soon as the cabbage heads are formed, which is about June 15, the truck is pulled out in the field and the cabbage heads are cut, loaded, and sold just as fast as they can be harvested.

During the year 1928, five loads in one day were taken out of the field and sold at the time when the market was at its best. This continues until the field is entirely cleared of marketable heads, and this requires only a few days because, with the system of growing the crop, the total heads are ready to sell almost at one time.

Pages From A Field Note Book

Fertilizers Made the Difference

By Harry Q. Holt

Remington, Indiana

ARTHUR SIGO, a 15-year-old Jasper county, Indiana, potato lub boy, proved the value of comnercial fertilizers n producing poatoes by fertilizng every other ow. The plot vas a measured ne-fourth acre of lack sandy loam, nd had exactly 2 rows. The 11 ows, not having ny commercial lant food, ielded 25 bushels t a cost of $6.00, vhile the addition f an 0-20-20 ertilizer on the est of the field ncreased the yields to 36 bushels and he cost to $8.50. In other words, the oy made exactly $11.00 from an investment of $2.50. Only 125 pounds of fertilizer were used and this was placed directly in the row. A 10-foot chain was then dragged in each of the fertilized rows to mix the soil and commercial fertilizer.

Arthur Sigo

Farm experiments such as this one carried out by Arthur Sigo, not only serve to build up the faith of youthful farmers in the future of agriculture but are a distinct influence for improved methods of farming in a community. They are one of the brightest spots in the outlook for America's agricultural industry.

Bigger Beet Profits

By Rich Lucas

Mountain View, Missouri

ALL growers of sugar beets looking for bigger profits should base heir hopes in greater tonnages. Luck vill not bring extra profits. Bigger onnages can only be secured by consistent attention to tried and proven methods, from the preparation of a seedbed on through the final harvesting.

A good seedbed is a prerequisite for

best returns. There is one and one time only that a good seedbed for beets can be made and this is before planting. Deep plowing, adequate discing, and smoothing will prepare a firm bed for the planter.

To grow and mature the maximum acreage tonnage of beets, plenty of available plant food is required to feed the crop from germination to maturity. For best profits, the plant food should be of proper balance to assist heavy growth, and as potash is a necessary requirement in helping to grow the beet, then later to transform the starch into sugar, a plentiful supply of this element in the fertilizer is strongly recommended. For many growers a 3-6-12 analysis is proving both practical and profitable. For the nitrogen content, I like sulphate of ammonia to start the seedlings. Superphosphate assists in forming the framework, while potash greatly helps to regulate the formation and quantity of sugar. However, it takes a combination of all three elements to produce the largest tonnage of the best beets.

Seeding time has been found a more important factor than many realize, the most desirable period being from the last week in April through the first week and a half in May.

After the beets have passed the thinning period, if a good stand has been secured with adequate fertilization given just before or at planting time and with proper cultivation, Nature will do her part. Growers may then look forward to satisfactory pay checks as soon as the field tests show sugar content sufficiently high for delivery of the beets to the factory.

Convinced

By C. Hamilton

LaFontaine, Indiana

C. E. TROYER who has twice won the title of Corn King by his winnings at the International and has won seven gold medals in the five-acre corn club with yields of 100 bushels or more, had been convinced for years that fertilizer did not pay on his type of soil, especially for corn.

This soil was river bottom loam, good rich soil as far down as you wanted to dig. It was sandy and light, easily worked and full of plant food. Almost every year it was overflowed, adding still more plant food.

In addition to its natural resources, a rigid system of crop rotation had been carried on. It was planted to corn two years, then wheat or oats and either alfalfa or sweet clover, then corn again.

His theory was that always the limiting factor in his crop had been a lack of moisture. This sandy soil dried out easily in hot weather and there was seldom a year when there was enough rain to use all the plant food available.

He was induced last year to apply 150 pounds of 0-28-12 fertilizer to a plot. This was sown broadcast after the corn was planted. He watched this plot carefully all summer and could see not the least trace of difference in the fodder or size of ears.

About the first of October he shucked the fertilized corn and weighed it, and also the unfertilized which grew adjoining it, and found a difference of eight bushels to the acre in favor of the fertilized corn.

The main difference was in the quality of the corn. The ears were more mature, having less moisture and better keeping quality.

Crops Determine Dairymen's Profits

(From Page 24)

a few years ago when five grade cows were purchased by the University from different farmers who were in Herd Improvement Associations but were not feeding the cows properly. A very complete record was available in the Herd Improvement Association, as to the amount and value of their production and the feed cost, when these cows were purchased.

These cows were brought to the University and remained in the University herd until they had completed a lactation period. They were fed a ration consisting of alfalfa hay and silage, and a grain ration of four parts ground corn, two parts ground oats, and one part linseed oil meal. They were fed alfalfa hay and silage in amounts practically equal to what they would consume. The grain ration was fed in proportion to the milk produced. The same price for feed and milk was used in figuring the cost of feed and the value of the milk produced on the farm, as at Purdue.

The average production of these five cows on the farm was 5,063.8 pounds of milk and 202.9 pounds of butterfat. The average production of these cows when in the Purdue herd was 8,662.2 pounds of milk and 316.8 pounds of butterfat, an increase of 3,598.4 pounds of milk and 113.9 pounds of butterfat per cow when fed a good ration. The cows had an average return above feed costs of $57.40 more per cow in the Purdue herd than when on the farm.

Proper feeding of the dairy herd is one of the outstanding problems of the Indiana dairyman.

Montana

(From Page 12)

try has seen.

The headquarters of the Montana Agricultural Experiment Station staff are at Bozeman, in the famous Gallatin valley. Here the station has two large farms, one 320-acre farm under irrigation and another dry-land farm of 600 acres. Branch stations are established throughout the state, at Havre, Huntley, Moccasin, and Corvallis, the latter station being devoted to horticultural work. These substations, by their distribution, cover the different agricultural districts of this large state. The Montana State Grain Inspection Laboratory, located on the state college campus, is also under the direction of experiment station officials.

Many different lines of work in Montana have been delegated to the experiment station proper or to individual staff members. The station entomologist is also state entomologist and is in charge of work in western Montana looking to the eradication of the wood tick. Much of the work of insuring the standards of Montana crops and grains is handled by staff workers in the experiment station and extension service. In addition to his duties as director, Mr. Linfield during the past year has been acting president of the Montana State College, during the absence of President Atkinson, who has been in Europe on a year's leave.

The experiment station staff in

Bozeman has one of the largest and most modern buildings on the college campus—Agricultural Hall. There are also the grain laboratory, agricultural engineering building, veterinar science building, poultry building an plant, and the many barns and shec of the station farm.

Corn

(*From Page 25*)

million acres. The balance of the corn acreage in the United States is distributed among all of the remaining states. Virtually all of the important corn states are in the Upper Mississippi Valley.

Of the corn grown in the United States over 83 per cent is ordinarily used for grain. On the northern edge of the corn belt, where dairying is important, considerable quantities are used for silage. In Wisconsin, where this type of use has probably gone furthest, in some years approximately one-half of the corn crop has been put into silos. For the United States as a whole, however, only between four and five per cent of the crop acreage is used for this purpose. The remainder is used in various ways, hogging down, corn cut green, fodder corn, and other purposes. Almost the entire crop in the United States is grown as a feed crop.

Of the world acreage the Unite States has about 55 per cent. Ther is no other region in the world tha compares with the United States cor belt in corn production. Souther Europe, the area including Roumania Jugoslavia, parts of Southern Russia and other countries, represents th leading corn region of the Old World In the Western Hemisphere, Mexic and the Argentine are the most im portant minor producing countries.

Many varieties of corn are grown The so-called squaw corn, formerl grown by the Indians and to som extent by the early settlers in th United States, has virtually disappear ed, and in its place are now grown th highly productive varieties of den corn, which have been bred by th American Experimental Stations. Th bulk of the corn production is now of these improved varieties.

Fertilize Potatoes

(*From Page 15*)

last fall. The buyers were not storing for speculation. They purchased only for immediate consumption. The reason for this unnecessary additional sluggish angle of the market was brought on by fear of the inevitable storage loss the buyers would face regardless of at what figure they bought. An extensive potato buyer told me early last November that whereas he had taken $50,000 worth of potatoe into his warehouse a year ago at thi time, this season he had only $64 wort in his storage house.

The housewife and chef demanc palatable sound potatoes, but th grocer is between them and the ful fillment of their wishes. Behind th grocer are many types of farmers

When will all cooperate to make potatoes more popular, particularly when they are cheap? Recently the writer, after visiting a leading potato growing section and seeing thousands of potatoes pitted in the field for lack of demand and other thousands of bushels allowed to rot in the field, entered the dining room of the leading hotel of the marketing city. Potatoes were at the time quoted at 35c a hundred. Baked potatoes were at the same time listed on the menu at 10c apiece or at the rate of about $12 a bushel. Not through any spirit of beneficence but because of choice, I ordered baked potatoes. But alas! My serving was represented by two under-sized, wrinkled, and cold tubers. Upon opening the first I found an unappetizing, brown hollow core and when the jacket was removed from the other, an unsightly, discolored grey pulp was revealed. One has to be mighty hungry to enjoy blighted potatoes.

Hence, the most successful growers, buyers, and consumers are united in believing that on quality production rests the future success of the potato industry. To insure quality, necessitates a more general application of scientific methods of production, including the generous use of commercial fertilizer and thorough spraying of the crop. Marketing methods must also be improved. It entails extra cost to put carefully graded table stock in the hands of the consumer, but the latter will gladly pay for what he wants.

Freezing-up

(*From Page* 28)

freezes solidly, and this ice with the surrounding soil forms a continuous sheet. If the cold continues, ice crystals form immediately below the sheet and increase in length as in the first type. These crystals act upon the sheet of soil and ice above them in the same manner that an automobile jack acts upon your car.

The layer of soil is forced upward, and immediately beneath it, there is a space partially filled with the ice crystals. As in the first type of freezing, plants are carried along with the upward moving soil. As thawing occurs, the ice crystals melt and the upper layer of soil settles back to its original position, but the plants can not return because their roots hold them at the position to which they have been lifted.

Repeated freezing and thawing has the same action on plants as occurs when any object is raised with a jack, then blocked up at the point of greatest lift, and a second lift obtained by placing blocks beneath the jack. This type of heaving occurs oftenest in the spring when there is a great variation between day and night temperature.

In the work at Michigan State, one instance was noted where a sheet of concrete, which weighed 15 pounds and was placed on the soil surface, was raised three inches in one night by the upward thrust of the ice crystals. The exertion of such a force accounts for the damage done to both plants and pavements.

The greatest heaving occurs in wet soils and adequate drainage would reduce the damage to some extent, but it would be difficult to prevent heaving in the spring when most surface soils are saturated with water. A straw mulch which would reduce the rapidity of freezing in low soil areas would probably reduce the damage, but each farmer would have to determine if the saving made would pay for the labor of applying the mulch. The possibility of preventing damage to pavements appears to be more hopeful, as it is possible to drain the underlying soil and to prevent the accumulation of water beneath the pavement.

Father & Sons—Partners

(*From Page* 29)

farming near Baldwin, Georgia. Here I really found a father and his sons as partners in farming. It was indeed a pleasure to visit this congenial trio and hear them talk of their farming business.

I have never seen two boys more interested in the home farm than Ernest and Conrad. Probably the reason they are interested is because they are allowed to share in the profits from it and are given some consideration in its operation.

While Hinson and Sons are carrying on a well-balanced farming program, the most interesting part of their farm is the dairy business. Since October, 1924, they have developed a registered Jersey herd valued at $2,900 and are selling at present approximately $375 worth of milk per month.

While enrolled in a Vocational Agricultural Class in 1924, Conrad, with the aid of his father and brother, purchased four registered Jersey heifers and one bull for which they paid $740 as a start towards developing a dairy business. Very fortunately they bought good calves of splendid breeding. They selected Jerseys because this breed predominates in northeastern Georgia, and seems naturally adapted to local conditions.

Ernest and Conrad had saved approximately $275 from projects they had carried on as a part of their agricultural work. The remainder of the purchase price of the calves, about $500, was borrowed. Since that time the profits from the herd have more than paid the purchase price of the calves, and Hinson & Sons are well on the road to prosperity, which usually follows the dairy cow.

As the heifers came into milk, they were put on official test for milk and butterfat. One of their cows—Dame's Molly's Aneta has produced enough milk and fat to be designated as a silver medal cow, and is the state leader in her class.

The Hinsons are now milking eight registered Jerseys and two grade cows. They have five registered Jersey heifers, four of which are their own breeding. The milk is being retailed in Baldwin and Cornelia, Georgia. Conrad is assuming the major part of the work in carrying on the dairying. Ernest, however, is giving as much of his time to the project as his school duties will allow.

A large part of the feed for the dairy cows is produced at home. In this way Hinson & Sons are saving quite a bit on their feed bill. Alfalfa which grows abundantly on the Hinson farm constitutes a large part of the feed for the cows. Only last year eight additional acres were planted to alfalfa.

When asked their future plans, Conrad replied, "We expect to keep only as many cows as our milk trade demands, and to keep only high class individuals and continue official testing."

As soon as Ernest finishes high school, he will carry on the dairying while Conrad spends at least two years at the Georgia State College of Agriulture. Then Conrad will operate the airying while Ernest attends college; t least this is their plan at the present.

No doubt many boys would manifest more interest in the farm if they were given some consideration in its operation and were taken in as partners by their fathers.

Agriculture Today

(*From Page* 19)

n California, and is being grown also on hundreds of thousands of acres in the typical cotton regions of Texas, Oklahoma, and Arkansas. The breeding work on cotton is leading to important by-product results such as cotton community production where, through cooperative action, single varieties of selected and bred cottons are being handled by community effort so as to exclude the mixing of strains.

Approximately 4,000 plants a year are being brought into the United States in connection with the bureau's search for new food, feed, and fiber crops. Of especial interest just now are large collections of soybeans obtained by American plant explorers in the Orient. Other plants include wheat, barley, and mungbeans from northern Manchuria. Among them is a wild apricot which was found growing on the rocky Manchurian mountainsides otherwise barren of vegetation except for a few weeds and a little grass. The fruit is very small, dry, and mostly seed, but the tree is so hardy that it may possibly have use in developing an apricot for regions farther north than the apricot now fruits.

The use of gloves, blunt clippers, and special canvas sacks, to prevent bruising the fruit, have reduced harvest losses in the orange groves.

The collection includes a wild grape that grows rank all over the Manchurian mountains where it is a heavy yielder and is used largely for claret. Its hardiness makes it of potential value for the breeding of a hardy table grape for our more northern sections where grapes are not now being grown. A wild grapefruit, unlike anything ever before brought to the United States, may prove of value to citrus growers in breeding work. An exploration by airplane, canoe, and on foot in the tropical districts of Papua and New Guinea the past summer has yielded a collection of 167 varieties of sugar cane, to be used in tests and for interbreeding in the bureau's experimental plats devoted to the development of sugar cane varieties which are resistant to damage by mosaic and other diseases.

One variety of sugar cane in this collection is a hard, straight cane, growing to a height of nearly 33 feet. Cuttings of each variety obtained were shipped to the United States in refrigerated rooms of steamers for growth under observation in the bureau's sugar cane detention greenhouse at Arlington, Virginia. Duplicate cuttings have been planted at Sydney, Australia, as a precaution against possible loss or death of cuttings sent to the United States.

Liming Sour Soils

(*From Page* 23)

ference in the crop producing value of the three forms of lime. These data further emphasize the importance of lime in the rejuvenation of sour soils so abundant in our eastern states. Based on the average yields due to the three forms of lime, corn was increased 145 per cent, oats 56 per cent, wheat 127 per cent, and hay from weeds to 3,793 pounds per acre.

Within the last few years specially prepared blast furnace slag has been sold in several eastern states as a source of agricultural lime. This material is placed on the market at the present time in granular form prepared by running molten slag into cold water. The slag is broken down into small porous particles through the process of rapid cooling and becomes quite brittle. The lime is present in the form of calcium silicate equivalent to from 45 to 52 per cent lime oxide (CaO). This new form of agricultural lime is now being studied at the Snow Shoe experiment fields on DeKalb soil. The experiments are arranged in four tiers of 50 plots each. From one to five tons of slag per acre are compared with an application of one ton per acre of pulverized limestone. The following data shows the relative value of the two materials in the production of hay.

In the production of hay the heavier applications of slag have given yields comparable to those produced by one ton of limestone. In each case the four lime applications have given yields considerably in excess of the unlimed soil. The several applications of lime were applied in 1926. The above crops were harvested in 1928 except soybean hay which was produced in 1926.

A study of the above data serves to emphasize the importance of lime in our scheme of soil management as a means of paving the way for maximum return from the use of fertilizers. The several forms of basic lime when applied to the soil on the basis of equal units of lime oxides of similar fineness show the same value in crop production.

POUNDS PER ACRE

	Clover and Timothy	*Timothy*	*Soy-beans*	*Kentucky Blue Grass*	*Sweet Clover*
No lime	*617	*651	3010	1599	0
One ton limestone	1666	1122	5651	2145	8041
One ton agr'l slag	617	834	4392	2096	165
Two tons agr'l. slag	1880	1105	4806	1711	4758
Three tons agr'l. slag	1855	1117	5636	2548	7712

*Weeds.

Fertilizers for Pecans

(From Page 9)

the high nitrogen mixture grew more rapidly than did those fertilized with the high potash or high phosphate fertilizer.

The relative effects of the three fertilizers on yields are somewhat different than on growth.

Potash Increases Yields

With each of the varieties the fertilizer mixture high in potash has given largest yields. With the Curtis the high potash mixture yielded 1,907 pounds of nuts per acre in the four years against 1,309 pounds for the unfertilized trees. With Schley, which is normally a low-yielding variety, the high potash mixture produced 644 pounds of nuts per acre in four years against 206 pounds for the no-fertilizer plot. The Stuart produced for the high potash fertilizer 488 pounds per acre in four years against 311 pounds for the no-fertilizer plot.

The fertilizer application was as follows:

1922,	400	pounds per	acre
1923,	600	" "	"
1924,	800	" "	"
1925,	800	" "	"

It is a matter of simple mathematics to determine whether or not fertilizer has been profitable in this orchard. The total amount of fertilizer applied per acre in the four years is 2,600 pounds. The approximate cost of the fertilizer giving best yield is $35 per ton or $45.50 for the total amount applied.

With the Curtis variety there was an increase in nuts, when the high potash mixture was used, of 598 pounds over the check. The volume of this increase at 30 cents per pound is $179.40 or a gain of $133.90 after deducting the cost of the fertilizer.

With the Schley variety there was a gain, when the high potash mixture was used, of 438 pounds of nuts over the check. The value of this increase at 55 cents per pound for this high-quality nut is $240.90 or a gain of $195.40 after deducting the cost of the fertilizer.

With the Stuart variety there was an increase of 177 pounds of nuts over the check. The value of this increase at 40 cents per pound is $70.80. When the cost of the fertilizer is deducted the gain is $25.30. In this orchard nitrogen has produced a vigorous tree growth, but potash is required for nut production. Both fertilizer elements are essential.

Potash Improves Quality

The pecans from fertilized trees in most of the experiments were slightly larger than those from the unfertilized ones. The mixtures high in nitrogen produced the larger and better filled nuts. The protein of the pecan meat was influenced very markedly by fertilizers. There was a difference of 3 to 4 per cent in protein content of pecan meat in nuts grown where fertilizers high in nitrogen were used over those grown without fertilizer or with fertilizers which were principally phosphate or principally potash.

Fertilizers have an influence on the fat or oil content of the kernel. By a laboratory examination of the nuts grown with different fertilizers on a number of soil types, it was found that potash has an appreciable influence in enriching the kernel in oil. Pecans grown where high potash fertilizers were used contained approximately 2 per cent more oil than nuts from unfertilized trees. In all the experiments conducted, the color and plumpness of the kernel of the nuts were noted. While no comparative figures were secured it was apparent that potash produced a clearer meat having a lighter color than did phosphate or nitrogen. This factor was determined with several varieties, namely, Schley, Stuart, Alley, Success, and Frotcher, all of which showed a lighter colored meat when grown under high potash fertilization.

Fertilizer Mixtures

The fertilizer for the pecan orchard should contain all three of the fertilizer constituents, nitrogen, phosphoric acid, and potash. The ratios of these constituents depend on the character of the soil and the cultural system practiced. Phosphoric acid and nitrogen influence tree growth, and the yield, filling qualities, and size of the nut, and potash the fat content and color and plumpness of the kernel. On clay loam and sandy loam soils where leguminous cover crops are grown and turned under for manuring, thus supplying considerable nitrogen, fertilizers analyzing 4 to 5 per cent nitrogen, 8 to 10 per cent phosphoric acid, and 3 to 4 per cent potash have given good results on bearing trees. For soils of this type high in organic matter and nitrogen, a 4-10-3 mixture could be used with good results, but for most soils a mixture containing 5 per cent nitrogen is preferable. For young orchards from time of setting until they are 7 to 8 years old, it is advisable to fertilize with a mixture containing even more nitrogen. A mixture containing 6 per cent nitrogen, 8 per cent phosphoric acid, and 4 per cent potash has been used widely by nurserymen and orchard growers with success.

For light sandy soils of the Coastal Plain, mixtures containing 6 to 7 per cent potash should be used. In preparing a fertilizer mixture for pecans, consideration should be given to the material used. Superphosphate is used principally in mixed fertilizers and is the most available source of phosphorus. The potash materials do not seem to vary widely in their effects, the sulphate and muriate and manure salt being most widely used. The fertilizer mixture should contain several sources of nitrogen and should be derived partly from such quickly available materials as nitrate of soda, sulphate of ammonia, and synthetic nitrogen compounds and partly from slowly available sources, such as fish scrap, tankage, blood, or cottonseed meal.

A fertilizer containing approximately 5 per cent nitrogen, 10 per cent phosphoric acid, and 3 per cent potash can be prepared by mixing the materials in the following proportions:

Superphosphate (16% P_2O_5)	1,250 lbs.
Muriate or sulphate of potash (50% K_2O)	125 "
Nitrate of soda (15% N)	200 "
Sulphate of ammonia (19.5% N)	255 "
Organic materials as tankage, fish scrap, or dried blood (12% N)	170 "
Total	2,000 "

In such a mixture 1.5 per cent of nitrogen is derived from nitrate of soda, 2.5 per cent from sulphate of ammonia, 1.0 per cent from an organic material.

A 6-8-4 mixture suitable for young trees can be prepared as follows:

Superphosphate (16% P_2O_5)	1,000 lbs.
Muriate of sulphate of potash (50% K_2O)	160 "
Nitrate of soda (15% N)	270 "
Sulphate of ammonia (19.5% N)	210 "
Organic source as fish scrap, tankage or dried blood (11% N)	360 "
Total	2,000 "

The nitrogen in this fertilizer is derived 2 per cent from nitrate of soda, 2 per cent from sulphate of ammonia, and 2 per cent from an organic material. Two-thirds of the nitrogen is from readily available sources and one-third is from organic substances which are more slowly available.

Fertilizer applications in commercial pecan orchards vary from a few pounds per tree to a couple of bags. This large amount was tried on the Gulf Coast in a favorite orchard of a pecan enthusiast, who declared it a profitable investment. The economical application will vary with the orchard, depending on orchard management. For orchards from 7 to 10 years old from 400 to 800 pounds per acre is a normal application. Older orchards require larger amounts.

Obligations

(*From Page* 4)

circumvent hard and unhealthy labor. The more we successfully invent means and methods to do our menial tasks, the more time we have again for education. This may have some semblance to a cycle process, but it is not a vicious one.

Good roads, better schools, and human sanitary safeguards probably represent the bulk of our public expansion at public expense. Save in a few outlandish backwaters, the tax payer who objects to these obligations is snowed under at the ballot box. The progress and prosperity shibboleth is victorious because it is at least *potential* and *positive*. Mankind likes to think in terms of hope and promise for the future. So he is willing to pay for his dreams.

Whenever somebody tries to find out if the obligations imposed upon some officer are being prudently met, the average citizen yawns and flutters his newspaper to read the latest persiflage.

We leave our public obligations to proxies for their solution, just as we often postpone our individual ones to that distant date when our ship comes in.

When we are on the receiving end of some other debtor's obligation, the test of character and strength is no less trying.

In private obligations the attitude of the "party of the first part" toward the "party of the second part" has undergone a decided outward change. Time and custom have changed his demeanor, not that the creditor is less anxious, but he is less crude in his anxiety.

The cringing debtor and the skinflint creditor have largely become obsolete. The wider use of credit by big business as well as little business, the progress of legislation and other factors have made this happen. "Save the Homestead of Uncle Josh" as portrayed in the melodramas of thirty years ago made cruelty, parsimony, and greed seem intolerable.

Duty and a decent respect for others have largely replaced fear and trickery in mercantile trade.

In all the field of obligations we must see that *principle* is above *principal* and that *human interest* is mightier than *compound interest*.

Once a month we settle the outstanding (and sometimes longstanding) obligations with a few splutters of ink and numerous inward sighs for self-denied objectives which have been thwarted by our real obligations.

But our bank account of good will,

kindness, cheerfulness, and sympathy cannot be drained by spending it. Given good health and a reasonable share of the world's opportunity, our spiritual and mental treasures actually increase every time we use them.

Parental obligations, neighborly obligations, and many business obligations cannot be plastered with the dollar sign.

When I wish you a Happy New Year, I am not thinking so much about the raise which your Chief owes you, but I am hoping for nicer things than that in store for you.

I am in fact congratulating you on the possession of a sympathetic wife and heedful children, and wishing you more pleasant hours of their companionship. I know that your wife married you for your personality, not your purse, and that your kids do not cease to be considerate after Christmas.

I know that your job is as dear to you for the joy as the jack there is in it. The misfits and misanthropes on any job have but one obligation to society, and that's to get a new job before it's too late. Anyone who lives only for the money in his work is just crouching in a haunted house waiting for the ghost to walk!

EMBROIDERED art mottoes that enjoined us to be upright and honest have disappeared from the household along with the framed coffin plates and other parlor horrors. The copy-book precepts and platitudes have been laid aside by wise school ma'ams. Sensible firms do not lay claim to the only original supply of fair dealing any longer.

Obligations have become something of every-day vitality in our humdrum lives, so that we often perform them without patting ourselves on the shoulder blades.

The world has come into a positive atmosphere where "do" is recognized and "don't" is penalized.

The old-time revivalists of my boyhood used to have old reformed reprobates on the mourner's bench to clinch their red hot arguments on the temperature of Hades. The modern reformer organizes boy scouts out of boy slouches and does a little flood control engineering at the headwaters of life's swift current. We should be teaching youth to face obligations, not avoid them.

Actual obligations have been partly sidetracked in these hectic days for *fancied* obligations.

"Keeping up with the Joneses" is too often a besetting idiosyncrasy of life in this sophisticated era. Whether it is a sin or not depends upon how much you neglect the real for the imaginary obligations.

One of my business friends remarks cynically that "no one wants anyone else to have more than he has, unless it be debts or diabetes."

He goes on further and accuses our manufacturers and salesmen of practicing what he terms "progressive obsolescence" or the nifty art of making new models popular before the old ones are paid for. He claims this tickles the palate of all our kindred who follow the fetish of newest notions, regardless of bread, butter, or budgets.

The wife who does not envy the expensive fur coat of her husband's stenographer is like unto the wise women of old Israel—we should rise up and call her blessed. Her friends call her a frump! Rare indeed is the family which has not fallen victim to the lure of social competition. The watchful eyes of petty jealousy creates misery in the midst of plenty.

The get-rich-quick mania is either the best or the worst among our fancied obligations. It all hinges upon what kind of stock you buy, from whom you buy, and how, and when, and where.

It was only last month that many felt obliged to pit their luck and margins against the wily turns of the paper profit wheel of fortune, only to ome away with their pockets turned vrong side out. In their chase to the nd of the rainbow of fancied obligaions, they found themselves unable to neet the coal man face to face. Those who escaped the squeeze imagine themelves preferred, while the unlucky nes feel pretty common. Hazard aking is always a self-imposed, needess obligation, but they tell me that he thrill is worth the spill.

What a list of obligations face us n our way. The real ones and the llusions, mingled together in a crazy attern hard to distinguish or identify! Happy were the owners of log cabins, orn cob pipes, hound dogs, and fiddles ack when the West was young.

Tales of our grandsires, simplicity nd content; hoping for little and etting less; living in robust kinship vith the skunks and the stars, the oppers and the clouds; dreaming away n land that later gave painful birth o skyscrapers, subways, and sinecures. Their obligations were as scarce, but heir resolutions became the realities of the present which we now enjoy and speculate upon.

Having but a few thoughts to think and a few tasks to do, they did them well. Antique furniture hunters will tell you that. They were at least *obliged* to be *resolute*, and keeping that fixed idea uppermost as the necessity of existence, they came through life with less complexity and confusion. Resolutions are easy to make and keep for the resolute, and obligations are simple when one has few things to be "much obliged" about.

The only time I do not feel sorry for the inmates of our poor farm is when I have a grist of modern pressing obligations to fulfill. At such times I yearn for a seat on the shady lawn next to the fat maniac who thinks he is Napoleon. But even he is trying to return from Elba, and so there is no peace for me anywhere!

Finally, here's to 1929 and our aspiring resolutions! But don't assume too many, for each one will turn out to be an obligation.

FAMOUS SAYINGS OF EVERY-DAY WOMEN

"I've had plenty of chances to go on the stage but my folks won't let me."

"You'll eat your spinach or you won't get a bit of dessert."

"I'll have to have a little extra money this week."

"Anyhow, I notice her hair is dark at the roots."

"You must promise not to tell another soul."

"I'd do anything to lose a few pounds."

"You don't know the half of it."

"When did you shave last?"

"My feet are killing me."

"Mind your own business."

"Don't forget to write."

"Wipe off your feet."

"Now you stop."

"Darn it."

"Huh?"

—*C. A. Leedy, in Youngstown Telegram.*

A REAL HEN

As the old lady strolled through the park, two urchins confronted her. "I say, lady," said the taller of the two, "my brother does fine imitations. Give him a penny and he'll imitate a hen."

"Dear, dear," smiled the old lady, "and what will he do—will he cackle?"

"No," replied the lad with a look of contempt. "He won't do no cheap imitashings o' that sort, he'll eat a worm."

NO TIME FOR TRIFLING

"Gimme twenty-two twenty-two," said the perspiring gentleman in the telephone booth.

"Two two two two?" repeated the voice with the smile.

"Now see here, young lady," came back the exasperated one, "you just get me my number and you and me will play choo-choo some other time."

"Low bridge," shouted the bus conductor. "Everybody keep his seat and face to the front."

A gay little flapper up forward turned around, smiled sweetly, and said, "My dear, you know that can't be done."

Love makes the world go round. But for that matter, so does a good swallow of tobacco juice.—*Yellow Crab.*

PARTNERS NOW

A Chicago man the other day took an extra big drink of corn whiskey, and shortly began to see reptiles, also animals in assorted colors. So he rented a room and opened a museum. Many people paid 35 cents admission and when they saw only an empty room they called a policeman. The policeman was going to arrest him, but the man got him off in a corner and gave him a drink. The policeman then gave the man $300 for a half interest in the show.—*Wroe's Writings.*

Printed in U. S. A.

Better Crops WITH PLANT FOOD

Feb. '29 10 Cts.

The Pocket Book of Agriculture

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

Editorial Offices: 19 West 44th Street New York

VOLUME XII NUMBER TWO

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Agricultural and Scientific Bureau

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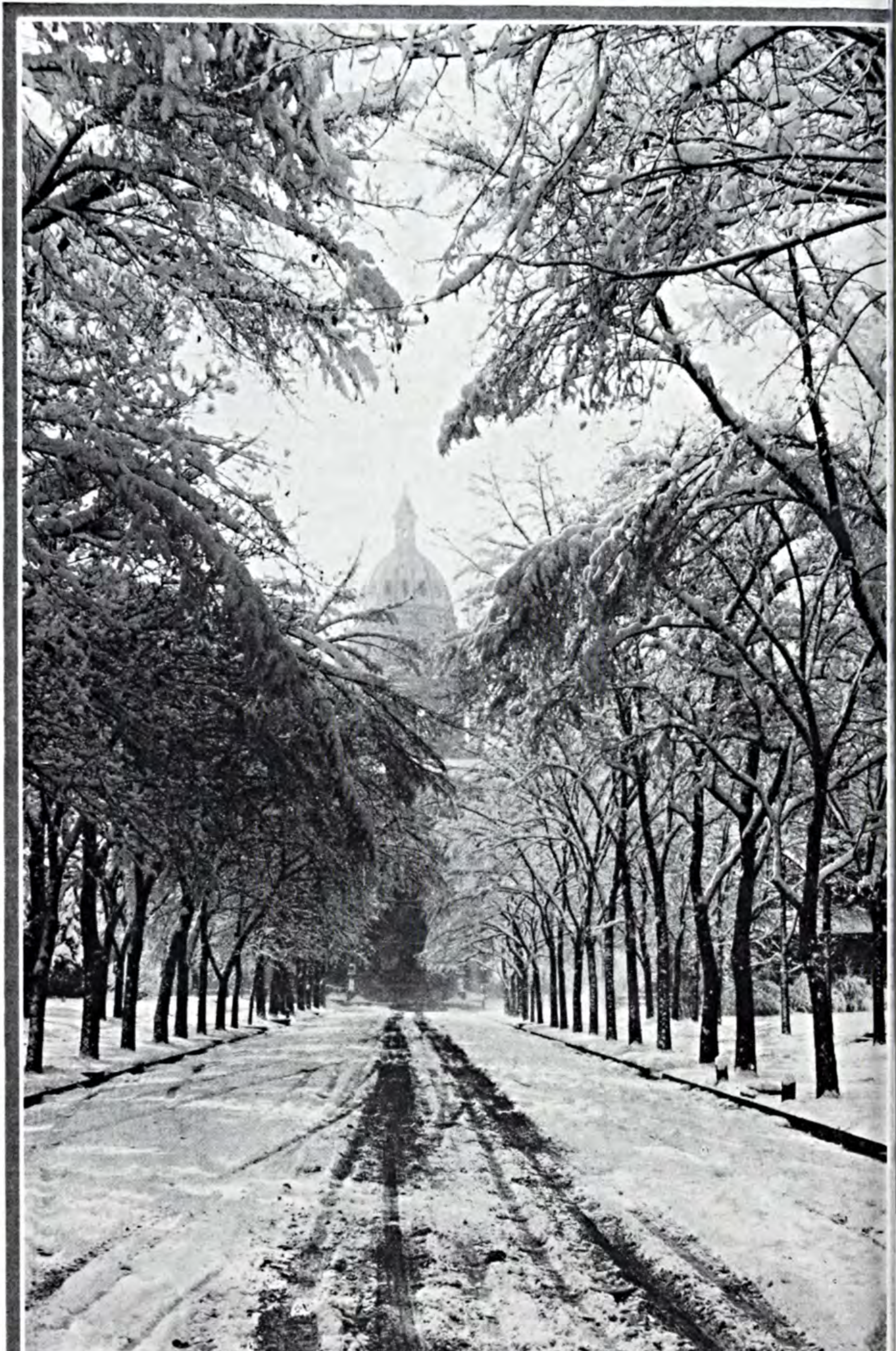

A winter scene in Denver, Colorado; Sherman Avenue looking toward the State Capitol.

Better Crops with Plant Food

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Vol. XII NEW YORK, FEBRUARY, 1929 No. 2

Jeff tells how to feel successful in—

Achievement

By Jeff McDermid

THERE used to be a magazine based on success but it finally failed to live up to its ambitious policies. It was filled with short interviews with men of long reputations and long articles by men with short memories. That was in the days when one hundred dollars a month was a princely salary and when young people first began to yearn for a career and believed they could not find useful employment for their immense capacities within the purblind limits of their native town.

Those were the early days of the urge for self-expression. All humble things at home were viewed through the small end of the mental binoculars, and the enchantment of distance held the youthful votary in its thrall—before there were "thrills" to be had daily. Those were the days when small towns gave up their more ambitious young masculine prodigies with a sigh of resignation and a deep breath of relief, and the census takers discovered more lonesome spinsters than there were after the military exodus of the Civil War.

This revolt of the masculine gender in search of achievement in the Elysian fields of gainful glory came about ten years before the first hints of the feminine emancipation. But too soon, alas, the modest wall flowers of the Victorian era turned into entrepreneurs like unto their brothers and sweethearts. When the zest for self-exploitation finally penetrated behind the bangs and pompadour rats of the gentle sex, women outdid the men in the mania for a mission.

The march became a crushing stampede, causing President Roosevelt to name a committee to study the causes of Rural Unrest—which has never been entirely completed. The youth of the farm and ranch pressed toward the villages; the flower of village beauty and chivalry rushed to the metropolis; and the surplus of the overburdened city jumped into oblivion!

The timid ones, meanwhile, who were left at home without careers grew cabbages and children, paid off the mortgages, earned a respected place in the community, and gave the sexton and stone-cutter just about as much satisfaction as did the others at the end.

ALL this sudden neurotic jumble for swift motion toward success of some sort began to assume its worst aspects when my generation were in their teens. Our fathers and mothers knew it not. Thus they had something more than good children to be thankful for, and were not aware of it!

But do we not observe a change once more, perhaps? Saner, steadier viewpoints are arriving to cheer old age and calm the ardor of intrepid youth. Remember, we are discussing mind, not morals! What are some of the reassuring things that curb the foolish race for rainbow fame? They are numerous.

The auto enables men to see that the limits of the far-off places are just about the same measure of his own. The radio is likewise as much a force for home content as for visionary yearnings. The movies once presented a problem, but their glitter is less potent—for youth knows there is much "sell" in celluloid.

Forces that are teaching the vit truth of real life objectives have a hol on youth that cannot be easily broken What are they teaching down at th Y. M. C. A. and the similar organiza tion for girls? What do the scout mas ters strive to develop in their troops What has been the glowing camp-fir motto for the young women, and th slogan of the four leaf clover clubs i the country?

Well, for one thing, it is this: tha leadership is all right, but that ther must first of all be good *followship* i order to make the work of the worl go on. One who becomes trained i the obedient ranks of a resolute *fol lowship* will ere long be ready to tak his place among the commissioned offi cers of progress.

Certain things concerning succes and achievement themselves are some times taught to the members of suc modern groups of youth. Nine time out of ten those definitions of succes and those precepts of achievemen gained in comradely fashion on th march of life will be worth much mor to them than any doled out by dotin parents by the chimney corner. Som of the present day parents themselve do not know what either success c achievement means, nor do they know how to impart the spirit of obedienc or the virtue of patience to their ques tioners. Having had neither obedienc patience nor prudence, the parent i ill prepared to do his share in givin the boy or girl the perspective to whic he is entitled.

SAD as it may sound to you, man of the best of our youth-servin clubs were created to protect ther from their parents! And in so doin some of the best of these organization reformed the parents also! Both o these movements sound much to m like success and achievement, and i you knew all the fathers and mother that I do, you would agree.

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A field of cabbage plants, Yonges Island, South Carolina.

The Plant Industry

By G. C. McDermid
Martins Point, South Carolina

WITH the remarkably quick growth of the vegetable in-lustry, someone had to supply the plants, especially for the colder cli-nates than are generally found in the outh. Such men as the late Frank Towles, of Martins Point, S. C., Nor-nan H. Blitch of Charleston, and W. C. Geraty of Yonges Island under-ook to supply this demand. From a very small beginning in the late nine-ies, the vegetable plant industry has rown by leaps and bounds until it as assumed the large proportions which it holds today; and these three nen might be called the "Fathers" of he industry in the United States.

Mr. Towles, always a very ener-etic and far-sighted man, finding hat the Jersey Wakefield cabbage did ot suit his needs, cast about for a pointed head cabbage which would be larger than the Jersey, yet just about as early in heading. Mr. Forbes, then of Peter Henderson and Co. of New York, interested himself in Mr. Towles' quest, and between them, they originated the now famous Charleston Wakefield cabbage. This cabbage has been adopted by practi-cally all the truck farmers of the Southeast.

At the present time the names of Towles, Jouannet, Blitch, Geraty, and Whaley are synonymous with the plant growing industry. These grow-ers annually ship millions of cabbage, lettuce, onion, beet, and other plants to the East, the middle South, the middle West, and the North. The plants are grown out-of-doors, seed

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Connecticut

Experiment Stations

By Walter Stemmons

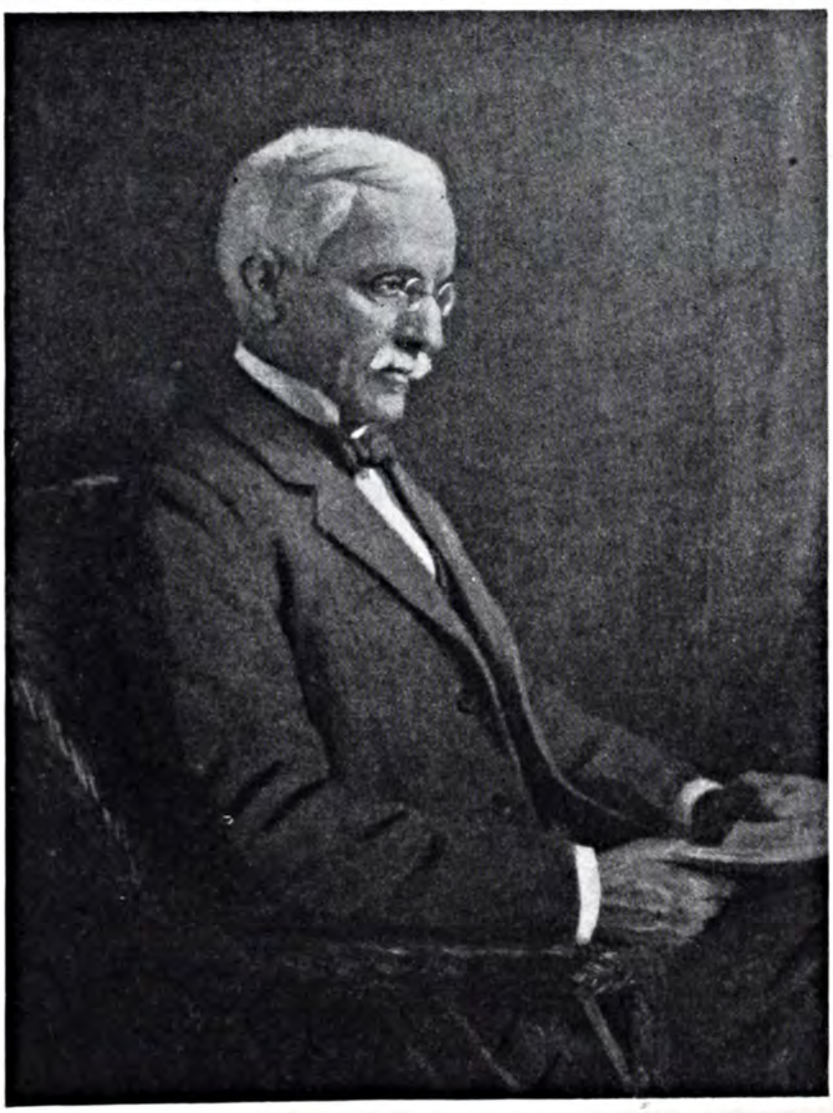
Editor, Connecticut Agricultural College

CONNECTICUT, one of the smallest states in the Union, has two agricultural experiment stations and one sub-station. For a state with an area of only 5,004 square miles and a population only about eight per cent of which is agricultural, this bespeaks an unusual interest in agricultural research.

Connecticut, in fact, is the mother of the experiment station idea in thi country. Having founded the firs such station in the United States an after testing the fruits of research fo more than half a century, Connecticu may well be considered as definitel committed to the idea, and once com mitted, the Yankee is notorious fo his tenacity.

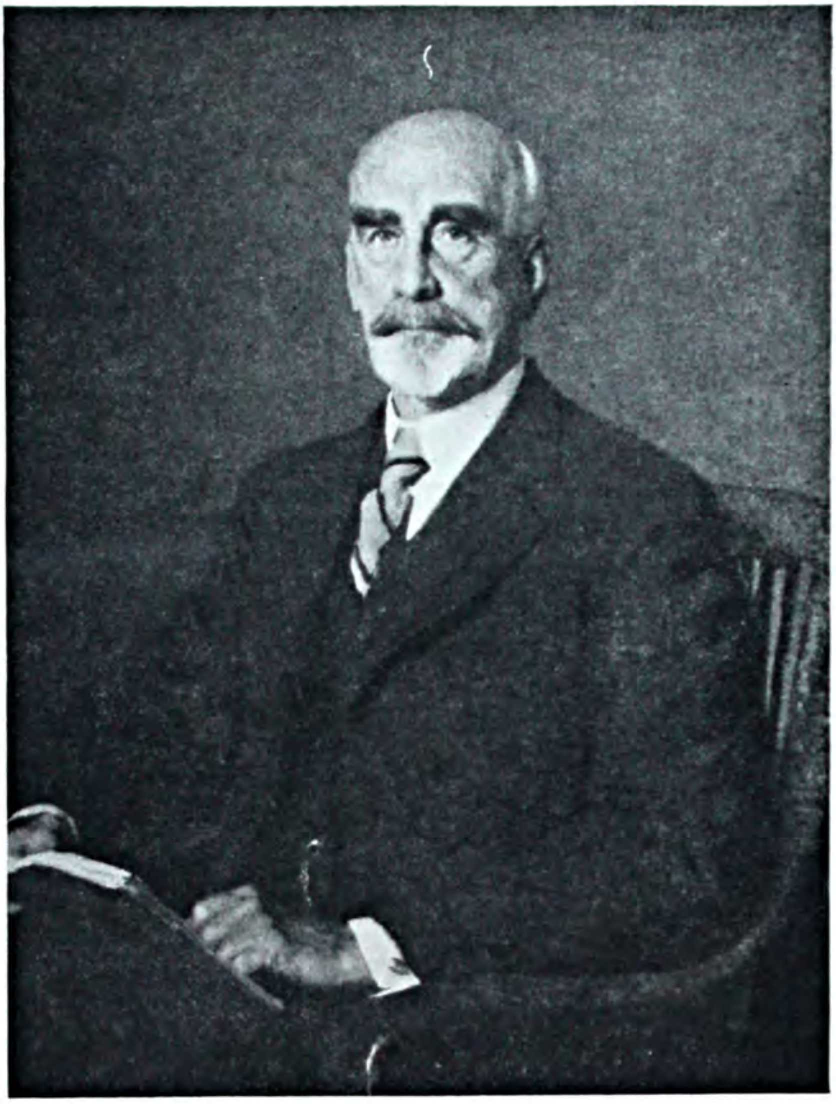
Germany and England preceded th United States in th field of agricultura experimentation, an it was from these tw countries that Con necticut drew her in itial inspiration. Pro fessor Samuel W Johnson of Sheffiel Scientific School a Yale began as early a 1885 to urge the es tablishment of a agricultural experi ment station at pub lic expense. In hi own laboratory he un dertook the analysi of fertilizers to ex pose frauds, then be lieved to be quit commonly practice on farmers.

The Connecticu Agricultural Experi



Professor Samuel W. John son, considered by many t be the "Father" of the ex periment station idea in thi country.

Dr. E. H. Jenkins, for a quarter of a century the guiding spirit of agricultural research in Connecticut.



ment Station was founded in 1875. Wesleyan University at Middletown had tendered the free use of a laboratory and other facilities to the State for the "general benefit and improvement of agriculture and kindred interests." The General Assembly in accepting this offer appropriated $2,800 for each of two years for its support. Professor W. O. Atwater of Wesleyan University was made director.

Two years later the State resolved to establish the experiment station as a separate and independent institution, and on March 21, 1877, an act of incorporation was approved. The station was located at New Haven, and an appropriation of $5,000 annually was placed at its disposal. The purpose of the institution as set forth in the act of incorporation was to "promote agriculture by scientific investigation and experiment."

Thus began the experiment station idea in America. So rapidly did it gain ground that 10 years later, in 1887, Congress passed the Hatch Act providing annual Federal support to state experiment stations. Even by that date several of the states had set up their own experiment stations and with the establishment of the station in Wyoming in 1891, just 16 years after the first station was established in Connecticut, every state in the Union was so represented. Rarely does any idea gain ground so rapidly. Perhaps the explanation is that although Connecticut was the first state to take such a step, the need for agricultural research had already been widely recognized.

The Hatch Act was approved by Congress March 2, 1887, and on May 18 of the same year the Connecticut General Assembly established the Storrs Agricultural Experiment Station as a department of the Connecticut Agricultural College at Storrs.

The Station at New Haven, since its beginning, has been a separate and independent station. Besides its experimental farm at Mt. Carmel, near New Haven, the Connecticut Agricultural Experiment Station maintains a substation at Windsor, founded in 1921 for the study of problems in connection with the tobacco industry.

When the Connecticut Agricultural Experiment Station was moved from Wesleyan University at Middletown to

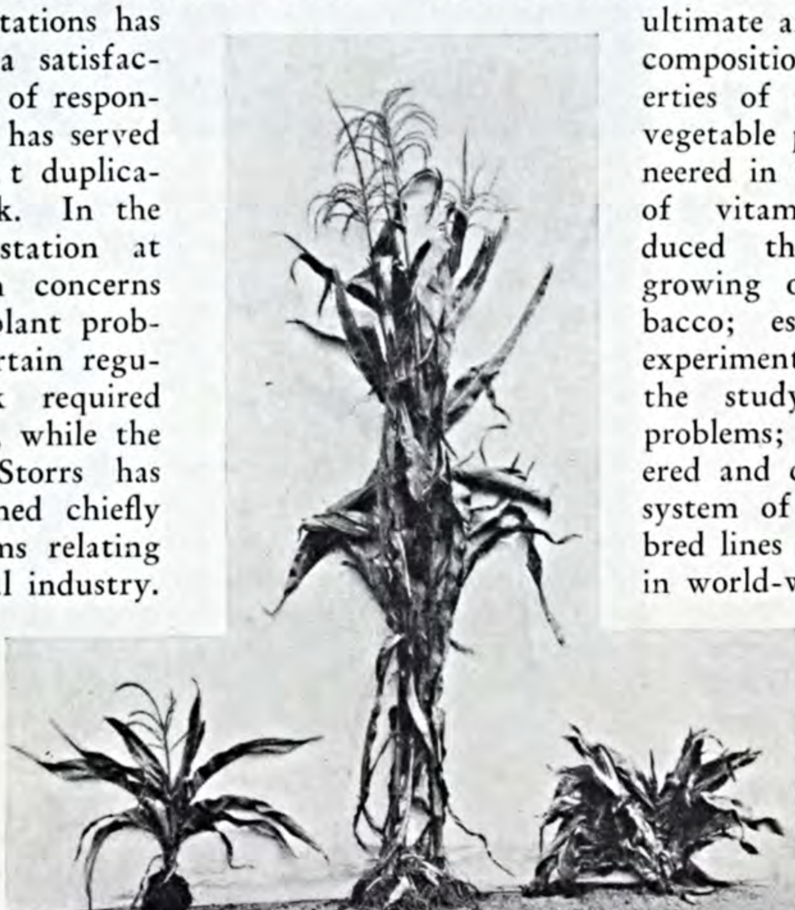
New Haven in 1877, Professor Samuel W. Johnson became its director. He remained as such until 1899. He was succeeded by Edward H. Jenkins, who served in this capacity until 1923. Professor Atwater, originator of the experimental work at Middletown, became the first director of the Storrs Agricultural Experiment Station in 1888 and remained until 1902. He was also founder and director of the Office of Experiment Stations, United States Department of Agriculture at Washington, and established the series of United States Farmers' Bulletins. In 1912, Dr. Jenkins was made director also of the Storrs Agricultural Experiment Station. Upon his retirement from service at both of Connecticut's stations in 1923, he was succeeded by Professor William L. Slate. Since 1912, the two experiment stations have been under one head, although each has its own board of control.

The policy of one director for both experiment stations has resulted in a satisfactory division of responsibilities and has served to prevent duplication of work. In the main, the station at New Haven concerns itself with plant problems and certain regulatory work required by the state, while the station at Storrs has been concerned chiefly with problems relating to the animal industry.

Fertilizer problems having been the inception of the experiment station idea and for many years the chief responsibility of the new station, the Connecticut Agricultural Experiment Station has never been divorced from certain regulatory work for the state in connection with fertilizers. To this has been added seeds, feeding stuffs, examination of food and drugs, and other control work. The gypsy moth, white pine blister rust, etc., have added to the "police duties" of the station in addition to complicating its purely research work.

Both the New Haven and the Storrs stations have made notable contributions to the solution of agricultural problems of the state and nation.

The New Haven station, for example, has contributed notably to the protection of field crops and orchards from fungi and insects; has added to the store of knowledge of the San Jose scale, the gypsy moth, pine blister rust, elm leaf beetle, etc.; has directed the state work of mosquito elimination; has identified and showed the ultimate and structural composition and properties of the principal vegetable proteins; pioneered in the discovery of vitamines; introduced the successful growing of shade tobacco; established an experimental forest for the study of forest problems; and discovered and developed the system of crossing inbred lines of corn, now in world-wide use.



Two hereditary dwarfs and their astonishing offspring when crossed.

The Storrs Station, among other things, proved the assimilation of free nitrogen by

rogress is being made in the solution of Blackhead, chief deterrent to turkey raising in New England.

guminous crops; introduced the omb calorimeter about 1890 and ne respiration calorimeter in 1896; onducted digestion experiments of rimary importance with animals; erformed extensive studies in dairy acteriology and introduced the overed milk pail; determined the ature and cause of bacillary white iarrhea in chicks; contributed vastly o the knowledge of infectious abortion in cattle; discovered important conomic facts in connection with arieties and stages of cutting of silage orn; and discovered control methods or the sheep stomach worm. The Storrs Egg-laying Contest was one of the first of its kind in the world.

Among the active projects now under way at the two stations may be mentioned the following:

At New Haven: Studies on the nature of the nitrogenous compounds in plants, especially those of the green tobacco plant; the cause of mosaic diseases; inheritance in corn, tobacco and numerous vegetable crops; studies in nutrition; curing and handling of tobacco; fundamental research in animal nutrition; the life history and control of numerous insects; the na-

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Connecticut pioneered in the study of infectious abortion. The herd is now entirely free from it.

Liming Sour Soils

II. The Economic Use of Lime

By J. W. White

Soils Research Chemist, Pennsylvania State College

TWO distinct systems of liming have been followed in Pennsylvania foı mıny years. In the southern half of the state, more especially in the southeastern counties, it has been the common practice to apply lime in sufficient quantity to bring about a neutral or slightly alakine soil reaction. In the northern half of the state, in sections remote from the natural limestone supplies, relatively small amounts of lime are applied with no attempt to correct the entire acidity of the surface soil.

From the standpoint of maximum production of the usual farm crops, the system of heavier liming has been fully justified by the results secured. In fact, until within recent years, our experiment stations, in the absence of definite experimental data, have advised the farmer to apply sufficient lime to satisfy the so-called lime requirement of the soil. Experimental evidence points conclusively to the fact that the physical, chemical, and biological properties of the soil (the determining factors in soil productivity) approach more closely ideal conditions where the soil reaction is neutral or only slightly acid (pH 6-7). The maximum fixation of atmospheric nitrogen, the most vital economic factor in grain farming, takes place to best advantage under conditions of a neutral soil reaction.

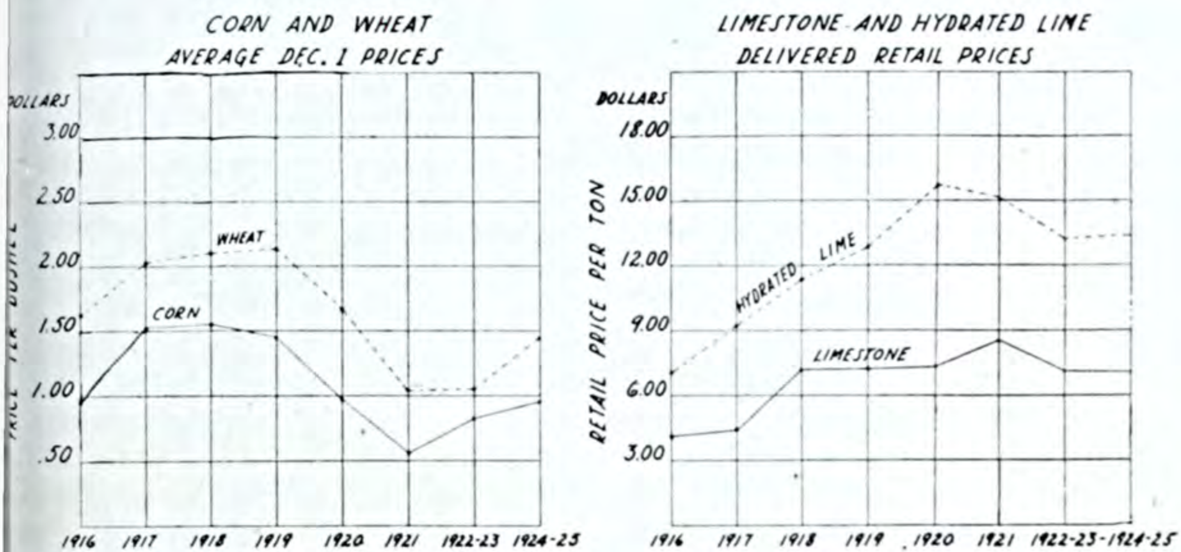
A lime requirement survey of all soils of the state disclosed the fact that 75 per cent of the soils were acid. In four representative southeastern counties only 14 per cent of the soils were acid, compared to 97 per cent in four northern counties. The average limestone requirement of the limed soils of the Hagerstown series was 130 pounds compared to 3,149 pounds for Volusia soil from the northern tier counties. In other words, the most acid soils were found most remote from the limestone valleys of the state. Many of the soils of northern Pennsylvania showed limestone requirements varying from 4,000 to 14,000 pounds per acre seven inches with a pH of 4.3.

To correct the acidity of such soils on the basis of the present delivered price of lime would cost from $20 to $70 per acre. It becomes evident, therefore, that the practice of applying relatively small amounts of lime in sections where soils are very acid and lime very expensive was brought about by economic necessity.

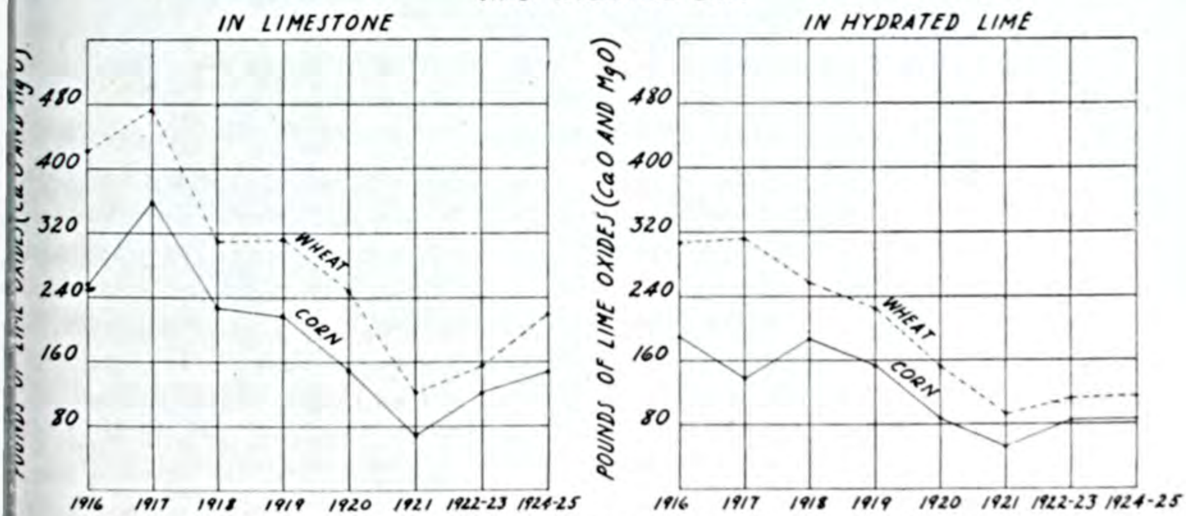
Prices Compared

The increase in the delivered (including freight and commission) retail price of all forms of lime, incident to the World War, was compensated in part from 1917 to 1919 by a marked rise in market values of farm crops, especially wheat and corn. Since that time, however, the trend of wheat and corn prices has been decidedly

TREND OF THE PENNSYLVANIA MARKET PRICES OF CORN AND WHEAT COMPARED WITH AGRICULTURAL LIME
1916 – 1925



DECLINE IN THE PURCHASING POWER OF A BUSHEL OF CORN AND WHEAT IN TERMS OF LIMESTONE AND HYDRATED LIME



TREND OF PENNSYLVANIA PRICES—BASED ON THE YEAR 1916 TAKEN AS 100

YEAR	1916	1917	1918	1919	1920	1921	1922 1923	1924 1925
CORN	100	158	160	152	103	57	85	102
WHEAT	100	127	132	133	105	64	65	90
LIMESTONE	100	111	178	176	177	212	174	173
HYDRATED LIME	100	126	158	181	218	208	184	184

The chart shows that the purchasing power of corn and wheat in terms of agricultural lime is considerably less in 1924-25 than in 1916. What goes up does not always come down.

downward and the delivered prices of lime have remained at war prices. Compared to 1916 the market price of corn in 1924-25 increased 2 per cent and wheat decreased 10 per cent. Between the same two periods limestone increased 73 per cent and hydrated lime 84 per cent in delivered price. These facts serve to emphasize the importance of economic studies to determine the most profitable rates of liming in our eastern states; for results secured in Pennsylvania are without doubt applicable to all eastern states.

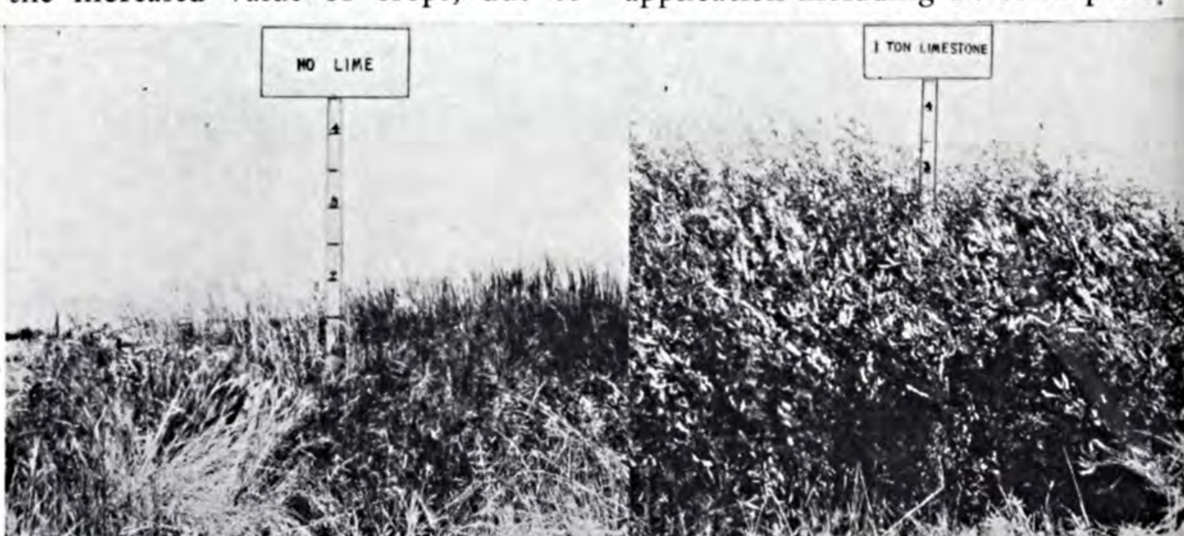
In 1918, the Pennsylvania Agricultural Experiment Station began a series of lime experiments on three soils for the purpose of studying (1) comparative values of limestone, hydrated lime, and ground burnt lime in crop productions, (2) comparative values of small applications of limestone and hydrated lime compared to heavy applications, (3) the economic returns from the two systems of liming. Space will not permit a detailed account of these experiments. This paper will be confined therefore to a description and discussion of the more important phases of the studies.

Three rates of liming were included in the plan of the experiment (1) sufficient limestone and hydrated lime to meet the lime requirement of the respective soils, (2) the equivalent of 800 pounds of pure hydrated lime and 1,080 pounds pure limestone applied once each four-year rotation to wheat, (3) 400 pounds hydrated lime and 540 pounds limestone applied for each corn and wheat crop. These three applications are designated as applications A, B, and C respectively. The results reported are based on the data gained at the end of two rotations. Two applications B and four applications C had been applied.

The total cost of lime in case of each application includes (1) retail price including freight and commission (Pa. prices 1921-1925), (2) cost of four-mile wagon haul, (3) spreading cost, (4) interest at six per cent on lime investment, continued until the increased value of crops, due to lime, was sufficient to cancel total lime debt.

The heavy application (A) of commercial limestone and total cost was as follows: DeKalb soil 4,450 lbs. ($22.94), Volusia soil 7,897 lbs. ($40.92), Westmoreland soil 3,908 lbs. ($20.00). Application (B) 2,272 lbs. ($11.97) for each soil. Application (C) 2,272 lbs. ($12.55) for each soil. Commercial Hydrated Lime, application A: DeKalb soil 3,432 lbs. ($29.16), Volusia soil 6,091 lbs. ($50.84), Westmoreland soil 3,014 lbs. ($25.30). Application B, 1,752 lbs. ($14.91) for each soil. Application C, 1,752 lbs. ($15.45) for each soil. The difference in cost of applications B and C is due to increased cost of spreading twice the number of applications. One application of A, two of B, and four of C are included in the first eight years' report.

The above costs of liming include $7.72 per ton of limestone delivered at nearest station, and $13.65 per ton for hydrated lime. Farm price includes delivered retail price plus $1.35 per ton for wagon haul. The spreading cost is based on a uniform traversing charge of 36 cents per acre, irrespective of the rate of application. The labor cost of loading on spreader is in direct proportion to the rate of application including 24 cents per ton



Value of Limestone in the Production of Sweet Clover on De Kalb Soil, Snow Shoe. One ton of limestone and fertilizers produced 8,041 pounds sweet clover hay per acre. Fertilizers without lime produced only sheep sorrel.

AVERAGE ANNUAL YIELDS PER ACRE FROM THE THREE RATES OF LIMING (GENERAL AVERAGE OF THREE SOILS):

	Bu. Corn	Bu. Oats	Bu. Wheat	Lbs. Hay	Lbs. Roughage	Lbs. Tot. Dry Matter
No Lime	20.3	28.2	10.4	1805	1399	2274
Limestone Application A	49.3	46.1	23.2	3867	2561	4491
" " B	44.6	43.7	21.8	3420	2300	4045
" " C	46.3	42.9	17.2	2992	2211	3881
Hydrated Lime " A	50.4	48.5	24.2	3720	2603	4535
" " " B	44.0	40.8	20.6	3472	2311	4106
" " " C	44.3	42.5	18.3	3077	2175	3814

Application A sufficient lime to correct lime requirement equivalent to 5,418 pounds commercial limestone or 4,179 pounds commercial hydrated lime. B—2,272 lbs. commercial limestone or 1,752 pounds commercial hydrated lime equally divided between each of two wheat crops. C—same as B but divided into four equal applications to both corn and wheat crop.

of material. Also is added six per cent to the applied cost of the lime until sufficient increased yields due to lime were sufficient to pay total cost of respective lime application.

It is recognized fully that it is difficult, under varied farm conditions, to determine the actual net returns or profit from the use of lime or other soil amendments. Many factors enter into the calculations which may be influenced materially by the peculiar farm conditions, such as labor economy through the use of improved farm machinery, proximity to market, conditions of roads, truck or wagon haul, etc. After full consideration of the many factors involved the following system was adopted in an attempt to at least approximate the profit derived from the use of lime on very acid soils. The total yields of grain and hay were computed in terms of farm values by deducting from the average market prices, the labor costs necessary for preparation and delivery to market. The roughages (straw and stover) were given an arbitrary value. The value of the increased yields over the unlimed land, less the total cost of liming, noted earlier, was recognized as net return or profit derived from the use of lime.

The yields and profit secured will be confined to the average results of the three soils since space will not permit a detailed report (See bulletin 211, Pa. Agr'l. Exp. Station).

A study of the data below shows

(Turn to Page 56)

AVERAGE ANNUAL RETURN AND PER CENT PROFIT (GENERAL AVERAGE OF THREE SOILS).

APPLICATION	A	B	C	B-C	A-B-C
Limestone —Annual net return	$12.67	$11.89	$10.15	$11.02	$11.57
Hydrated Lime— " " "	12.31	10.86	9.57	10.22	10.91
Limestone —Per cent Profit	348	761	620	691	576
Hydrated Lime— " " "	269	558	475	517	436

Showing how potash increased the yield of potatoes on a Miami fine sandy loam in Wisconsin.

POTASH

¶ In its relation to American Life.

By G. J. Callister

OVER large crop areas in the United States farmers are using fertilizers containing more potash. The average ton of fertilizer each year also contains more nitrogen and phosphoric acid, but the increase in the percentage of potash in recent years has been greater than the increase in the percentage of either nitrogen or phosphoric acid. The trend of plant food content in fertilizers is distinctly upward toward a narrower ratio and better balance.

The significant fact emerges, that there is now starting in American agriculture the same upward trend in the use of potash that for some years has been so marked a characteristic in the fertilizer usage of many other leading agricultural countries.

From a world viewpoint the trend of potash consumption is upward because potash is playing an increasingly important role in the maintenance of the life of the world and in sustaining our ever increasing standards of living.

Not individuals alone, but whole populations are affected by its use. Do you use starch or sugars, vegetables the year round, tropical and many other fruits in and out of season; do

I am indebted to Dr. E. E. Vial for the figures quoted in this article.

you use cotton goods, or drink coffee; do you smoke tobacco; do you use many kinds of canned goods, or any one of a long list of industrial and medical products? Then you depend on potash, whether you live on a farm or in a city apartment.

Thus "potash," the working everyday name for certain compounds of potassium, is more than an inert chemical on the laboratory shelf or in the manufacturer's fertilizer bin. It is many-sided indeed. It is of vital importance and interest to the farmer and appeals with a multitude of interests and problems to different associated groups—political, economic, scientific, financial, consuming, publicity, and commercial—each a field in itself.

Potash draws together men living on lands that could not otherwise be farmed without it; and it sends men apart, luring them to the most out-of-the way places of the earth seeking it; it induces men to risk time and fortunes with the hope of finding it. All for one reason and no other, because potash is essential to sustaining life, through plants and animals—the life of man.

As an essential plant nutrient in our national agriculture, crop production is cheapened and stabilized and the resources of our greatest asset, the land, are conserved by the use of potash.

More Potash Demanded

During the fiscal year 1927-28, with nitrogenous materials and phosphates, 250,000 tons of actual potash made up the 7,000,000 tons of fertilizer in our national fertilizer bag.

Let us see what changes have occurred in the content of this bag during recent years. The following data and discussion refer to changes in percentages in fertilizers actually used in three contiguous crop areas: the six New England states; the two large fertilizer-using states in the Midwest, Ohio and Indiana; and three Mid-Atlantic states, New Jersey, New York,

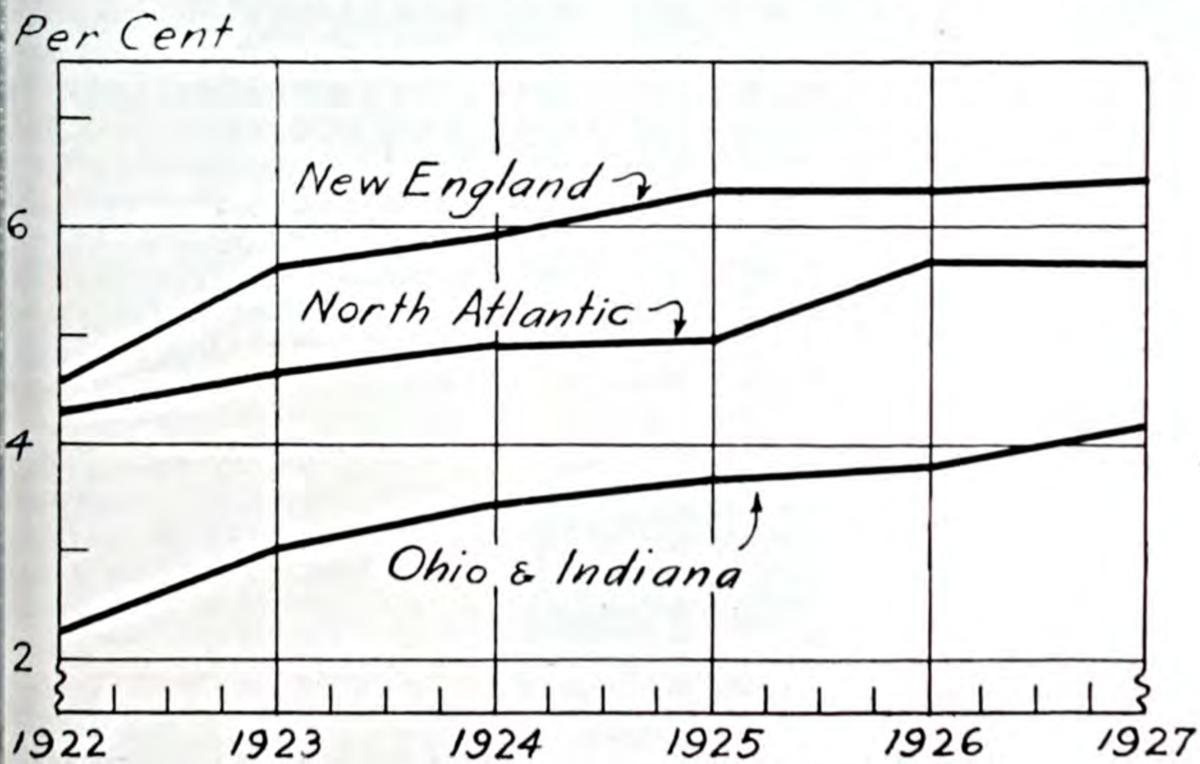


FIG. I. AVERAGE POTASH CONTENT OF MIXED FERTILIZERS IN NEW ENGLAND AND MID-ATLANTIC STATES, AND AVERAGE POTASH CONTENT OF ALL FERTILIZERS IN OHIO AND INDIANA 1922-27.

The percentage of potash in fertilizers is increasing.

TABLE I—AVERAGE ANALYSIS OF COMPLETE FERTILIZERS IN THE NEW ENGLAND STATES

	Nitrogen	Phosphoric Acid	Potash	Ratio of N to		
				N	P_2O_5	K_2O
1922	3.09*	7.47*	4.56*	1*	2.42*	1.48*
1923	3.21	7.65	5.59	1	2.38	1.74
1924	3.41	7.63	5.94	1	2.24	1.74
1925	3.52	7.76	6.34	1	2.20	1.80
1926	3.61	8.40	6.32	1	2.33	1.75
1927	3.68	8.29	6.45	1	2.25	1.75

* Maine and Rhode Island not included.

and Pennsylvania, which is as much as space will permit. These data will, however, fairly represent a large part of our national fertilizer usage. The latest official figures available for these states are for 1927. Few figures are available for 1928, but all the figures available to date show that the average percentage of potash in the fertilizers used in these areas has increased markedly during recent years. This is shown in the chart on page 15.

In the six New England states, the average content of potash in all complete fertilizers during this period has increased from 4.56 to 6.45 per cent, an increase in actual percentage of potash used of 1.89 per cent.

In the Mid-Atlantic states named, during this period the percentage of potash used increased from 4.24 to 5.63 per cent, an actual increase of 1.39 per cent.

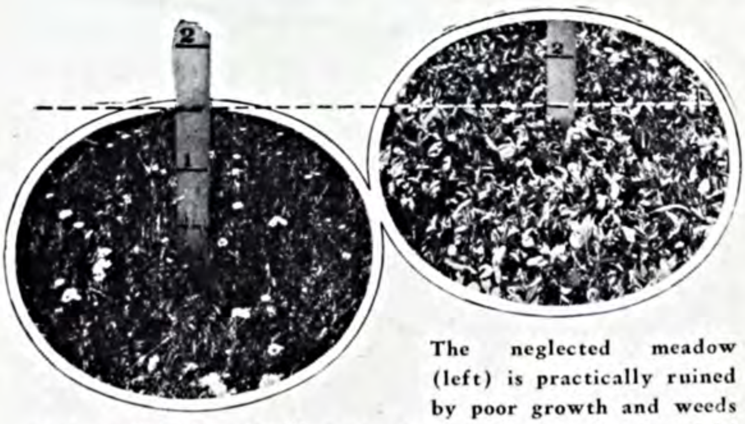
In Ohio and Indiana, representing the movement in the Midwest, potash in all fertilizers increased from 2.16 to 4.17 per cent, an increase of 2.01 per cent.

Not only has the average percentage of potash for the region increased, but potash has increased in each state. The few figures available on percentages for 1928 show that the movement continued. For instance, New York State Agricultural Experiment Station Bulletin No. 557 shows that the average potash content in complete fertilizers increased from 5.40 per cent to 5.80 per cent, comparing 1927 and 1928.

Together with these increases in the percentage of potash and other elements in the fertilizers, there has been in many sections an increase in fertilizer tonnage. These two factors, the increase in percentage and the increase in tonnage, have in many areas resulted in more actual plant food being applied to the land.

Other significant changes have occurred in the average analysis of complete fertilizers used in New England, which are shown in the table above.

It will be noticed in



The neglected meadow (left) is practically ruined by poor growth and weeds as a result of no fertilizer treatment. In the adjoining field (right) phosphorus and potash have brought back the clover and crowded out the weeds.

TABLE II—AVERAGE ANALYSIS OF COMPLETE FERTILIZERS IN NEW YORK, PENNSYLVANIA AND NEW JERSEY 1922-27

	Nitrogen	Phosphoric Acid	Potash	Ratio of N to		
				N	P_2O_5	K_2O
1922	1.99	8.13	4.24	1	4.09	2.13
1923	2.03	8.26	4.63	1	4.07	2.28
1924	2.23	8.42	4.92	1	3.78	2.21
1925	2.06	8.64	4.96	1	4.19	2.41
1926	2.35	9.14	5.64	1	3.89	2.40
1927	2.49	8.99	5.63	1	3.61	2.26

Table I that the percentage of nitrogen, phosphoric acid, and potash has increased. The greatest increase, however, is in the percentage of potash, which has caused in 1927 a narrower ratio between phosphoric acid and potash in complete fertilizers.

The same general trends are occurring in the Mid-Atlantic states as shown in Table II.

Again it will be noticed that the percentages of phosphoric acid and nitrogen increased but the major increase was in the percentage of potash.

The Midwest is an important potential fertilizer territory, possessing extensive farming areas of valuable land. Marked changes have taken place between 1922 and 1927 in the fertilizers used in this territory, as shown in the following Table III.

Again the percentages of nitrogen and potash have increased. In 1922 there was 6.5 times as much phosphoric acid as potash used; in 1927 only about three times as much. These figures are for all fertilizers,* including the sale of unmixed materials. Potash increased from 2.16 to 4.17 per cent; an increase of 2.01 per cent.

Thus, all over the fertilizer region under discussion, the general trend has been an increase in the average per-

* Data for Ohio and Indiana are for all fertilizers. Similar data for the other states were not available, and so average analyses of the complete fertilizers are given.

TABLE III—AVERAGE ANALYSIS OF ALL FERTILIZERS IN INDIANA AND OHIO 1922-27

	Nitrogen	Phosphoric Acid	Potash	Ratio of N to		
				N	P_2O_5	K_2O
1922	.59	14.13	2.16	1	23.95	3.66
1923	.77	14.35	3.00	1	18.64	3.90
1924	.76	15.13	3.41	1	19.91	4.49
1925	.94	14.20	3.67	1	15.11	3.90
1926	1.04	14.08	3.74	1	13.54	3.60
1927	1.22	13.09	4.17	1	10.73	3.42

The condition of the stalk in the field above indicates potash deficiency. Iron accumulations in the joints disclosed by the corn-stalk test of Dr. G. N. Hoffer, Purdue, verified the suspicion.

centage of nitrogen, phosphoric acid, and potash. The actual increase of potash for the period mentioned was greater than the increase in nitrogen or phosphoric acid. The trend in general is towards narrower ratio in the fertilizers used.

As the figures given refer to the fertilizer actually used, this is the farmer's verdict regarding what he needs. Farmers are buying fertilizers containing higher percentages of all three plant nutrients, but especially potash. Thus, it can only be presumed that the farmers are buying these fertilizers containing higher percentages of plant food because they pay and in line with this thought, it is inconceivable that the percentage of potash, or any other element, has increased, unless the farmers foun[d] it profitable.

There is nothin[g] theoretical or scien[-]tific about paying ou[r] hard - earned dollar[s] for a fertilizer bill[.] All the problems ar[e] wrapped up in on[e] question—does it pay[?] If it does not, the[n] the practice in spit[e] of all science and ad[-]vice will never be fol[-]lowed. Large respon[-]sibility to know what the farmer is doing rests on industry[.] That the percentage[s] of plant food hav[e] been increased show[s] that industry has responded to the farmer's need.

While the 250,000 tons of actual potash used in 1927-1928 in our na[-]tional agriculture sounds like a very big heap of potash and while as shown in many crop areas the consumption is increasing, the potash used is in reality very little in comparison to the extent of our arable acres.* Approximately 110 pounds of actual potash per 100 arable acres were used in 1927 and 100 acres is a fair sized farm. Hundreds of thousands of farmers and their families have lived and worked all their lives on farms of this size.

One hundred and ten pounds of actual potash cost $5.50, at $50.00 a ton for muriate—not a large amount for 100 acres. Making every allowance for arable acres outside the present fertilizer area and even for sections using the largest amounts, the average amount of potash used in our national agriculture is relatively small.

In Other Countries

Turning aside for a moment to Holland, we find that the farmer of that country used in 1927 approximately 38 times as much actual potash per 100 acres; the German farmer 21 times as much; the farmers of England and France 3 and 4 times as much. In fact, America uses less potash than most of the other leading agricultural countries of the world.

Not only do other countries use more potash than America does, but each year they are increasing their own amounts of this plant food. The marked tendency in potash consumption is upward. England, France, Germany, and Holland, for instance, are now using more potash than in former years.

The significant fact is that in America, even though relatively small amounts of potash are used in comparison with other countries in the areas discussed, our farmers are finding that they need more potash on many crops and on many soils and are joining in this upward movement. It is not unlikely, that the vast shortage of millions of tons of actual potash that occurred in 1914-19 is making itself felt and that the effects of this shortage on the crop is one cause of the commencement of this upward trend in potash consumption above the increases in the percentage of the other elements.

The Farmer's Verdict

This verdict of the farmer is sustained by the results of actual experiments and demonstrations conducted under practical conditions on the farm. During the last crop season, the field staff of the Agricultural and Scientific Bureau, N. V. Potash Export My., has conducted a large number of fertilizer demonstrations with different crops in many parts of the United States.

Brief summaries of demonstrations conducted in the areas under consideration are striking. They show that potash is often the limiting factor; that when used in the proper balance with the right amount of nitrogen and phosphoric acid and when good crop practices are followed, even with the low prices of some crops, potash will give good returns. In reporting these demonstrations, every allowance was made for the retail price of potash and every practical allowance was made for the cost of harvesting the extra crop.

Makes Potatoes Pay

On potatoes, an everage increase of 8 per cent potash in the fertilizer returned $8.32 for each dollar invested in extra potash on 16 demonstrations, even with the unusually low price of potatoes this year. In years of normal prices, the return would be two or three times as much.

Corn, although a low value per acre crop, returned $5.17 for each dollar's worth of extra potash (on an average of 27 demonstrations).

White pea beans, a crop frequently considered unprofitable to fertilize, received an extra 12 per cent of potash and returned $15.40 for each dollar invested in the extra potash on an av-

* Arable acres include land in crop and arable pastures, namely: 500,000,000 acres; potash tonnage sold—250,000 tons.

A field of flue-cured tobacco severely affected with potash hunger.

erage of three demonstrations.

Burley and Bright tobacco returned $26.86 per dollar's worth of potash used, when an extra 6 per cent potash was included in the mixtures. This is an average of 3 demonstrations, the final results for most of the demonstrations not yet having been secure

Cabbage gave an average return o $22.15 per dollar's worth of potash o 2 demonstrations, when an extra 2 per cent potash was included in th mixtures.

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A field of normal flue-cured tobacco. Here ample potash was supplied in the fertilizer applied. (U. S. D. A. photos.)

Restricting Production

By Arthur P. Chew

United States Department of Agriculture

ECONOMISTS agree that over-production has been one of the causes of the post-war depression in agriculture; many regard it as the chief cause. "The outlook for farm production is so good that the outlook for farm prosperity is very bad," said a leading authority two years ago. Others have declared the agricultural industry is suffering from too much efficiency. Machinery, improved crops, and improved livestock have maintained and even increased production, despite a heavy loss of farm population. It is averred that nothing can be done for the farmer until he restricts his production.

This doctrine conflicts with what is usually applied to other industries. Success in manufacturing is attributed to facility in production. Our greatest industries have banished the phrase "saturation point" from their vocabulary. In the recent election campaign, it was said, and not denied in responsible quarters, that the secret of America's prosperity is the cooperation of labor with capital in unrestricted productivity. This principle can not be true for industry and false for agriculture. If prosperity is obtained for industry, not by limiting production so as to raise prices, but by underselling competitors through abundant low-cost production, the same formula ought to have some merit for agriculture. In fact it has. Post-war production in the United States has been large because farmers know that restricting production may mean lost business rather than increased profits. It is well to *adjust* the production of various crops to market needs: it is not well to diminish the *sum* of productive energy in use.

Our farmers understand this, as their post-war production shows. It is less understood in academic circles. At the international economic conference held at Geneva in May, 1927, representatives of the food exporting nations, including the United States, differed with the European delegates on a fundamental point. They contended that the welfare of agriculture required reduced rather than increased production. The Europeans conceded that agriculture was entitled to a better reward, but declared this benefit should not be bought at the price of a diminished supply of consumable goods. Thus the European attitude was the typical *American* attitude toward production, whereas the American representatives leaned toward the doctrine of ca' canny. American *practice* in agriculture has not been tainted with the ca' canny philosophy.

Considering Demand

The truth is that, with rapid urban development throughout the world, the overproduction problem in agriculture tends to solve itself. Western Europe has long ceased to be self-sufficient in foodstuffs, and the United States seems destined eventually to be partly dependent on food imports. Our agricultural export trade has much declined in recent years. In the production of corn, beef, and spring wheat we are close to the margin between the import and the export basis; the producers of these commodities may soon regularly have to contend with foreign competition in the United States market. Dr. O. E. Baker, of the U. S. Department of Agriculture, says rational checks to the growth of population will be necessary within a century if the population is to be kept in a comfortable relation to domestic food resources. The tendencies Doctor Baker has in mind are already running in favor of agriculture and will do so more and more strongly as time passes. In the basic supply and demand relationship between agriculture and the rest of the world, the long-time advantage is with agriculture.

In the last century and a half the American nation has grown from a community of 2,500,000 people to one of about 119,000,000 people. Throughout this period the growth of our farm production has exceeded the growth of our population, except in the years from 1897 to 1921, when the increase in our food production fell behind the increase in our population. Since 1922 the familiar relationship has been resumed. We are again making our food production outstrip the growth of our population. But how long will the tendency continue? Some economists believe the normal condition for the twentieth century will be like that manifested from 1897 to 1921, when urban growth and declining agricultural expansion caused population growth to run ahead of food production. The post-war spurt may be a temporary phenomenon, resulting partly from the hang-over of the war's stimulus to farming, and partly from factors in the increase in production that by their nature must diminish in strength. These points are worth examining, because they throw light on the vital question how long the surplus question will be with us.

First we may note what the war-time hang-over has had to do with the boost in American farm production since 1922. As already mentioned, a marked drop took place in our food production per capita of th population from 1897 to 1921. Eve in the war years the average produc tion per capita of the population w less than in the period 1897 to 190 It might seem that our agricultur contribution to the Allied cause di not arrive until the fighting was ove but that would be a mistake. Ur usual specialization took place on ou farms during the war period, as a re sult of which our exports of certai products, notably cereals, increase enormously. It is true that the stimu lus of war-time prices was not felt i increased agricultural production *as whole* until after the war. Finall however, this stimulus reversed th downward trend manifested in produc tion per capita of the population dur ing the first two decades of the cen tury. This belated war-time influenc probably continues, but it must event ually disappear. Over-expansion cause by the war has been liquidated thor oughly in some leading agricultur enterprises, and liquidation in others going forward.

Farm Efficiency

What about the post-war jump i farm efficiency? In the five-yea period 1922 to 1926 the production o milk, pork and lard, potatoes, fruit and vegetables in the United State was higher per capita of the popula tion than in the five-year period 189 to 1901. It was higher also, except i the case of potatoes, than in any in tervening five-year period. The pro duction of veal and lamb increase likewise. In production per unit o labor engaged, the percentage of gai was still higher. Some decline too place in the production of beef, mut ton, and wheat per capita of the popu lation; but even in these lines a gain i output per worker was effected.

Thus increased efficiency has ha much to do with the increase of farn

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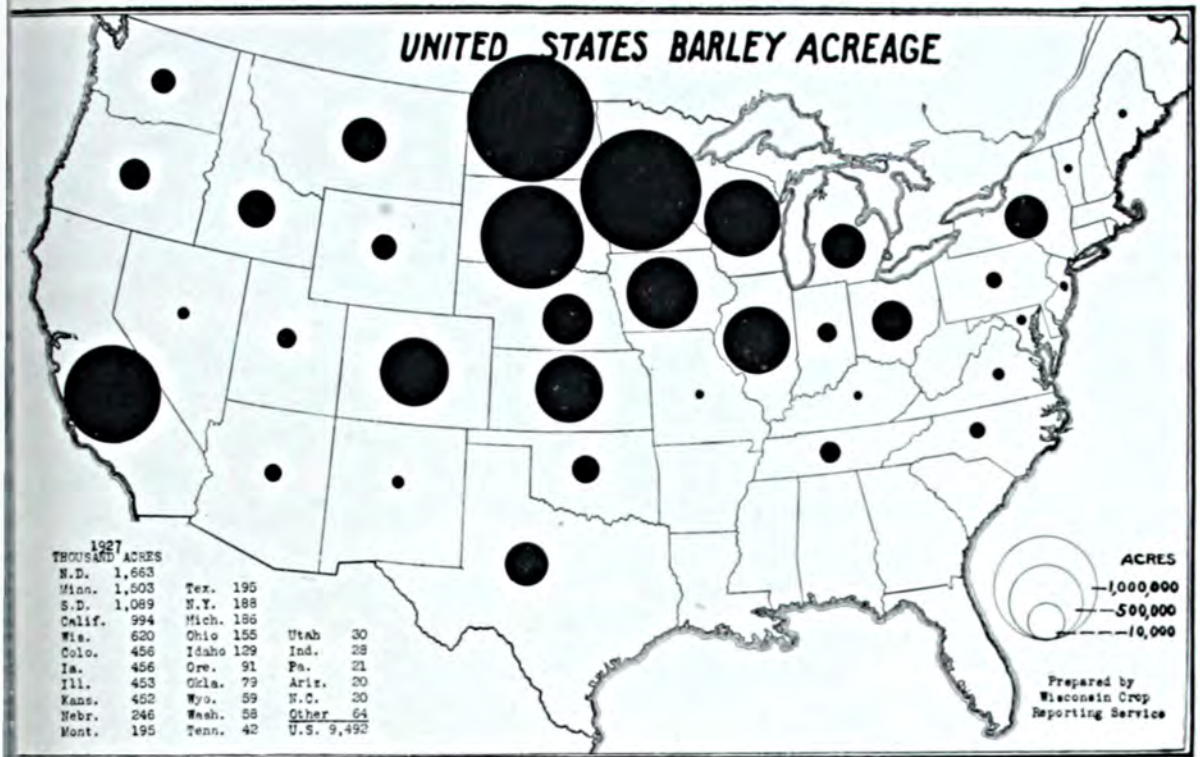


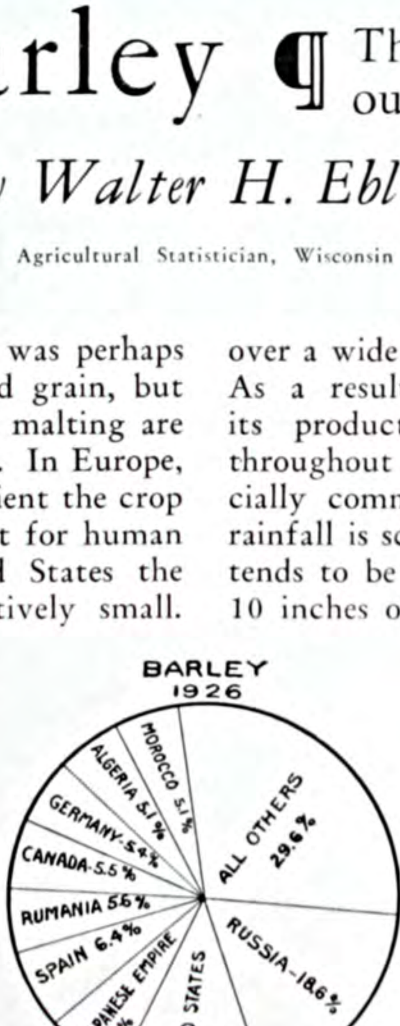
Barley ¶ Third of our series

By Walter H. Ebling

Agricultural Statistician, Wisconsin

IN former times barley was perhaps best known as a bread grain, but now its uses for feed and malting are much the most important. In Europe, North Africa, and the Orient the crop is still used to some extent for human food, but in the United States the quantity so used is relatively small. The American crop is used almost entirely as a feed crop, though the malting industry was a prominent outlet for this grain at one time.

As a grain, barley has a rather short growing season. It matures in considerably less time than either oats or wheat. It is shallow rooted, mostly spring sown, and is grown over a wide range of soils and climate. As a result of its versatile nature, its production is widely scattered throughout the world, and it is especially common in regions where the rainfall is scant or the growing season tends to be rather short. As little as 10 inches of rainfall, if properly distributed, will make a crop of barley. In general the world distribution resembles somewhat that of wheat, but it extends farther north and also farther into the arid regions.



The world's leading areas in barley production are southern Russia, the Mediterranean countries of Europe,

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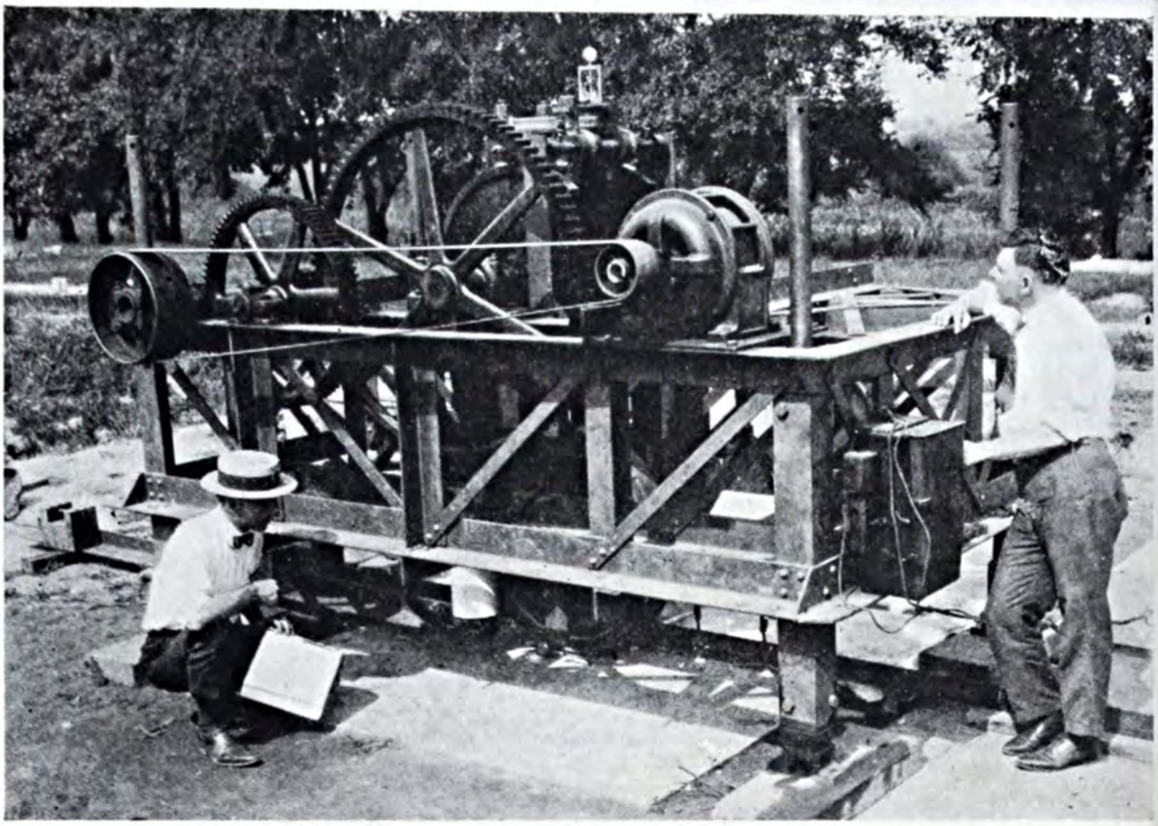

Apparatus for measuring resistance of road subgrade. The machine subjects sample slabs of pavement to impacts similar to those of motor trucks.

Agriculture Today

IV. Engineering

By Frank George

THE remarkable development of machine farming since the World War has marked the last decade as the beginning of a new mechanical era in American agriculture. Farmers have been compelled to resort to machine methods in production and marketing in order to reduce unit operation costs and to meet the competition of industry for man power. In some cases they have had to invent their own mechanical equipment—the cotton sled, for example.

Equally spectacular as the combine, corn harvesting machinery, and equipment that digs and sacks potatoes in a single operation, has been the development of more efficient machine methods of combating crop pests to replace hand, horse and cart sprayers. Airplanes are in use in some regions to spread poison dusts over vast areas. Control of the corn borer is now regarded largely a mechanical problem. Many investigators are exploring the field of electricity, seeking methods of destroying insects, and stimulating plant growth with electric sprays.

Discussing current agricultural engineering problems, Thomas H. MacDonald, chief of the Bureau of Public Roads, lays emphasis upon the development of improved machinery for use in controlling the European corn borer, the prevention of soil erosion and reclamation of eroded land, and the economical use of irrigation water. The corn borer problem, he declares, is no doubt the most pressing one at this time, but when one looks into the future he is impressed with the problem presented by the erosion of agricultural soil and that of making the available water supply of the arid West answer for the needs of agriculture.

Engineers of the Bureau of Public Roads the last two years have been conducting extensive research at Toledo, Ohio, in developing mechanical equipment needed by farmers to combat the corn borer. Chiefly, the object sought is to present to the borer a perfectly clean ground surface when he emerges from the soil in the spring. If the borer finds no last year's stalks or stubble, no weeds or other trash, the insect dies from exposure or is devoured by birds. In the fall, if the standing stalks are cut at the ground surface and shredded in the fields, the borers in the stalks are destroyed.

Should the farmer elect to leave until spring the stubble and other remnants of the cut corn crop, he may then, with a suitable plow, cover them entirely. On the other hand, he may, with the proper implement, plow under the entire standing stalks of last year's crop, together with all other trash. Or, with a suitable type of horse rake he may, in the spring, rake the field clean and burn the trash in piles.

"The entomologists," Mr. MacDonold says, "have laid bare the life history of the borer, his seasonal habits, and all his vulnerable points. The farmer's part is to conduct his regular operations in such a way as to present to the borer the maximum of resistance to the completion of the insect's life cycle. Our engineers are working on the problem of altering existing types of commercial machines, and developing new types, so that the farmer may accomplish these things with as little interference as possible with his seasonal routine."

The question of soil erosion, although not fully realized by the public, is one of the most serious problems facing agriculture of the future, in Mr. MacDonald's opinion. Erosion robs the farmer, he says, not only of the soil fertility which he is at much

An eroded area in the Cane hills near Yazoo City, Mississippi.

Deep plowing is recommended in fighting the European corn borer. All stalks, stubble, and other corn refuse are turned under.

labor and expense to maintain, but of the soil itself. The remedy for soil erosion on sloping fields is the terrace system, a series of low earth ridges following the contours of the land.

Analysis of the principal soil types throughout the country and of the material washed out of fields, idle lands, and pastures, and carried out to sea by the rivers or deposited on lower slopes, in stream channels, and over alluvial bottoms where it often does great damage indicate an estimated annual loss of upwards of $200,000,000. The quantity of sediments annually carried into the Gulf by the Mississippi River alone, say the Government engineers, amounts to 428,000,000 tons. In addition, 270,000,000 tons of dissolved matter are transported to tide-water every year.

It has been estimated that American farms suffer a yearly net loss of 5,900,000,000 pounds of plant-food elements removed by crops. More than 20 times this quantity is removed by erosion each year. Cultivation is made more difficult, and increasing quantities of fertilizers are needed to enrich the exposed raw subsoil material. Even in arid regions, erosion is destroying fertile valley areas and valuable overgrazed mountain slopes.

In a single county of the Piedmont plateau, 90,000 acres of formerly cultivated land had to be classed recently as nonarable, rough gullied land because of gullying that could have been prevented. A survey in another county of the coastal plains revealed more than 70,000 acres of land that have been similarly despoiled. In the great region of brown loam soils (loess soils) along the Mississippi and Missouri Rivers, farming has been largely abandoned in the uplands of some entire counties, because of gullying.

Terracing is regarded as an individual farm problem; it is not susceptible of community or organized treatment in the way that drainage ditches and irrigation canals can be handled. To be effective, terrace system must be well designed and constructed. To work out the problems involved in adjusting the terrace to the various land slopes, kinds of soil, and types of crops, the bureau has begun a large-scale experimental project in connection with which an entire farm will be operated under the conditions imposed by severe erosion.

This experimental farm is located near Guthrie, Oklahoma, and presents soil and topographic characteristics that are typical of large areas in Oklahoma and adjoining States where erosion by rain water is very active and already has caused enormous losses of cultivable land. The section in which the farm is located has suffered extensively from erosion and the tract acquired for test purposes has cultivated fields that have already been affected. Other portions that have been used for pasture are not affected.

The farm will be terraced in strict accord with the requirements of soil and slope. The results will be observed closely and run-off and erosion measured; changes in location and dimensions of terraces will be made from time to time as seems advisable until the best possible terracing system is secured under actual conditions of cropping, cultivation, and harvesting. The project will constitute a practical demonstration of terracing methods and results and is expected to yield information of great value.

"The increase of area being put under irrigation in the arid West," Mr. MacDonald declares, "has brought us to the point where securing the necessary water is becoming more and more difficult. Irrigation so far has been practiced largely by making lavish use of the water easily accessible. More and more it is becoming necessary to bring the water from longer distances. This immediately brings in the matter of waste due to losses from canals by leakage, seepage, and evaporation.

"It may be said in general that the possibility of materially increasing the irrigated area, of using the soil resources that are available, will depend upon our ability in the future to make better use of the water now accessible, rather than the possibility of tapping of new water supplies. Consequently, the bureau is devoting considerable attention to the development of a more economical application of water on the part of the farmer, a determination of the minimum water requirements of crops, the conservation of moisture in the soil, the reduction of losses from canals, and other related problems, the solution of which will make for the maximum of economy in the use of the total water supply."

The problem of developing natural water supplies and otherwise making water available on dry ranges is being studied at the United States Sheep Ex-

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Burning apparatus used in a field badly infected with corn borer. The burning carriage generates a heat of 1,400 degrees F.

Apple Blotch

By C. T. Gregory

Purdue University Agricultural Experiment Station

DR. M. W. GARDNER of the Purdue Agricultural Experiment Station has made a thorough study of the apple blotch disease. This disease is one of the bugbears of apple growers in southern Indiana. As a matter of fact it is a toss-up between this disease and scab which is most serious. Too often blotch has the better of the argument. At any rate the control of blotch is a vital question with these orchardists, and the spray schedules recommended previous to Gardner's work did not do the business quite effectively. As a result of this study, the petal-fall spray followed by applications two, four, and six weeks later were developed.

These sprays will control blotch, but the growers find it difficult to eliminate the disease. Thorough spraying one year had little or no effect on the disease the next year. Gardner's studies have revealed the reason and more than this, he has found a simple remedy, "shaving the cankers," in young orchards.

The blotch fungus lives its entire life within a single tree. This disease does not ordinarily spread any great distance, the nature of its spores being such that they cannot easily make the jump from one tree to the next. The fungus produces tiny, flask-like bodies within which the spores are produced. In wet weather the moisture forces the spores through the mouth of the flask in a sticky mass, and it is only by the washing and spattering of raindrops that the spores can be spread. There is practically no wind dissemination of the spores as in scab. These facts practically preclude any chance of the disease jumping from tree to tree except as the branches of the trees become interlaced.

It has been known for some time that the fungus is not only able to attack the fruit but it can also attack the young twigs and branches causing sunken cankerous areas. Moreover, these cankers are able to persist from year to year and become gradually larger as the fungus works its way into new tissues. Each year a heavy new crop of spores is produced in these cankers, spores that are ready to contaminate any unsprayed apples and also produce more cankers on the branches, a steady merry-go-round of destruction. It is little wonder that the southern Indiana apple growers need to battle this disease each year and that too long a wait between sprays causes such trouble.

Hits the Solution

Obviously if one could rid the trees of the cankers the problem of control would be less serious. With this question in mind Gardner tried different kinds of dormant sprays trying to find something that would penetrate the canker and kill the fungus but not harm the tree. He had no luck. He noticed, however, that the cankerous tissue did not spread deeply into the bark of the apple. This gave him a hunch. Why not cut off the diseased tissue and so destroy the canker? He tried it and it worked far beyond his hopes. It is not only necessary to shave off the brown cankered tissue but to cut considerably beyond the visible margins of the canker. It is not necessary to treat the wound in any way because the cankers do not penetrate more than half way through the bark. With the cankers shaved off, the tree will continue its growth as if nothing had happened and will form a new healthy bark to replace the canker in a short time.

For a time Gardner was worried about the chips or shavings. He feared that the spores in these chips might find their way up to the fruit but this fear was unfounded. Once the cankered tissue is shaved from the tree it is harmless. There is no need of picking up the chips. All that is needed in this canker-shaving job is a sharp knife and nature does the rest.

So much for the theory, but do we know it will work? Let R. A. Simpson of Vincennes, Indiana, answer this. He set out an orchard in 1917 and applied the 2-4-6 weeks bordeaux sprays annually since 1920. In 1922 he began shaving off the blotch cankers, doing the work in winter so that the workmen could see them more easily. Simpson did not do the work himself, it was done by his regular force. In 1925, three years after he started removing the cankers they tried an experiment. Twenty-one trees were left unsprayed for blotch, that is, the dormant and scab sprays were applied, but the blotch sprays were omitted. From these trees 5,758 apples were picked and examined for blotch, but no lesions were found. In 1926 the same 21 trees were again left unsprayed and 8,173 apples were examined. They found one blotch spot on one fruit.


Shaving blotch cankers from a young tree.

Simpson tried the same thing in another orchard planted in 1918, also sprayed yearly, and in which the canker removal also started in 1922. In this orchard 68 trees were left unsprayed in 1925, that is, the blotch sprays were omitted. More than 6,900 apples from 64 trees were picked and no blotch could be found. In 1926 the trees were left unsprayed and 11,673 apples from 52 trees had not a single blotch spot. Any man who has had experience with blotch will know that under ordinary conditions failure to spray means failure to get marketable fruit. In other words this test of Simpson's proves conclusively that the practice of removing cankers is an easy means of holding blotch in check.

Shaving the cankers is not designed to take the place of spraying but it does act as a mighty valuable supplement. It makes 100 per cent control by spraying a much easier and more certain task. Moreover, the work can be done by any grower. It does not need a scientific eye to detect the cankers nor an especially trained hand to do the work. However, it will hardly pay to try this canker removal in old trees. It is the young orchard about which we are chiefly concerned.

Rid the young trees of the disease cankers and when they come into bearing the blotch will have lost its power to do harm. It is quite probable that the disease is brought into the orchard on nursery stock and in no other way.

Tobacco Farmers—Prepare!

By W. H. Scherffius

Lexington, Kentucky

SPRING will soon be upon us with its multitude of duties for every farmer. It is therefore essential that the tobacco planter begin now to plan for his 1929 crop. Every farmer wants to do better than he did last season. He even hopes to do as well or better than his neighbor, who has a reputation of producing one of the best crops in the neighborhood.

Well-prepared seedbeds; the best seed sown at the right time; labor contracted for in advance; modern implements for planting and cultivating; good fields well prepared in advance; liberal applications of manure, when obtainable, supplemented with a high-grade well-balanced plant food in a mixed fertilizer; if manure is not available, an increased amount of plant food in a mixed fertilizer; plenty of barn room for housing the crop; all of these are essentials that should not be overlooked.

Select, if possible, an eastern or southern exposure for the seedbed. The soil should be a good rich loam, that will not water-log, worked into a fine tilth before sowing. Sow a teaspoonful of sterilized, root-rot resistant seed to every 20 square yards of seedbed. Cover the bed with canvas. Keep the beds free from weeds. If the plants do not grow rapidly, in order to stimulate growth, sprinkle them with a solution of nitrate of soda, sulfate of ammonia, or high-grade complete fertilizer. Follow this with a sprinkling of clear water in order to wash the fertilizer solution off the leaves.

Do not plant a bigger crop than your labor can handle; it is a losing game. Modern implements, for planting and cultivating tobacco, are so essential that no tobacco planter can afford to be without them. The production of tobacco is hard and tedious work, at all times. Therefore, it is necessary that the drudgery be eliminated as much as possible by using the best equipment, thus securing the maximum amount of service at a minimum labor cost.

Plenty of Plant Food

Tobacco draws more heavily on the plant food in the soil or on the fertilizer that has been applied, than most other crops. For this reason, it is essential that tobacco be planted on very fertile soil, or the soil be given a liberal application of manure and a high-grade fertilizer. When buying fertilizer for tobacco, the following facts will help you to determine the amount of each of the three essential plant foods (nitrogen, phosphate, potash) needed in your fertilizer mixture. A 1,000-pound crop of tobacco removes from the soil approximately 50 pounds of nitrogen, 3 pounds of phosphorus, and 60 pounds of potassium. Thus it is seen that tobacco draws heavily on potash and nitrogen but only lightly on phosphates. It is becoming a recognized fact, especially in the Eastern and Southern States, that liberal applications of potash to tobacco and cotton lands tend to check the spread of some of the diseases, to which these crops are subject.

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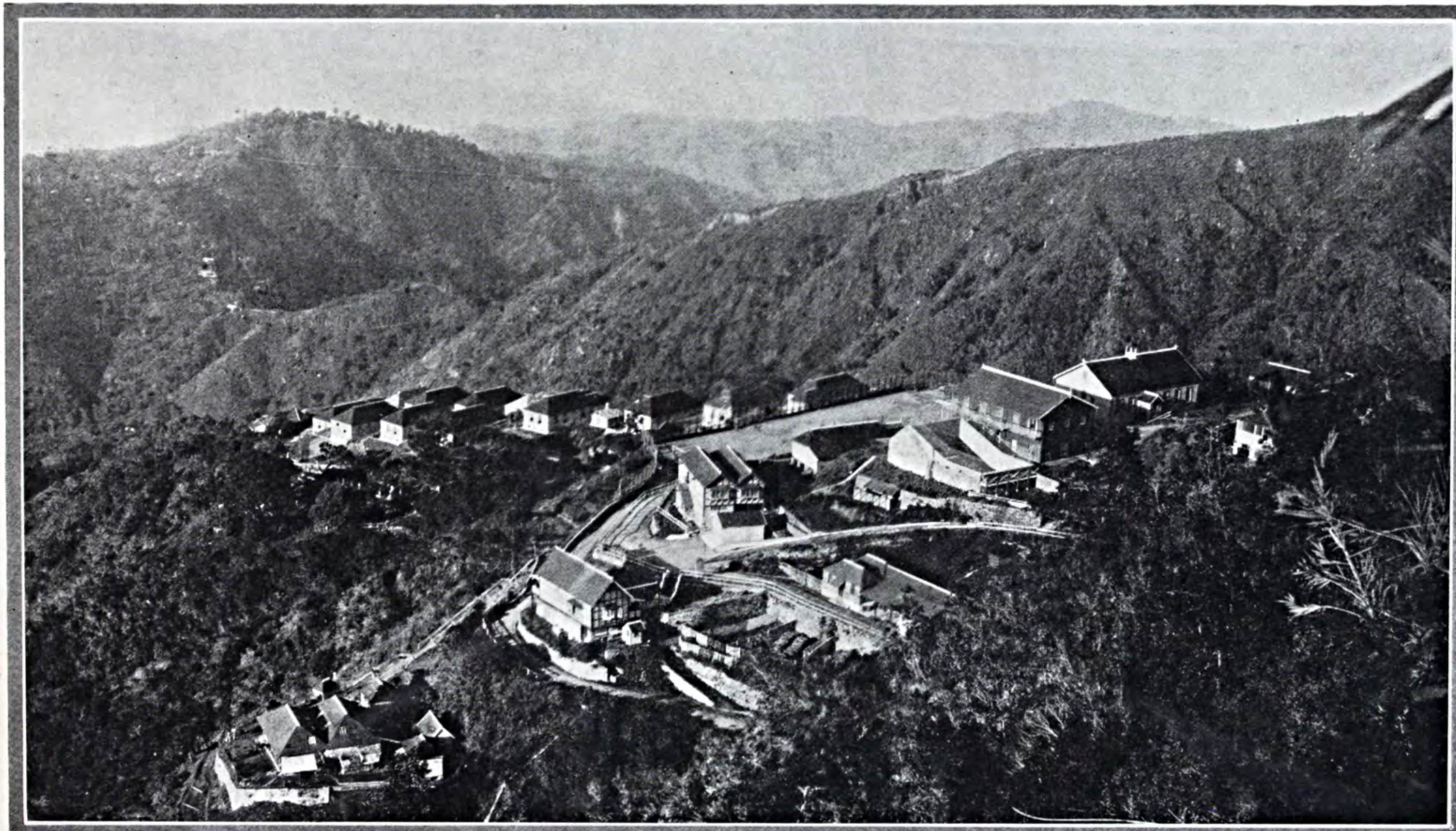
Jamaica's second love, bananas; 23,000,000 stems were grown in 1928.

PICTORIAL

Blue Hole, Port Antonio; a strikingly beautiful tropical scene on the northern coast of Jamaica.

Irrigation at Spanish Town, Jamaica; typical of the irrigation systems on the banana plantations.



Newcastle, Jamaica, where the British troops live during the summer as a means of maintaining their health.

Green Park, near Falmouth, Jamaica; showing that the stock-raising industry is not neglected.

A coolie hut in Jamaica; showing the simple requirements of some of the laboring classes.

Going to market; the native colored population is expert in carrying loads on the head.

The Editors Talk

Potash

Potash from all angles is being discussed more and more among people, in the press, agricultural bulletins, trade, and other journals. Its relationship to many groups is enlarging. Because of this, we are glad to publish in this issue an article with reference to potash in its relation to American life.

In the article figures are given showing that in many major crop areas farmers are using more potash in their fertilizers. In starting to use more potash over large crop areas in the United States, American farmers are following the same movement that has developed for some years in many of the other leading agricultural countries of the world. This development places a definite responsibility on science and industry to keep pace with the needs of the farmer. If fertilizers are to return the greatest profit to the farmer, fulfill their proper function in producing more abundant and cheaper food supplies, more knowledge is required regarding the role of plant nutrients in crop growth under field conditions.

This means that the emphasis should be on adequate research and experimental work if industry is to properly fulfill its obligations to the increasing consumption, not only of potash but of nitrogen and phosphoric acid.

We can use only the knowledge that has accumulated. The accumulation of knowledge, especially of information relating to plant life and soils, is a slow and tedious process requiring time, men, and money. While many other measures may help the farmer in a temporary fashion, no temporary assistance will ever do away with necessity of adequate research, neither can enduring benefit to the farmer be based on anything else except thorough work of such a fundamental character. Research in the use of fertilizers is one of these needs. We have gone long enough on meager knowledge and the acceptance of popular practices.

Some far-sighted scientists and leaders in industry have advocated and started more fundamental work. This needs to be encouraged to the utmost.

It is too often thought that these problems are related merely to agriculture and it is quite overlooked that ultimately all such work pertains to the maintenance of our standards of living and the conservation of our greatest natural resource, the soil. Through these fields such problems ultimately are related to life itself. Therefore, research problems on plant nutrients in relation to crops and soils are far more than merely academic in their interests and far more reaching in their effects than tonnage or profits.

Leaders in both industry and scientific work see these points very clearly. More and more people will eventually see the true value of these related forces. Then it is hoped that it will be possible to secure the time and the means adequately to attack and solve the multitude of problems in connection with soils and fertilizers that so sorely need attention today.

The National Farmer

Two men were asked what their occupation was. The first replied, "I am an American farmer." The other said, "Oh, I farm over yonder in Smoky Hollow."

Merely a difference in viewpoint, but a difference which is worth a great deal of consideration on the part of those of us who are seriously interested in the improvement of American agriculture.

We have heard a great deal about the plight of the farmers. We have heard a lot about farm relief, about the farmers working out their own salvation, and about cooperation. But after all where is the farmer in Smoky Hollow ever going to get, if he cannot see beyond Smoky Hollow?

Such an authority as Secretary Jardine does not believe that the remedies for farm conditions lie entirely with the farmers themselves. However, he feels that the agricultural industry is not yet in a good position to take advantage of any benefits which might come from government legislation.

"We need to so organize agriculture," Mr. Jardine says, "that it can act quickly and intelligently as a group. We don't want farmers in different sections working at cross purposes. It is good business for farmers and good statesmanship for Government to achieve for agriculture the same solidarity in organization that business already enjoys."

It will be a great departure for farmers to give up the feeling of independence and security which has always been one of the chief attractions of country life. Yet, until there is instilled along with this feeling a recognition of an "organization" tie-up between the individual and the whole great industry of agriculture, we will still have Smoky Hollow and fellows who just farm there.

The Tobacco Situation

The tobacco industry during 1928 passed through extremes of optimism and pessimism. Although the Spring was late and cool, the outlook was promising. After the crop was planted, rains in many sections of the country were practically continuous for a month. Rapid growth was noticed. However, in July and August the rainfall diminished, and the succulent crop, which had been started in very moist conditions, soon began to suffer for want of moisture. As a consequence, the crop on the average did not grow to its full size. It was also lacking in those qualities which are necessary to make a first class article, namely—body, weight, and elasticity.

However, "Old Mother Nature works in mysterious ways, her wonders to perform." At harvest time, the weather was dry and favored the farmers with a good curing season. Consequently, the cigarette tobacco areas produced a crop of good color, though light in weight.

The sales started in Georgia and moved north into the Carolinas and Virginia. Although the average price was only \$15. to \$18. per hundred pounds, considerably below that of the previous season, it was such as to allow the farmers a small margin of profit. In the Burley tobacco district, the sales opened the first week in December, with prices somewhat below those of last year. These prices improved as the season advanced. Probably one third of the crop had been sold at the end of the calendar year, the average price being around $32. per hundred pounds. At this time the Burley tobacco growers had been paid more than $6,000,000. The sales in the Dark tobacco belt, also started the first week in December. Although the prices have not kept pace with those in the other tobacco producing areas, they have maintained an average around $10. to $15. per hundred pounds.

In the areas producing light colored tobacco, it is becoming more and more noticeable that "light color" is the outstanding quality that brings the highest price on the market. Whereas, in the areas producing Dark tobacco, body, elasticity, and size are also important qualities.

When the farmer places his tobacco on the market for sale, he is completely at the mercy of the buyers, who can make or destroy profitable prices. However, the buyers have learned by experience that it is to the best interest of the manufacturers as well as the farmers to pay a good price for tobacco. It is quality in the tobacco that the manufacturers want. It requires money for the farmer to produce that quality, and it is only the successful farmer who can afford to put money into his farming operations. In order to produce good tobacco, careful attention is required as well as experience, good equipment, and a liberal application of manure and high grade fertilizer.

As there has been no serious slump in the tobacco market during the present season, we can confidently expect the tobacco growers in America to plant a normal crop during the year of 1929.

A Clearing-house for Science

When the American Association for the Advancement of Science held its 85th meeting in New York recently, there were several startling contributions made to the knowledge of the world. This is to be expected at a gathering of 5,000 of the leading scientists. They represented practically the whole field of science and research.

Many of the papers read at the meeting are highly technical and theoretical, lying within that select realm known as pure research. These papers are of more than mere scientific interest. They usually are fundamental in character and form the foundation upon which more practical research work may be built. In back of nearly every paper which might be considered practical, will be found a large amount of pure research. Many other papers related directly to our every-day problems, the value of which can easily be seen.

Glandular secretions that have important influences on physiological action in our bodies, color photography, prehistoric life in Asia, motion pictures of growth by cell division, the theory of numbers, the nature of light, a universe beyond our own were some of the important subjects discussed at the meetings.

Agriculture was well represented at the congress by meetings of several groups. The New England section of the American Society of Agronomy held an excellent symposium on pasture management research. The 15th annual meeting of the Potato Association of America considered many problems in the production and utilization of this important commodity. The American

Society for Horticultural Science discussed the many phases of fruit and vegetable growing.

Meetings of this nature are of great value and importance to scientists, industry, and the public. Scientists get many new ideas for research work from the papers presented and from formal and informal discussions. The inspiration derived from the scientific atmosphere always surrounding such meetings is certainly of no little value. Industry quickly finds many applications for the scientific ideas developed. Without meetings of this nature, valuable developments and discoveries might lie hidden for years in scientific journals or departmental files. The public benefits because of the quick utilization of new ideas, the results of which are passed on to it sooner than would be the case if no such scientific clearing-house were established.

As They See It

The agricultural depression following the war made necessary many changes and readjustments. Farmers have made adjustments, but more are still to be made. In order to make the changes to the best advantages, it is necessary to know not only what has happened during the recent past, but also the outlook for the future.

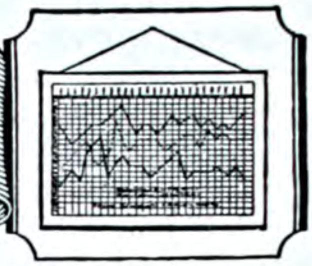
The United States Department of Agriculture is doing valuable service in issuing outlook reports. The report for 1929 as prepared by the Bureau of Agricultural Economics, assisted by representatives of the agricultural colleges and extension services, has just been released for publication. It will be available in a printed circular distributed by the Department about February 12.

These economists of wide experience have given a review of the general agricultural outlook and also an outlook for each of the important crops and prices of livestock. On the whole, they believe that 1929 will offer some improvement in the Midwest and East which may be offset by conditions in other regions, possibly not quite as good as in 1928. The total gross income will probably be maintained near its present level of around 12 to 12½ billion dollars.

"The agricultural situation for the past five years," according to the report, "has been marked by a rising level of production and relative stability in prices paid by farmers for goods and services, such as labor, machinery, building materials, and taxes. The chief contributing factors to the upward trend of production have been dairy and poultry products, small grains, truck crops, and fruits and vegetables. In 1928 these trends continued, with prices to producers of the principal crops generally lower than in 1927, with an upward tendency in prices of most classes of livestock and livestock products, and with land values becoming more stabilized."

The publication of this outlook report by the United States Department of Agriculture is making available much information which will be used as a guide for farmers who are making up their spring program. County agents and teachers of vocational agriculture will want this report to use in their advisory capacities. Agricultural industries will carefully consider its contents. It is especially valuable to anyone interested in any way in bringing about changes in agricultural production. With it we hope that in 1929 many more of the adjustments necessary to put agriculture back on a satisfactory basis may be made.

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

NEW FACTS ON NODULE BACTERIA

The fact that a certain strain of bacteria will produce nodules on the roots of clover plants is no indication that this particular strain is doing anything to increase the yield of clover. This is the finding of I. L. Baldwin and E. B. Fred of the Wisconsin College of Agriculture after greenhouse experiments in which many strains of these nodule bacteria were tested as inoculants for clover seed. They found great variation. All strains tried produced nodules, but some of them produced no better growth of the clover plants than was obtained when no inoculant was used. It was found that the strains of bacteria that produced the most growth of clover produced relatively large nodules near the top of the root system, while the poorer strains caused small nodules to form on various parts of the root system, but it is not yet known whether this would be true in field tests. The Wisconsin bacteriologists say farmers should buy their legume bacteria from laboratories that constantly check the efficiency of the mother cultures in increasing plant growth.

BETTER CHEESE FROM COOLED MILK

The old notion that the best cheese could be made from raw, uncooled milk has been disproved by experiments conducted at the New York State Agricultural Experiment Station. After destroying the bacteria normally in milk that has been kept cool to prevent their multiplication, a pure culture of the kind of bacteria desired for cheese curing is added. Other progress in cheese making at this station by J. C. Marquardt, who reports these recent results, was recorded in this department a few months ago.

GRANULAR NITRATE FERTILIZER

It is probable that a sodium nitrate in granular form will soon appear on the market. The principal advantage claimed for this new form is that the uniform grain-like structure makes it easy to handle and causes it to feed freely and evenly. D. B. Lucas, assistant agricultural engineer at the New Jersey Agricultural Experiment Station, who has been making tests of the handling qualities of this new form of nitrate, says "the new fertilizer, though hygroscopic, has a rather uniform, granular structure, pours freely, and handles more like grain than salt. It appears to have many of the qualities which have made possible the accurate seeding of grains, such as uniformity of grain size, hardness, smoothness, dryness, and freedom from extreme stickiness. The grain size of the samples tested was somewhat smaller than rice, but this may be varied by the manufacturer who developed the fertilizer if desirable."

Although this investigator says that present fertilizer distributors will have to be recalibrated and that some feeding devices are entirely unfit, he believes the advantages are strongly in favor of the new form of nitrate. He thinks elaborate stirring and agitating mechanisms can probably be eliminated from distributors.

RAISE CALVES WITHOUT MILK

New Jersey, which has a good many dairy cows and can sell milk to the city markets at a good price, has developed a milkless calf ration which is said by the Experiment Station to be a real success long searched for elsewhere. It can be fed to calves when they have reached the age of 30 days and will carry them along successfully thereafter. The average cost, the experimenters have found, of raising a heifer calf to six months of age by this milkless method is $28, a saving of from $25 to $50 over the old method. There is also an additional saving in labor. The ration consists of 150 acres of ground oats, 100 pounds of yellow corn meal, 50 pounds each of wheat bran, linseed oil meal, and soluble blood flour, and 12 pounds of minerals. The minerals and the blood flour are said to be the most important factors in replacing milk.

The practice at the New Jersey station is gradually to taper off on milk beginning with the third week so that at the end of the fourth week of the calf's life it will be getting no milk at all. From that time on it will get only the grain-blood-flour-mineral mixture, a good quality of alfalfa hay, and all the water it wants. It is said the calves have never noticed they are saving money.

HOW WEEDS GET AHEAD

The number of seeds produced by certain weeds is reported by O. A. Stevens, seed analyst of North Dakota. With what must have been considerable patience, or mechanical or human assistance, he found that one plant of the common plantain produced 36,150 seeds, a plant of the curled dock 29,500, and one of wild buckwheat yielded 11,900 seeds. The biggest seed producer among the weeds examined by Mr. Stevens was a wormwood plant that tried to insure the future of its kind with 1,075,000 seeds.

OPENING THE POTATO'S EYES

The normal resting period for potatoes before they begin to sprout is about four months. By gassing them with ethylene chlorohydrin they may be made to sprout within three weeks of digging time. They are dipped in the chemical for about a minute, then placed in an air-tight container for 24 hours. This method makes it possible to ship seed potatoes of extra quality from northern potato growing regions to warmer regions where they may be planted with only a very little consideration of the age of the seed tubers. The treatment also makes it possible to speed up experimental work that is carried on in the greenhouse.

CORN BORER MAY BRING SOME BENEFITS

The boll-weevil brought some benefits to the South, and one community at least erected a monument to Old Boll-weevil because he helped the farmers get rid of the one-crop idea. Maybe Old Bill Borer will get his tribute too. The Department of Agriculture, with considerable assistance from manufacturers, is now testing 30 different types of plows in the borer area near Toledo, Ohio. The object is to develop plows well adapted to turning under completely the corn stalks and other field debris. In this case the mother of invention is apt to have a Latin name, the same as that of the European corn borer. But why look it up.

Foreign and International Agriculture

The West Indies

AS one approaches the port of Kingston, Jamaica, one is made to feel very conscious that Jamaica grows and sells bananas. In order to land on the island as an accredited and welcome visitor, one must fill out a form on board ship answering questions something to the effect: Have you ever worked on a banana plantation? Do you desire to import machinery for banana cultivation? Have you ever studied bananas? Of course, it is merely a routine matter quickly disposed of. There is no trouble in landing; the visitor is very welcome; but the questions impress one with the rising importance of the humble banana.

Subsequent impressions after landing confirm the first, namely: that in Jamaica the sun rises and sets on bananas and to make sure that the sun does so rise and set on ever more and more bananas, various fruit companies have set up organizations of agricultural experts, medical, hotel, shipping, and other departments. The fruit companies' farms and lands are seen in many parts of the island, though of course, there are also small growers who produce a large part of the banana crop. But to all appearances, the large fruit companies appear to be the dominant factors.

The tomb of Columbus in the Cathedral, Santo Domingo.

Sugar was, of course, the first love of Jamaica, as of nearly all the islands of the West Indies. Columbus apparently started the idea and for many generations the West Indian sugar planters, who lived in the days when sugar was King, were the great men of the islands. Typical of one of the great houses of the old sugar planters is "Rose Hall" on the north shore of Jamaica. It is said that the Hall, which was erected in 1760, cost $150,000, which was a lot of money in those days.

But in recent years came overproduction of sugar, low sugar prices, troublesome tariffs in some importing countries, hurricanes, expansion of credit, and other troubles. The West Indies—the sugar bowl of the world—if it did not exactly smash, has suffered from a number of cracks. Thus, many islands except those favored by tariff relationships, the most suitable soils, and low production costs have tended to abandon their first love and look around for a second.

Jamaica has chosen the fruit, and especially the banana industry. It was in 1893-94 when sugar was supplanted for the first time by fruit. The acreage given for 1924-25 is 79,145 acres. This acreage is increasing. Sugar-cane acreage in the same year was 46,767 acres. As the island is very mountainous, Jamaica possesses large areas of land at different altitudes "well suited for the cultivation of all tropical and sub-tropical crops." It is said that the coffee from the Blue Mountains is the highest priced of any coffee.

However, the important crop is bananas. The Director of Agriculture in his Annual Report of the Department of Agriculture for 1927 states, "The outstanding fact of 1927 was the exportation of 21,074,612 stems of bananas, an increase of over 3,000,000 stems over the previous record of 1926. But for the autumnal gales which destroyed 2,000,000 stems of fruit, the banana crop of 1927 would have passed the 23,000,000 mark. For the year 1928, allowing for some set-backs due to drought in certain areas, the estimated crop of bananas may be set at 23,000,000 stems. With favorable seasons and a brisk trade, this estimate may easily be passed, for the number of banana plants growing in Jamaica at this moment is greater than ever before in the history of this industry."

The chief practical difficulty in growing bananas is the Panama disease. The report states, "the fight against Panama disease has continued. With our increased staff of 18 inspectors, it has been possible to supervise the chief banana areas." The records show that 40,000 diseased plants were dealt with during the year.

New land is being cleared by the fruit companies for bananas. In some cases the choice yellow fruit is being planted right up to the doors of old sugar factories. What they shall do with the sugar plants is a question that has to be settled. The British Government, of course, maintains an Agricultural Experiment Station at Hope, near Kingston. The station conducts experiments with fertilizers,

(*Turn to Page* 48)

Castleton Gardens, Jamaica, one of the gardens maintained by the Department of Agriculture.

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 Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. 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

Dr. L. L. Van Slyke begins his bulletin "Commercial Fertilizers" (New York State Agr. Exp. Sta., Geneva, N. Y., Bulletin No. 557, November 1928) with a short history of fertilizer control work in the state. This is followed by tables and discussions on trends of analyses and costs of fertilizers for 1914 to 1928. The average composition of all mixed fertilizers in 1928 was 2.91-9.64-5.80. The total plant food in the mixed fertilizers is now the highest in the history of the state. The average cost of plant food in all mixed fertilizers was 13.4 cents in 1928. The average cost of phosphoric acid in superphosphate was 6.8 cents; nitrogen in nitrate of soda was 21.7 cents; nitrogen in sulfate of ammonia was 17.3 cents; and potash was 5.1 cents, the lowest of any material.

Dr. Van Slyke has made a distinct contribution to the intelligent understanding of trends in fertilizer prices and analyses. More bulletins containing this type of information are needed.

"Tomato Fertilizer Experiments in Chautauqua County, N. Y.," by Paul Work, summarizes the results of 3 years' experiments with canning tomatoes. (Cornell Agr. Exp. Station, Ithaca, N. Y., Bulletin No. 467, June 1928.) A basic fertilizer equivalent to 1,600 lbs. of 4.8-8-12.5 analyses was used as the standard or check treatment. Higher and lower amounts of each of the 3 elements were then compared with the standard. Dr. Work apparently does not consider that 4.8-8-12.5 is necessarily the ideal analysis. The author summarizes the work as follows:

"The nitrogen series did not yield clear-cut differences, probably because of a fairly good supply of nitrogen already in the soil,——.

"The phosphorus series indicated the need for a liberal amount of this element, but did not favor an increase over the check treatment.

"The use of lime for tomatoes is not supported.

"Applications of 10 tons of manure and 5 tons of manure with phosphorus were not equal to the check treatment of fertilizer. Applications of 10 and 20 tons of manure with phosphorus are probably about equivalent, and 10 tons of manure in addition to the check fertilizer treatment improved the yield."

While this bulletin is intended to apply primarily to local conditions where the experiments were conducted, the general principles will be of interest to all tomatoes growers and probably apply to other sections with somewhat similar conditions.

"The Hydrolysis of Sodium and Potassium Zeolites with Particular Reference to Potassium in the Soil Solution," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 22, June 15, 1928, O. C. Magistad.

"Base Exchange in Orthoclase," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 24, Aug. 1, 1928, J. F. Breazeale and O. C. Magistad.

"Report on Inspection of Commercial Fertilizers, 1928," Agr. Exp. Sta., New Haven, Conn., Bul. 296, Oct., 1928, E. M. Bailey.

"Report of Analyses of Commercial Fertilizers," Louisiana Department of Agriculture and Immigration, Baton Rouge, La., Fertilizer 1927-28, Harry D. Wilson, Comm.

"How to Use Agricultural Limestone," Col. of Agr., Columbia, Mo., Cir. 208, Aug., 1928, Ide P. Trotter and O. T. Coleman.

"Analyses of Commercial Fertilizer, Fertilizer Supplies and Home Mixtures for 1928," Agr. Exp. Sta., New Brunswick, N. J., Bul. 479, Oct., 1928, Charles S. Cathcart.

"An Apparatus for Adding Gypsum to Irrigation Water," U. S. D. A., Washington, D. C., Cir. 38, Sept., 1928, C. S. Scofield, Elmer W. Knight.

Soils

"Reaction Studies of Delaware Soils," Agr. Exp. Sta., Newark, Del., Bul. 155, Sept., 1928, C. R. Runk.

"A Type of Bacteria Abundant in Productive Soils, but Apparently Lacking in Certain Soils of Low Productivity," Agr. Exp. Sta., Geneva, N. Y., Tech. Bul. 138, July, 1928, H. J. Conn.

"A Southern Upland Grass-Sedge Bog," Agr. Exp. Sta., Raleigh, N. C., Tech. Bul. 32, Oct., 1928, B. W. Wells and I. V. Shunk.

"Report of the Chief of the Bureau of Chemistry and Soils," U. S. D. A., Washington, D. C., Sept. 1, 1928, Henry G. Knight.

Crops

Some of the most interesting and valuable reading this month can be found in the several annual reports of directors of experiment stations which recently have been released. The concise summaries of experimental work to be found in these reports make for easy reading and ready reference.

Included in the reports on work done with plant food in crop improvement are some interesting results of alfalfa experiments at Storrs, Conn., Experiment Station, Bul. 150, Report of the Director for the Year Ending June 30, 1928. "After 10 years without any fertilizer treatment except muriate of potash at 200 pounds per acre every third year, good stands and yields of alfalfa have been obtained. As a supplement to 10 tons of manure, 100 pounds of muriate of potash have given a better stand and yield the second year after seeding than 500 pounds of superphosphate. In June, Shepherd's purse and chickweed thrive on the phosphorous plots, but alfalfa does very poorly; both weeds and alfalfa grow vigorously on the phosphorous and potash plots, while on the plots receiving only potash, scarcely a weed can be found in the stands of alfalfa. Evidently alfalfa cannot satisfy its potash requirements from the soil as readily as the weeds mentioned, while the reverse is true in the case of phosphorus." This report also has some interesting data on pasture improvement.

Another annual report which contains much information on crops is that of the Georgia Coastal Plain Experiment Station, Georgia Bulletin 9. Much experimental work on cotton has been done by this station, the results of which will be of particular interest to a wide range of cotton growers.

"The Baking Strength of Arizona Early Baart Flour," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 23, July 15, 1928, Margaret Cammack Smith.

"Growing Pine Pulpwood as a Farm Crop," Ext. Serv., Col. of Agr., Little Rock, Ark., Ext. Cir. 249, June, 1928, W. K. Williams.

"Corn Production in Arkansas," Ext. Serv., Col. of Agr., Little.

"Fortieth Annual Report," Agr. Exp. Sta., Fayetteville, Ark., Bul. 231, Dec., 1928.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Cal., Vol. XVII, No. 11, Nov., 1928.

"The Effects of Early Planting on the Composition and Yield of Corn, Agr. Exp. Sta., Storrs, Conn., Bul. 151, Sept., 1928, B. A. Brown.

"Growing Tomatoes in Georgia," Ext. Div., Col. of Agr., Athens, Ga., Vol. XVII, Bul. 353, Oct., 1928, George H. Firor.

"Kudzo," Ext. Div., Col. of Agr., Athens, Ga., Vol. XVII, Bul. 356, Nov., 1928, Paul Tabor.

"The Cut-over Lands of Northern Idaho," Agr. Exp. Sta., Sandpoint Substation, Idaho, Bul. 158, May, 1928, J. H. Christ.

"Work and Progress of the Agricultural Experiment Station," Agr. Exp. Sta., Moscow, Idaho, Bul. 160, Jan., 1928.

"Grading Tomatoes for Quality," Agr. Exp. Sta., Lafayette, Ind., Bul. 317, Nov., 1927, Fay C. Gaylord and Harry M. Cleaver.

"Studies in Flax Retting," Agr. Exp. Sta., East Lansing, Mich., Tech. Bul. 95, Sept., 1928, Antoinette Trevethick, B. B. Robinson, and R. M. Snyder.

"Strawberry Growing in Michigan," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 182, *Sept.*, 1928, *R. E. Loree.*

"Chrysanthemum Breeding," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 186, *Nov.*, 1928, *Elmer D. Smith and Alex Laurie.*

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. XI, No. 2, *Nov.*, 1928.

"American Potato Journal," The Potato Assn. of America, East Lansing, Mich., Vol. V, No. 12, *Dec.*, 1928, *J. C. Mohler.*

"Report of Northeast Experiment Station, Duluth," Agr. Exp. Sta., University Farm, St. Paul, Minn., M. J. Thompson.

"Safe and Profitable Uses of Sweet Clover," Col. of Agr., Columbia, Mo., Cir. 204, *June*, 1928, *C. E. Carter.*

"Four Essentials of Wheat Production," Col. of Agr., Columbia, Mo., Cir. 210, *Sept.*, 1928, *K. G. Harman.*

"Selecting Seed Corn," Col. of Agr., Columbia, Mo., Cir. 211, *Sept.*, 1928, *K. G. Harman.*

"Making the Farm Pay," Agr. Ext. Serv., Columbia, Mo., Project Announcement 25, *June*, 1928, *A. J. Meyer and A. A. Jeffrey.*

"Head Lettuce," Ext. Serv., Univ. of N. H., Durham, N. H., Press Bul. 144, *April*, 1928, *J. R. Hepler.*

"Orchard Practice in New Hampshire," Ext. Serv., Univ. of N. H., Durham, N. H., Ext. Bul. 34, *April*, 1928, *E. F. Potter, L. P. Latimer, H. A. Rollins.*

"Rhododendrons and Their Kin," Agr. Exp. Sta., New Brunswick, N. J., Cir. 210, *July*, 1928, *Chas. H. Connors.*

"Pruning Young and Bearing Apple Trees," Agr. Exp. Sta., New Brunswick, N. J., Ext. Bul. 60, *Oct.*, 1928, *M. A. Blake.*

"The Growth Status of the Tomato as Correlated with Organic Nitrogen and Carbohydrates in Roots, Stems, and Leaves," Agr. Exp. Sta., New Brunswick, N. J., Bul. 461, *Sept.*, 1928, *G. T. Nightingale, L. G. Schermerhorn, and W. R. Robbins.*

"Approved and Suggested Practices in Peach Production and Marketing for New Jersey," Agr. Exp. Sta., New Brunswick, N. J., Bul. 477, *Aug.*, 1928.

"Corn Production in New Mexico," Agr. Exp. Sta., State College, N. M., Bul. 166, *Feb.*, 1928, *J. C. Overpeck.*

"Factors Affecting the Germination and Growth of Chamiza," Agr. Exp. Sta., State College, N. M., Bul. 169, *June*, 1928, *C. P. Wilson.*

"Two New Varieties of Red Kidney Bean: Geneva and York," Agr. Exp. Sta., Geneva, N. Y., Tech Bul. 145, *July*, 1928, *W. O. Gloyer.*

"Forty-Seventh Annual Report for the Fiscal Year Ended June 30, 1928,*" Agr. Exp. Sta., Geneva, N. Y., F. B. Morrison.*

"Fortieth Annual Report 1927,*" Agr. Exp. Sta., College Station, Texas, A. B. Conner.*

"Annual Report of the Extension Service," A. and M. College of Texas, College Station, Texas.

"Denton Wheat, a New Variety for North Texas," Agr. Exp. Sta., College Station, Tex., Bul. 388, *Oct.*, 1928, *A. H. Leidigh, P. C. Mangelsdorf, and P. B. Dunkle.*

"Why Grow Timber?" U. S. D. A., Washington, D. C., Misc. Pub. 26, *June*, 1928, *W. N. Sparhawk.*

"Sugar-Cane Variety Tests in Louisiana During the Crop Year 1926-27,*" U. S. D. A., Washington, D. C., Cir.* 36, *Aug.*, 1928, *R. D. Rands, Sidney F. Sherwood, F. D. Stevens.*

"A Seed Counter," U. S. D. A., Washington, D. C., Cir. 53, *Oct.*, 1928, *E. Brown, E. H. Toole, W. L. Gross.*

"Irrigation of Small Grain," U. S. D. A., Washington, D. C., Farmers' Bul. 1556, *June*, 1928, *W. W. McLaughlin.*

"Harvesting Grain Sorghums," U. S. D. A., Washington, D. C., Farmers' Bul. 1577, *Sept.*, 1928, *John H. Martin, L. A. Reynoldson, B. E. Rothgeb, W. M. Hurst.*

"Report of the Secretary of Agriculture, 1928,*" Washington, D. C.*

"Studies in Tolerance of New England Forest Trees," Agr. Exp. Sta, Burlington, Vt., Bul. 282, *June*, 1928, *W. R. Adams, Jr.*

"Extension Work in Agriculture and Home Economics in Virginia," Virginia A. & M. College, Blacksburg, Va., Bul. 105, *Aug.*, 1928, *John R. Hutcheson.*

Department of Agriculture-Immigration of Virginia, Richmond, Va., Bul. 252, *Dec.*, 1928.

"Fourteenth Annual Report of the Extension Service," Ext. Serv., State College of Washington, Pullman, Wash., No. 150, *Dec.*, 1928, *S. B. Nelson.*

Economics

The agricultural depression has stimulated a wide interest in prices of farm products. In order to get a complete picture of the situation, it is necessary to have not only the information for the United States as a whole, but for each state individually. Purdue Bulletin 320, "Prices of Farm Products in Indiana," by E. C. Young and O. A. Day, gives the data for Indiana.

In Iowa, cooperative livestock shipping associations are important factors in the marketing of livestock. In 1924, about 25 per cent of the livestock of Iowa was marketed through these associations. Bulletin 254, "Local Cooperative Livestock Marketing Associations in Iowa since

1920," by D. A. FitzGerald, is a study of some of the problems which these associations have met.

It is often stated that farmers should grow the quality of products which the market demands. The study reported in Texas Bulletin 383, "Relation of Farm Prices to Quality of Cotton," by G. L. Crawford and L. P. Gabbard, indicates that "the great bulk of cotton is bought from the farmers not on a quality basis but on an average basis, and particularly so in regard to staple." Since farmers with a high-grade cotton get practically the same price as farmers with a lower grade, as yet there has been no incentive to produce the higher grades.

"Lemons," Agr. Exp. Sta., Berkeley, Cal., Bul. 460, *Oct.,* 1928, *H. R. Wellman and E. W. Braun.*

"Economic Aspects of the Beef Cattle Industry," Agr. Exp. Sta., Berkeley, Cal., Bul. 461, *Nov.,* 1928, *E. C. Voorhies and A. B. Koughan.*

"Grapefruit," Agr. Exp. Sta., Berkeley, Cal., Bul. 463, *Dec.,* 1928, *H. R. Wellman and E. W. Braun.*

"What is Happening to Agriculture in Northwestern Indiana?" Agr. Exp. Sta., Lafayette, Ind., Bul. 321, *Feb.,* 1928, *M. H. Overton.*

"Living Conditions Among White Land-Owner Operators in Wake County," Agr. Exp. Sta., Raleigh, N. C., Bul. 258, *June,* 1928, *W. A. Anderson.*

"A Study of Town-Country Relationships," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul., Oct., 1928, *C. R. Hoffer.*

"South Dakota Potatoes—Production, Prices, Destination," Agr. Exp. Sta., Brookings, S. D. Bul. 234, *June,* 1928, *V. R. Wertz.*

"Profitable Farming Systems for the Intensive Spring Wheat Area in South Dakota," Agr. Exp. Sta., Brookings, S. D., Bul. 235, *June,* 1928, *C. A. Bonnen and R. H. Rogers.*

"Marketing California Grapes," U. S. D. A., Washington, D. C., Cir. 44., *Aug.,* 1928, *E. W. Stillwell and W. F. Cox.*

"Marketing American Cotton on the Continent of Europe," U. S. D. A., Washington, D. C., Tech. Bul. 78, *June,* 1928, *Alonzo B. Cox.*

"Major Transactions in the 1926 *December Wheat Future," U. S. D. A., Washington, D. C., Tech. Bul.* 79, *Sept.,* 1928, *J. W. T. Duvel and G. Wright Hoffman.*

"Tax Delinquency in Northern Wisconsin," Agr. Exp. Sta., Madison, Wis., Bul. 399, *June* 1928, *B. H. Hibbard, John Swenehart, W. A. Hartman, and B. W. Allin.*

Diseases

"Idaho Recommendation Chart for Plant Disease and Insect Control," Agr. Exp. Sta., Moscow, Idaho, Bul. 159, *May,* 1928, *Claude Wakeland and C. W. Hungerford.*

"Blight and Leaf-spot of Carrot in Massachusetts," Agr. Exp. Sta., Amherst, Mass., Bul. 245, *June,* 1928, *W. L. Doran and E. F. Guba.*

"Bacterial Wilt and Winter Injury of Alfalfa," U. S. D. A., Washington, D. C., Cir. 39, *July,* 1928, *F. R. Jones and J. L. Weimer.*

Insects

"Control of Red Spider and Powdery Mildew on Greenhouse Cucumbers," Agr. Exp. Sta., Amherst, Mass., Bul. 246, *Oct.,* 1928, *W. D. Whitcomb and E. F. Guba.*

"The Application of Sodium Fluosilicate by Airplane in an Attempt to Control the Sugar-Cane Moth Borer," U. S. D. A., Washington, D. C., Cir. 45, *Oct.,* 1928, *T. E. Holloway, W. E. Haley, J. W. Ingram.*

The West Indies

(*From Page* 44)

plant breeding experiments, research and control work with diseases, and many other activities. Besides this, the Department of Science and Agriculture maintains a farm school at Hope with 54 students in residence in 1927. This school has been in operation for 18 years. A Government stock farm also is maintained at Hope, which is doing a great deal of good for the livestock industry of the island.

Another outstanding activity of the Department of Agriculture is the

The cottonwood tree, out of which canoes are carved by the natives.

maintenance of public gardens at some seven different centers. Glimpses of Hope Gardens and Castleton Gardens will be noticed in the photographs published with this article. An interesting feature of the gardens at Hope is the collection of orchids, a continuous bloom being maintained throughout the year. Thousands of economic and ornamental plants are distributed from these gardens.

The wild flora of Jamaica, of course, looks different and strange to a visitor from the northern United States. One of the most imposing and conspicuous objects of the landscape is the cotton tree. "Its towering trunk finished at the base with immense buttresses and crowned with spreading branches completely dwarfs other trees." (See photograph.) Its chief use is for the making of canoes, which are hollowed out of the trunk of this tree. Another striking feature of the landscape is the variety of palms. The commonest is, of course, the Coconut palm, easily distinguished by the cluster of nuts. The Royal palm is the most beautiful, easily recognized by the straight, smooth stem. There are many other palms, among them Thatch, Cabbage, and Fan palms. Other trees are the Ackee, Ginep, Goango, Trumpet, Logwood, Tamarind, Cedar, Mango, Blue Gum, Ligmun, and Vitae. The timber of the Logwood is one of the most valuable exports of Jamaica and is used for making purple dye. The bright flowers of many shrubs and plants are conspicuous objects of the landscape.

The total area of Jamaica is 4,207 square miles. The total length of the island is 144 miles; its extreme breadth 49 miles. The main ridge of mountains runs east and west through the center of the island, terminating in the east with the famous Blue Mountains, the highest peak of which has an altitude of 7,288 feet.

The roads are good. Automobiles of the latest model can be engaged at reasonable prices. The bathing is good, especially at the Doctor's Cave, Montego Bay. Golf courses vary. The climate is healthy; while it is warm in December, it is very comfortable.

Leaving Kingston, one can sail in many directions to New York, direct to Cuba, to Europe, or to any ports in Panama, Colombia, and other places. We chose a ship that took us eastward across the historical windward passage to Haiti and Santo Domingo, the route of many a buccaneer in the halcyon days of the West Indies.

Many a rover has sailed the windward passage to Port Royal, the finest town of the West Indies, and at that time, 1692, the brightest spot in the universe, being as it was the headquarters of the buccaneers and as such the emporium and mart of ill-gotten wealth.

But the quarrels as to who should trade in the West Indies are over, quelled by such forcible means as "His Majesty's ships of war." It has settled down to what shall we do about sugar? The Republics of Haiti and Santo Domingo are, of course, large producers of this crop.

Approaching the city of Santo Domingo as the sun is rising, the houses present a bright striking appearance in strong contrast to the tropical verdure, extending along the low coast to the east and west. Coming closer, the old part of this Spanish walled city shows in striking contrast to the newer modern buildings. There is no harbor. Ships have to enter the mouth of a comparatively narrow river. At the entrance is the old Spanish castle. Farther back on the hill is the famous Cathedral completed in 1540, which contains the tomb of Columbus.

Landing on the wharf on the river bank, the entrance to the city is through a gate in the old Spanish wall. The chief center of interest for the tourist is the cathedral. There is no railway from Santo Domingo City, hence all travel into the interior is by car, but there are plenty of modern cars available.

Leaving Santo Domingo, we set sail for historical San Juan, Porto Rico. Of all the striking examples of the ability of the Spaniards to build castles, the Morro Castle at the mouth of the harbor, built in 1539 to 1584, is the most striking that one can imagine.

San Juan is on a promontory, that is, practically an island, as it is connected with the mainland by a bridge which crosses a marshy lagoon. At the seaward end of this promontory is the castle. The city was once strongly fortified and as the authorities say, "still forms a noble example of an old Spanish walled city." There are several other historical buildings of much interest, as Casa Blanca, the ancient castle of Ponce de Leon.

In spite of its historical interest, San Juan gives the impression of a modern city, clean and well cared for with several spacious plazas. The roads in the island are exceptionally fine. The hotel accommodation in San Juan is very good indeed. Many people believe that the natural beauty of the island is far greater than anything that Cuba can boast of. At the same time, Porto Rico is not far from New York by direct steamship. Undoubtedly as time goes on, a larger tourist travel will develop.—G. J. Callister.

Connecticut

(*From Page 9*)

ture and properties of Connecticut soils; the influence of soil on the composition and rate of growth of the forest.

At Storrs: Causes of degeneracy of potatoes; numerous alfalfa tests; value of fertilizers in pasture improvement; economic study of the tobacco industry; infectious abortion in cattle; blackhead of turkeys; effect of freezing and storing in a frozen state, milk and milk products; inheritance of fat percentage in milk of dairy cows; and factories involved in the hatching of eggs.

Striking Resemblance

Photographer—Your son ordered these photographs from me.

Father—They certainly are very much like him. Has he paid for them?

Photographer—No, sir.

Father—That is still more like him. —*Cleveland News.*

Pages From A Field Note Book

Ohio's Alfalfa—Clover Project

By H. L. Garrard

Mansfield, Ohio

PLANS for a 5-year Ohio, Alfalfa-Clover Project, to be started this Spring, are under way. County agents who are to conduct the preliminary projects in 1929 have met and compared plans for their educational programs for more legumes.

In Ohio about 80 per cent of the farms raise some kind of hay, with a total acreage for the state of about 3½ million acres, or an average of 13½ acres per farm. The following show the percentage and proportions of different kinds of hay in Ohio in 1925:

Timothy	36.0 per cent
Timothy and clover mixed	45.0 "
Red, alsike and mammoth clover	9.0 "
Alfalfa	5.0 "
Sweet, crimson and Japan clover	0.8 "
All other hay	3.5 "

The total amounts of clovers are the equivalent of 0.3 acre of clover per livestock unit, while it has been determined that each livestock unit should have approximately 2.0 acres of clover or their equivalent. To provide this theoretical optimum, it would be necessary to produce 6.3 times the present amount of clovers in the state as a whole. Of course some sections raise a greater proportion of clovers.

This project is of special interest to the Dairy and Animal Husbandry Departments of Ohio State University, but the Farm Crops and Soils, Rural Economics, Agricultural Engineering, and other departments are to cooperate in conducting this project.

The suggested method of procedure for the Crops and Soils departments is as follows:

1. First year's work to be carried on in not more than 4 counties of each quarter of the state.

2. A series of alfalfa or clover schools to be held in the selected counties the first two years.

In some counties it may be advisable to precede the alfalfa schools with fertilizer schools. One meeting should be with fertilizer dealers.

3. The Portable Soils Laboratory will be available to the selected counties for at least 7 half-day meetings, to determine soil needs for the successful production of alfalfa.

4. Survey of liming materials available to the farmers to be made in each county.

5. The Crops and Soils departments will attempt to get cooperation of limestone manufacturers and dealers, fertilizer companies, etc., to the end that all may advocate the same proper methods.

6. Demonstrations may consist of variety, methods of seeding, number of cuttings, fertilization, harvesting, and liming.

7. Field meetings or tours to follow up the demonstrations or meetings.

Hunger Fighters

THE works and achievements of agricultural workers are finally securing some much deserved recognition. Paul de Kuif in "Hunger Fighters" (Harcourt, Brace & Co., N. Y., 1928) has described some of the more spectacular and outstanding achievements. He presents the stories in a more or less connected series of narratives, graphically giving pictures of the men doing the work, often under great difficulties and discouraging circumstances.

The principal sections of the book discussed are:

Carleton and his introduction of Kharkov and Kubanka wheat; Mackay and the Saunders, and their development of Marquis wheat; Dorset, and his conquering of hog cholera; Mohler and Loeffler, and their stamping out of the foot and mouth disease; Francis, and his control of tularemia (rabbit fever); Shull and others, and their developments of high yielding corn strains; Hoffer, and his control of corn root rot with potash, together with the development of tests to make the corn plant show soil fertilizer needs; Babcock, and his milk testing methods, and with Hart, his cattle nutrition work; Steenbock, and his vitamin discoveries, controlling rickets; Goldberger, and his curing and control of pellagra by the use of correct nutrients.

This very readable book is recommended to all interested in agriculture and its problems.

Spraying Pays

HARRY DAVIS, a student of vocational agriculture in the Masontown, West Virginia, High School found that the difference in yield in spraying and not spraying potatoes was the difference between 396 bushels and 231 bushels of potatoes per acre.

Not only did he obtain 71 per cent increase in yield through spraying, but his record shows that he produced a 350 bushel crop at a cost of 34 cents per bushel.

A one-acre field was used in this experiment which was conducted in cooperation with the Agricultural Experiment Station of the West Virginia University. All the plots were harrowed three seasons before planting. At planting time a mixture of 1,000 pounds of equal parts of potash and sulphate of ammonia was added.

THE BUSY MAN'S CREED

I believe in the stuff I am handing out, in the firm I am working for; and in my ability to get results. I believe that honest stuff can be passed out to honest men by honest methods. I believe in working, not weeping; in boosting, not knocking; and in the pleasure of my job. I believe that a man gets what he goes after, that one deed done today is worth two deeds tomorrow, and that no man is down and out until he has lost faith in himself. I believe in today and the work I am doing; in tomorrow and the work I hope to do, and in the sure reward which the future holds. I believe in courtesy, in kindness, in generosity, in good cheer, in friendship and in honest competition. I believe there is something doing, somewhere, for every man ready to do it. I believe I'm ready—RIGHT NOW!
—From "The Book of Business" by ELBERT HUBBARD.

Five rows in the plot were not prayed, four were sprayed with arse-ate of lead, and the remaining 84 ows were sprayed with arsenate of ead and bordeaux.

When the plants were about three inches high they were sprayed with arsenate of lead to control fleas. After seven days the regular spraying schedule was started and the potatoes were sprayed nine times at intervals of seven days.

The Plant Industry

(From Page 5)

eing planted from October 1 to 15. rost comes to Coastal South Caro-ina about November 20, so it can be eadily seen that the young seedlings ave ample time to get in a good rowth before cold weather sets in.

Most of the plants grown for sale re prepared in about the same way. rom 800 to 1,000 pounds of a fer-ilizer containing 5 per cent ammo-ia, 7 per cent phosphoric acid, and per cent potash are broadcast a few ays before planting time. This fer-ilizer is thoroughly incorporated into he soil with harrows. The land is hen bedded out in 6 or 8 furrow eds, and the seed are sown either vith the seed drills in six-inch rows r are broadcast, and "rolled in." The more progressive plant growers re using the seed drill method ex-lusively, because they find that they an get better plants, and can "pull" nore to the acre.

Alfred Jouannet, of Mount Pleas-nt, and others have recently come to sing a fertilizer containing 4 per ent ammonia, 8 per cent phosphoric cid, and 6 per cent potash. The high otash content of this fertilizer seems o toughen the plant so that it will esist cold better, and becomes truly "frost proof" cabbage plant. A ertilizer containing the above named roportions should have most of its mmonia from a mineral source, o that the plant may be able to use his quickly available nitrogen dur-ng its early growing stage. Most of his element of plant food has been used or has leached out, by the time that frost comes, and the potash being available hardens out the plant to resist the cold weather. A tremendous root system is developed during the cold period and the plants turn blue, or rather a bluish green, which is the ideal color for them at this time. The average plant grower feels safe when his plants look "tough" and stunted, because he knows that they will carry well in the mail or express car, and will arrive at destination in a much better condition than if they were bright green and sappy. The uninitiated receiver of cabbage plants, receiving these plants through the mail looking like the "last rose of summer," feels as though he has been "taken in," but the plants are frost proof and will give him excellent results in almost all cases.

During the winter of 1927-28 the South experienced some rather cold weather, after almost abnormally hot fall months, and as a result the cabbage plants were in a sappy condition and had kept on growing. When the thermometer fell to 18 degrees on January 12, millions of plants were killed and other millions were badly frost-bitten. Mr. Jouannet, mentioned above as having used the 4-8-6 (NPK) fertilizer, was practically the only grower in the territory who could deliver his orders 100 per cent, and he feels that his fertilizing methods were entirely responsible for this.

In addition to his regular fertilizer,

Mr. Jouannet has applied 800 pounds of muriate of potash to some of his seedbeds this fall and winter with the idea that he can make his plants still better able to resist unseasonable cold weather. This, of course, is only in the nature of an experiment, but he feels that the additional potash will be the best insurance that the crop has ever had.

Barley

(*From Page* 23)

North Africa, the north central region of the United States, as well as Germany, Austria, England, India, and Japan. Russia is probably the leading producer of barley for export and most of the output in that country is grown in the region just north of the Black Sea. As much as 25 per cent of the barley crop of Russia was formerly exported to other European countries, and over 13 per cent of the cropped land in the old Empire was devoted to barley production. The other European producers are less intensively engaged in barley production, though Austria-Hungary at one time had over 10 per cent of the cropped land in barley, and Spain had over 8 per cent. In India most of the production has been in the valley of the Ganges and the Indus Rivers where the crop has gradually increased. In Japan it is an important cereal crop and it is used to a considerable extent as human food.

A barley region of considerable interest is that of northern Africa where it is the leading grain crop. In Algeria it has occupied over 40 per cent of the cropped land. The production of barley per capita in that country is higher than any other country of the world. There the crop is sown in November and harvested in April or May, thus avoiding entirely the dry summer. Under these conditions a grain of fine quality and unusually high color is produced.

The north central United States is the most important barley region in America: North Dakota, Minnesota, and South Dakota being the leading states. An area of considerable importance is also found in California and some minor sections in the North Pacific states. The six-row types of barley are most commonly grown in the central states but in the far western states two-row varieties are common. Formerly, the central region, particularly the areas west and northwest of Lake Michigan, produced barley very largely for malting purposes. With the decline of the malting industry, the acreage was for a time considerably reduced, but it has since come back very strongly as a feed crop, the production increase of the last few years being very unusual.

In 1927 the United States grew 9,493,000 acres of the crop, making an average yield of 28.1 bushels per acre. In 1928 the acreage rose to 12,531,000 acres and the average yield was 28.5 bushels per acre, making the production 356,868,000 bushels, a new record and over 34 per cent above 1927. The distribution of the crop in states where malting barley was once important is now quite different from former years. In Wisconsin, for example, the malting barley was grown extensively in the eastern part of the state in a region of limestone soils, where the crop seemed to thrive exceptionally well. The present large barley acreage which is grown as a feed crop is not confined nearly so much to any one area, but it is scattered over the state in much the same distribution as the livestock.

With the advance of the corn borer

much interest is shown in barley as a substitute feed crop, and this accounts in part for the recent remarkable increase in the American barley acreage and the record crop of 1928. Should the corn borer advance much more and do serious damage in the corn belt, further increases in barley are sure to occur. As a feed crop barley is often used as a substitute for corn, and its value in swine feeding has long been demonstrated in Denmark, where an immense hog production is maintained largely on barley and dairy products.

Potash

(*From Page* 20)

The value of potash in improving the canning quality of tomatoes is shown in work conducted on several farms at Fruitland, Maryland. Increasing the potash in the fertilizer 16 per cent (4-8-4 to 4-8-20) increased the pack by 900 No. 3 cans, worth $60 per acre, assuming equal yields of tomatoes with both fertilizers. Since this extra potash usually increases the yields enough to pay for the extra potash used, the extra $60 worth of pack may be considered clear profit.

These field results obtained this year, show that on many crops and soils fairly large amounts of potash are profitable, provided of course, other limiting factors are considered. Especially must the fertilizer be properly balanced.

Another factor that causes this increase in potash consumption is that potash is cheap in price. The results of research work have been published on the wholesale prices and the index numbers of the chief fertilizer materials. These data are clearly given in "Fertilizer Economics," a pamphlet published by the Better Crops Publishing Corporation. The January number of "Fertilizer Economics" shows that compared with 1910-14 potash is relatively much cheaper than the average of 12 fertilizer materials, the index number for the 12 fertilizer materials being 128, whereas, the index number for potash is 99, organic ammoniates 161, phosphoric acid 119, and mineral ammoniates 88. The index number for all commodities is 150 and for farm prices 141. These figures clearly show that compared to other fertilizer materials, all commodities, and the price the farmer receives for his crops, potash is sold at a moderate price. This fact helps the farmer in obtaining the best return for each dollar invested in the potash part of his fertilizer bill.

To briefly summarize and give a clearer picture for the last five years on the changes in percentage which have occurred in the fertilizers used in the areas under discussion, the average increases in percentage 1923-1927 are shown in the following table:

TABLE IV—CHANGES IN THE NITROGEN, PHOSPHORIC ACID AND POTASH CONTENT OF FERTILIZERS—1923-1927

	N	P_2O_5	K_2O
New England	.47	.64	.86
Middle Atlantic	.46	.73	1.00
Mid-Western	.45	-1.26	1.17

Thus, the potash content of complete fertilizers has increased on the average approximately one unit per ton, or an increase of approximately 20 per cent, in the regions under discussion.

Not the farmer alone, but the maintenance of our national life and standards of living demand that adequate amounts of potash be used. This demand for fertilizers containing more potash is starting a movement which undoubtedly will continue as time goes on.

A Challenge to Research

The question inevitably arises—is present knowledge on the relation of this essential element to crop production in any way adequate? Broadly speaking, for practical purposes it is known that so many pounds of actual potassium on certain soil types will produce gross increases in the yield of cotton, tobacco, potatoes, vegetables, and other crops. Something is known about the relationship of potassium to soils and to diseases. Fortunately, far-sighted research workers have in recent years started excellent work on more definite problems, but except for such work, present knowledge on the fundamental role of potassium in crop growth and distribution is meagre. More knowledge should be available; much more research work is needed both in the scientific and economic fields, if science and industry are to fulfill their obligations to future needs.

Thus, the essential element—potassium—is finally a worthy challenge; demanding and rewarding men's efforts in adding not only dollar values to crop production but ultimately in creating in greater abundance, that which it helps to sustain—life itself.

Liming Sour Soils

(*From Page* 13)

that limestone and hydrated lime have given similar yields and approximately the same annual net returns. The per cent profit, however, is greater in case of the limestone applications.

The smaller applications of lime have given about twice the per cent profit, though the average annual net returns have been somewhat greater in case of applications A. The system of small applications of lime at frequent intervals, especially in sections remote from lime supplies, has been shown to be a profitable liming system.

Through a longer period of years the practice of small applications should prove increasingly profitable, for in cases of heavy applications there is a much greater relative loss of lime from the soil through leaching.

In a rotation system involving clover and potatoes or onions and tobacco, small applications of finely ground limestone or hydrated lime to clover crop are preferable to heavy applications since the potatoes and tobacco are injured by excess of lime.

The increased cost of all forms of lime in relation to market prices of farm crops should stimulate the use of small applications of lime at frequent intervals applied to the grain crop seeded to clover. These data seem to justify the application of not more than one ton of limestone for the first rotation followed by subsequent applications of one-half ton. The amount to apply depends, of course, upon the cost of lime, former treatment of soil, and nature of rotation. Excellent red clover has been produced on Volusia soil by the application of not more than 800 pounds per acre of hydrated lime even though the limestone requirement of the soil to plowed depth was found to be 7,000 pounds.

Tobacco Farmers—Prepare!

(*From Page 30*)

Evidence is accumulating which nquestionably shows the efficacy of beral applications of high-grade fer- lizer in the production of tobacco. n 1928, the season just closed, a dem- nstration conducted on the farm of arl Shropshire, near Lexington, Ken- icky, by T. J. McDaniel supports the bove conclusion. The fertilizer ap- lied, the weight of the crop per cre, and the actual cash obtained are hown in the table below. Numbers , 2, 3, 4 were half acres, 5 and 6 vere acres.

It is very evident that the increase n the amount of potash in the nalyses gave an increase in both ield and gross profits.

A good crop of ripe tobacco will be ruined if allowed to house-burn. If the tobacco is crowded in the barn while in the green stage, it is almost certain to house-burn. This should be avoided by giving it plenty of space in the early curing stage. House-burned tobacco loses all of the "life" in the cured leaf, that is, the elasticity and oiliness in the leaf. It is also damaged in color and loses weight. In short, badly house-burned tobacco is almost worthless, therefore, it is very important that ample barn room be provided in advance.

The above details may seem commonplace, but they are the essentials in the production of good tobacco.

'lot	Fertilizer per Acre	Yield	Returns
No. 1	Check plot, no fert.	838 lbs.	$303.36
No. 2	300 ibs. of 3-8-6	851 lbs.	$308.07
No. 3	300 " of 3-8-12	904 lbs.	$327.26
No. 4	300 " of 3-8-24	1,123 lbs.	$406.54
No. 5	300 " of 3-8-48	1,177 lbs.	$426.19
No. 6	300 " of 3-8-96	1,117 lbs.	$404.37

Agriculture Today

(*From Page 27*)

periment Station at Dubois, Idaho. The tation range includes about 28,000 cres of semi-arid grazing land which as a very limited supply of natural vater. One well, 750 feet deep has been provided at the station headquar- ers together with a power pumping outfit and underground concrete stor- ge reservoirs. It is considered that vater can be hauled to outlying points on the range at a lower cost than that of drilling additional wells.

Investigations of the water requirements of sheep indicate that under average conditions about three quarts to a gallon of water is required each day per ewe with lamb at side on green feed while about the same amount is required for a dry ewe on dry feed in the fall. Under abnormally dry conditions when the sheep must travel over a long dusty trail to water as much as 1½ gallons of water may be required daily. To water these sheep properly during dry periods at the Dubois station outlying water stations

Type of terrace used in North Carolina to prevent soil erosion.

have been constructed each station consisting of a 6400 gallon closed concrete reservoir and a concrete trough. These troughs are from 150 to 180 feet in length and have capacities varying from 1450 to 2250 gallons each. The water stations are situated so that they can be filled from the hillsides during storms and when snows are melting in the spring.

The conservation of flood waters and snow-drifts opens up areas to grazing which otherwise could not be utilized. Natural reservoirs have been constructed by throwing a rim of earth around a small natural basin which has a solid rock bottom. The useful period of snowdrifts can be prolonged by fencing them to eliminate trampling by the sheep by covering the drift with a layer of straw 4 to 6 inches deep to retard melting, and by placing a trough below the drift to catch the snow water as it melts.

Increased use of farm to market motor trucks is helping to emphasize road construction technique to meet the needs of modern traffic. Traffic surveys and tests of various road building materials, therefore, have become an important part of present-day engineering research. Emphasis is being laid upon the scientific analysis of subgrade materials for the reason that any load applied to a road surface or pavement must be carried or supported ultimately by the soil underneath the pavement.

Traffic surveys have revealed the fallacy of the widely held belief that all roads should be hard-surfaced. The road system in Connecticut, for example, is pointed to as a type of well-balanced construction. Roads there which carry the heaviest traffic are surfaced with pavements of concrete or bituminous concrete. Roads of the second order of traffic importance are surfaced with bituminous macadam or water-bound macadam, and the tertiary roads are surfaced with gravel.

Experiments on the bureau's circular track in Arlington county, Va., are yielding valuable information on the endurance of various road types. Here the results of laboratory research are put to practical test under actual traffic conditions. Trucks with various kinds of tires, with and without load, are operated over this road constructed in sections of various materials, and the results measured with precision instruments. The tests are enabling road builders to determine precisely the types of roads best suited to traffic needs.

Restricting Production

(*From Page 22*)

roduction in the United States since he war. It has contributed to the dis-arity between the unit prices of farm ommodities and the prices of other oods. For that reason some consider t a doubtful blessing. But increased fficiency is not itself a cause of agri-ultural depression. Efficiency may ometimes depress prices, but it gen-rally effects a greater proportionate aving in costs of production. Hence t yields a net gain. To gauge the in-luence of efficiency on surplus pro-luction, we must know how the post-var improvement came about. Then ve can tell whether or not it promises o increase production indefinitely.

First it is important to recognize hat the increased output of the post-var period was not the result of ex-pansion in acreage. Areas devoted to ertain crops increased, but this gain was offset in other directions; and 1928 was the only post-war year to how an increase in total acreage over 1919. The principal means of expand-ng agricultural production in the United States in the nineteenth cen-tury was to increase the area in culti-vation. But that means of expansion, though still available to some degree, has become relatively costly. Though a vast area of potential crop land still awaits cultivation, most of it is either difficult to work or relatively infertile, and will not be brought under the plow except under the stimulus of high prices for farm products. Expansion of the area in cultivation seems un-likely to be important in any early in-creases that may take place in produc-tion. Intensive rather than extensive development will chiefly account for whatever is accomplished.

Machinery supplanting human and animal labor has played a great part in the post-war grain in production. Since the war the mechanization of agriculture has released for other uses some 15,000,000 to 20,000,000 acres of land formerly required to feed horses and mules. Important shifts have been made from less productive to more productive field crops, as for example, from wheat to corn in the North and from corn to cotton in the South. Approximately two-thirds of the post-war increase in production is assigned to increased production per unit of feed consumed. Better beef animals produce more meat with a given amount of feed; better dairy animals yield more milk without con-suming proportionately more feed, and better hogs economize feed similarly. Slaughter at an earlier age increases the output of animal products per unit of feed consumed, since younger ani-mals make more rapid gains than older animals on the same amount of feed.

Such progress, however, can not continue indefinitely. Technical in-novations have their greatest relative influence on production in their early stages; eventually they become subject to the law of diminishing returns. Efficiency in the utilization of feed has obvious limits. It is estimated by the Department of Agriculture that the output of animal products in the United States in the period of 1922-26 was some 15 per cent greater than in the period 1917-21. That increase, accomplished by improved breeding and husbandry, and by earlier slaugh-ter, was effected more easily than a proportionate additional gain would be now. Subsequent efforts would begin nearer the point of diminishing re-turns.

It is likewise probable that the gain in production achieved since the war by the increased use of machinery has reached a point where the rate may be expected to slacken. The next decade will hardly see as heavy a replacement of work animals by engine power as did the last, since the opportunity to supplant work animals with automobiles and tractors is less now that it was before 15 to 20 million acres of land had been reclaimed from forage production by that means. Though the technical improvement and mechanization of agriculture will doubtless continue, the *rate* of progress must decline as the *sum* of the achievement increases. The last decade has witnessed a technical stimulus to production that will be difficult to duplicate.

Hence the near future will probably be less burdened with agricultural surpluses than the recent past. Efficiency will have less tendency to be offset by price recessions. Our urban and village population already constitutes 77 per cent of our total population. Urban development continues in other countries, and the great international struggles of the future will involve the control of food sources for congested industrial populations. As the population of the United States increases, the importation of food staples will be necessary. And the bidding for supplies will be keen. Other countries also will pass from the food exporting into the food importing category. There will then be little talk about agricultural surpluses. This development will not be reached tomorrow or the day after, but the tendency toward it is already manifest, and each year will exercise an increasingly favorable influence on the farmer's position. For the man that likes farming, the present is a good time to enter the business should opportunity offer to do so at a conservative outlay.

Here is the basic governing principle. Henceforth this nation will probably experience regularly what it has experienced in the past only for one period—namely, a food supply increase lagging behind the growth of population. Humanity has not yet escaped, even in the United States, from the tendency of population to increase until it presses upon the limit of subsistence. This was recently emphasized by the United States Department of Agriculture in a study pointing out that changes in the national diet may eventually be necessary to conserve land. It was suggested that the recent trend toward decreased cereal and increased meat consumption may be reversed. As Doctor Baker puts it, only continued technical progress in agriculture can save us from the danger of an overproduction of people and an underproduction of food. Thus the future promises to put a premium on the work of the farmer, and to make it the stateman's chief concern to maintain a balance between the production of food and the production of other goods, so that national development may continue without excessive reliance on outside sources of food supply.

The United States still produces large amounts of food for export. Living standards in this country could be maintained for a time without any increase in farm production per capita of the population, simply by reducing food exports. The danger of insufficient food production can be staved off indefinitely by continued progress in the agricultural arts. But such progress will eventually be indispensable to stave off the danger. The problem will not be to avoid swamping the individual farmer with overproduction due to excessive efficiency, but rather to maintain efficiency in harmony with domestic food requirements. All the factors in the situation are subject to unpredictable change. Population growth may stop sooner than at present seems likely, or science may greatly increase our powers of production. But on the basis of the factors that can now be seen and appraised, the agricultural problem of the near future will be how to keep our agricultural production from falling behind our requirements.

Achievement

(*From Page* 4)

Contrary to the popular attitude of middle age, I *do* see many high-minded youths who still hitch wagons to the stars, and not motors to the moon. I still have faith in the dreams and visions of callow kids, for out of the void of nothing something sometimes comes. My only fear is that I shall by inadvertent word or deed do something crass and bromide to destroy the magic spell of youth's idle necromancy. I hesitate to match my idea of achievement (marked with the label of the eighteen-nineties) along with the goals that require mental flying fields to reach. It is hard to keep a boy's feet on the ground when he has seen Lindbergh! Shifting bases force us older heads to make sudden adjustments or risk losing caste. But yet, somehow, I stick to certain preconceived ideals as to what makes for success and achievement. Maybe if the sun still rises in the East I may after all be right. Some fundamentals of life, love, and the law seldom change much after all.

Achievement doesn't mean getting your name set on a linotype slug. I knew one ambitious matron who spent so much of her time trying to break into the society columns over the telephone that she neglected the training of her children. While she was courting the journalistic four hundred her son was dallying with the alley gang. By the time she got to lead the grand march he was doing the lock step. They both achieved publicity, but neither one relished it as they had anticipated.

Achievement means doing something worth while and doing it well. That's probably why there is more room for achievement nowadays than there used to be when America was emerging from the raw. We all have so many different standards as to what is worth while in our lives, and we do not cater to the same careers. So this leaves us pretty certain to achieve something, if we can pay the penalty for the pace.

One itinerant gentleman I know achieves great satisfaction at being able to stand on street corners and entertain crowds with stupendously stupid dates and numbers. Another acquaintance has a barn full of musty antiques, filled with genuine worm holes. My nephew collects hotel soap wrappers and is not much interested in their contents. Still others achieve satisfaction in huge stores of Highland humor, pre-Volstead vintages and bridge whist trophies. Probably I am equally off-center (English for "dotty" or "barmy") in my zeal to spoil a perfectly good spruce tree to hang these paragraphs upon.

My Sunday newspaper carries eight or ten pages of what printers call "nonpareil" face, devoted to finding jobs for the jobless and jobless for the jobs. It is the index of potential achievement, the dawn of destiny for some one. There is romance in it, colorless as it is beside the funny section.

In scanning it, I am struck by the way employers advertise for men and women who are under middle age. They put a premium on the physical advantages of youth, but lose sight of the mature judgment, shrewd experience, and calm faithfulness which go with the accumulation of years.

I am prejudiced no doubt. I am forty, albeit neither fair nor fat. Yet there is just as much comfort to mankind in the doctrine of giving heed to older workers as in the current preference for youthful ardor. Every youth, almost before he knows it, must face the fact that he, too, has traveled a goodly ways along the road of life. To encourage mature ambition and achievement and open greater chances for older people simply gives youth a longer avenue to run his race and train his talents.

There is after all much to be said for the deeds of the world done by folks not wanted in the want ads. One could make quite a case in the defense of seniors who have not only survived but surpassed the fledglings. Almost any handy list of the world's workers in all lines of endeavor testify to the ill-founded custom of insisting forever upon age limits. You cannot stifle the soul with statistics, and the souls of some men never grow old. Witness just a few examples:

Tourists who stare at the paintings in the Sistine Chapel of Italy, remember they were done by Michelangelo between sixty-five and seventy with a brush still dipped in the vigor of inspiration. Von Moltke conquered France for the Prussians arms at seventy-two. John Wesley traveled fully 250,000 miles in an age of sail boats and ox-teams, and lived to preach some of his best sermons at eighty-five. Thomas Jefferson, Talleyrand, Herbert Spencer, Newton, and Voltaire were fruitful of great thoughts and great deeds as octogenarians. Goethe wrote Faust at eighty. Gladstone became premier of Britain at eighty-one. History tells us that Cato learned Greek and Plutarch learned Latin, while Socrates began to study music at eighty. In America we find Whittier and Bryant at their best in their seventies; Joseph Jefferson outdoing earlier Rip Van Winkles at seventy-five years; Henry Clay, John Calhoun, and Uncle Joe Cannon, Thomas Edison, and Samuel Fallows—all issuing a challenge to the vulgar idea that achievement ends with advancing age.

Between the ages of sixty and seventy years, when some men have retired or their employers lost faith in them, we see Pasteur discovering a cure for hydrophobia, Columbus making his third and fourth voyages, Wagner and Verdi composing their noblest operas, Hugo, Ruskin, Emerson, Franc Bacon, Edmund Burke, and John Mi ton all making classics for the guic ance of humanity and the imitatio of younger minds.

What would the world have lost i an age limit to achievement had bee placed at fifty years? Let's se Columbus would have been prevente from discovering America, Mors could not have invented the telegrapl John Knox could not have conducte a religious revolution in Scotlanc Wyclif and Luther would not hav translated the Bible for hungry thou sands, Copernicus would never hav contributed his celestial studies, Adar Smith would not be found in th economist's library, Plato and Aristotl could not have added to the philosoph of the world, and the Supreme Cour of the United States would be vacant

Should you care to lower the ag limit to the forty mark, such as th want ad lists proclaim so generally I am afraid that the rest of the great est deeds done in almost any line o work would be obliterated. It is saic that eighty per cent of the world' greatest figures closed active lives o achievement between fifty and eighty years, while about six per cent of thes men in the hall of fame closed thei activities in the nineties. Now tro out your want ads and see if I care.

The secret of this lies in the fact that when men and women keep thei minds tuned to achievement and thei hearts open to conviction there is som great unknown force that unites with them and enables them to carry on where indifferent folks give up th race. This is why I am sorry for th retired farmer, and why in so many instances the retired farmer soon goes his rusty way to an early death instead of wearing out in the harness in the full joy of seasonal achievement.

Aspiration must come before achievement. To aspire is the germ of achievement, the embryo of the living deed. One may aspire, as well as perspire, in the management of humble tasks. Aspiration is not alone for poets,

·tists, and musicians. It belongs to
; all.

American aspiration has been regarded as money madness, and our *mmum bonum* of achievement called ccumulation and acquisitiveness.

I am not quite ready to accept that ithout a modifier. Take a cross section of American life and you will see ıat it is not money for *keeping*, but oney for *spending* that animates uch of our work.

Agriculture's desideratum for unammeled achievement is the purchasg power of the dirt farm dollar. Comorts and conveniences for the happy omes of those who toil are now a goal or more people in gainful occupation ıan niggardly hoarding of cash. lisers have no mission and stingy men re not even sure of good funerals.

The current popularity of Scotch ırift stories goes to show which way ıe wind is blowing. Men laugh at ıings they take no stock in. I do not know after all that I should care to see America run the way so many foreigners think it is. Not all our achievement consists of accumulation.

For behind this penchant of ours for creature comforts and making Christmas last forever lies a warm heart of love and some degree of noble sacrifice. It takes more courage to spend sometimes and a lot more skill to do it wisely than it does to put money in the bank. Personally, I have a vast amount of endearing memories of parents who struggled hard to give a little, and I hardly think twice of an uncle who was very successful in keeping a lot. I think this really sums up our corner of the work-a-day world.

After all, the substance of our achievement that gives the most lasting hope to us after we are done with it all is the kind that doesn't have to be fought over in the probate court.

Probably that's why I feel so very successful!

A Few Whinnies

NOTHING STINGY HERE

Maggie, an old-time Virginia darky, was always doing favors for people. She never considered herself first. During her teens and 20's she had worked for several large Virginia families and she began to consider marriage as a change from the "hum-drumminess" of life, as she called it. A young Negro swain who had paid her much attention finally asked her to be his blushing bride, and she answered "Shuah." At last the wedding was over and the bride and groom were supposed to be off on their honeymoon. So, naturally, Maggie's employer was surprised when she returned the same day to resume her work.

"Why, Maggie," she was asked, "how is it you are not on your honeymoon; weren't you married?"

"Yes, Ah was married all right," Maggie replied, "but Ephraim wanted to go to Memphis, and Ah had been theah befo' so Ah let's mah sistah go in mah place."

Little Girl Next Door—"What's the new baby at your home, Johnny, a boy or a girl?"

Disgusted Little Brother—"Aw, it's a girl. I saw 'em putting powder on it."

Four is that trying age when the subject can't go from the piano to the davenport, seven feet away, without getting on his tricycle.—*Detroit News.*

WATCH OUT FOR DAD

An eight-year-old Chicago bo came down to breakfast and his hanc and face just had a "lick and a prom ise" as grandma used to say.

"Come up to the bathroom," sai his father, "and I'll give you a rea good wash."

When he got to school his teache commented on his clean feature "Why, Ralph," she said, "you loo wonderfully clean. Who washe you?"

"My dad washed me," declare Ralph, "and say, if ever you want bath and want to be good and clea you just go to dad. You will b clean all right, when he gets throug with you."—*Godfrey Gossip.*

ALL AT SEA

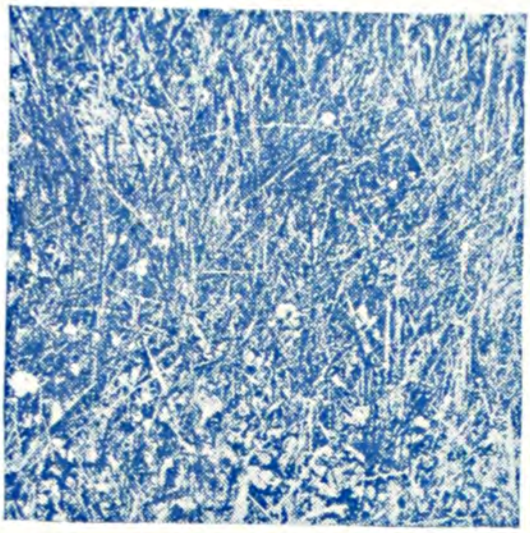
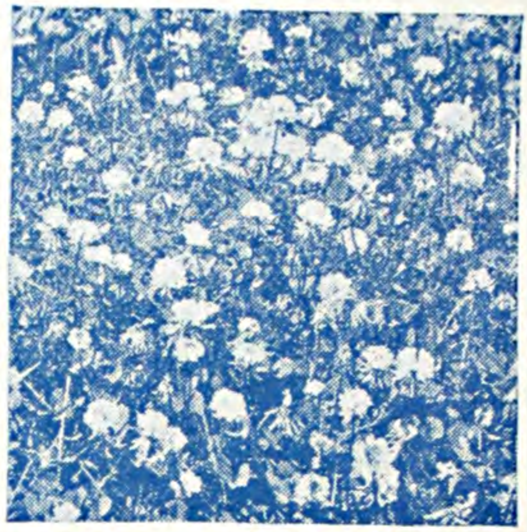
A girl at a public library inquire if "The Red Boat" was in.

"I don't think we have the book, she was told.

"Oh, excuse me," said the girl. " made a mistake. The title is 'Th Scarlet Launch'."

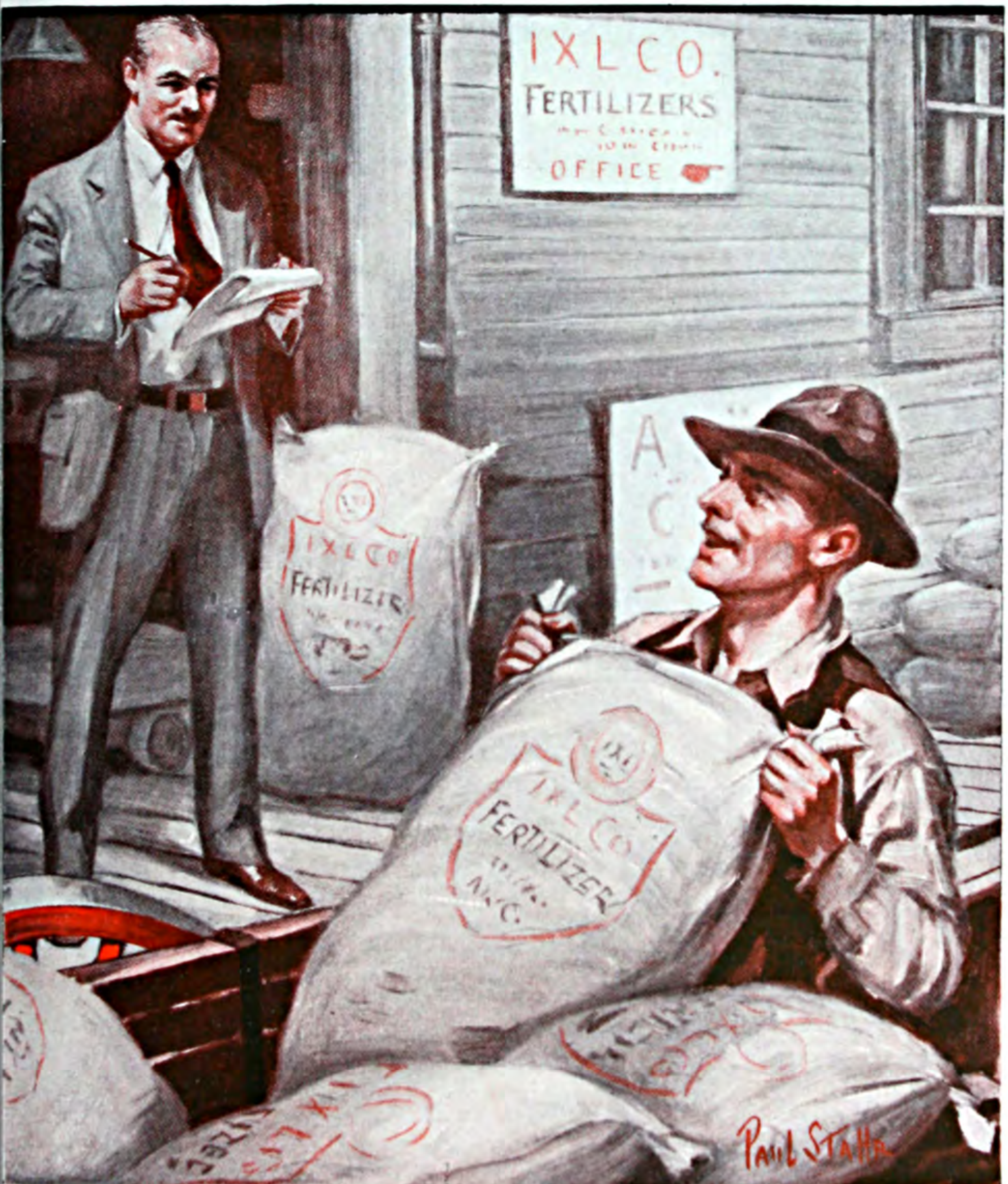
After a search the library assistan reported that no book with that titl was listed in the card catalog.

"But I am sure you have the book, the girl insisted. Suddenly she opene her handbag and produced a slip o paper on which something was writ ten. Then she blushed. "Oh, I be your pardon," she said, "it's 'The Rub Yacht,' by a man named Omar, want."—*Boston Transcript.*

Better Crops WITH PLANT FOOD

March, 1929 10 Cents



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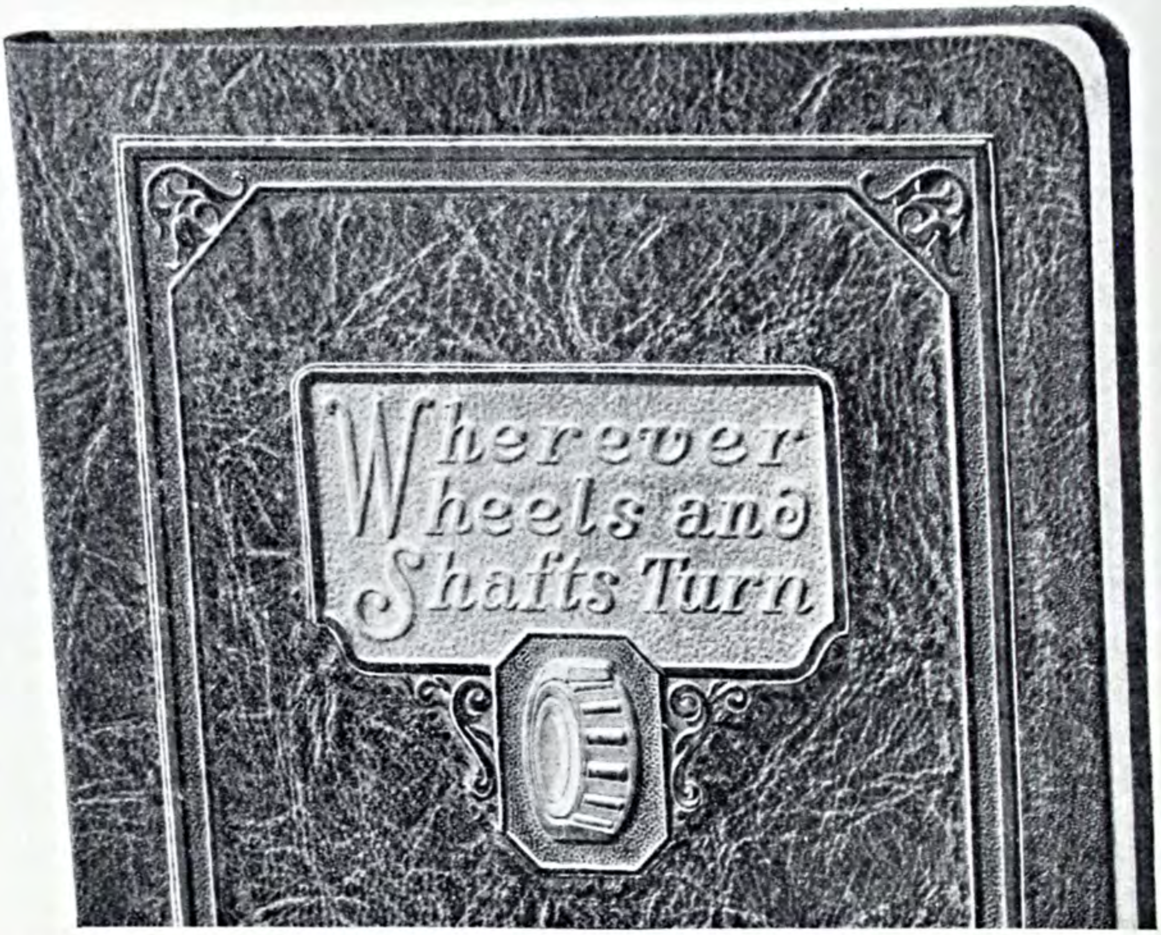
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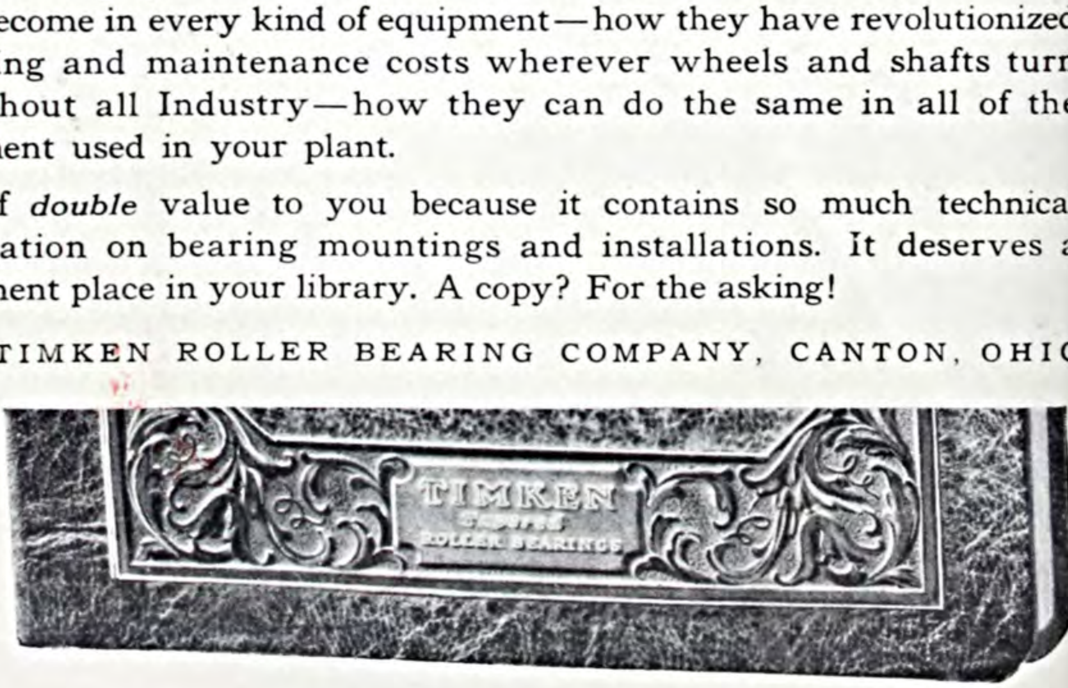
TIMKEN

Better Crops *with* PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Managing Editor* SID NOBLE, *Editor*

Editorial Offices: 19 West 44th Street New York

VOLUME XII NUMBER THREE

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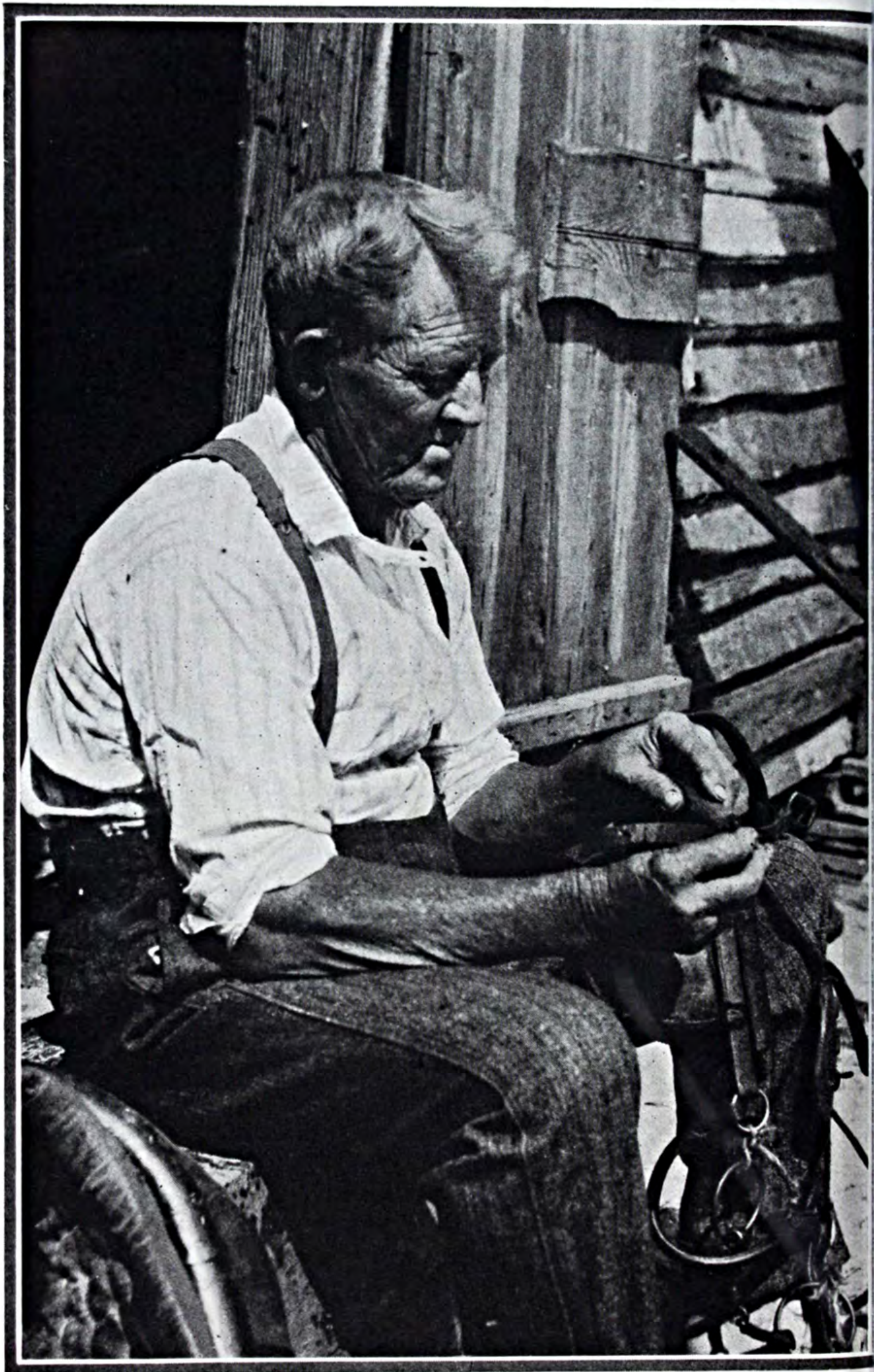

Getting Ready

Better Crops with PLANT FOOD

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VOL. XII NEW YORK, MARCH, 1929 No. 3

Jeff ponders over the meaning of—

Organization

By Jeff McDermid

IN Mr. Milne's popular juvenile story Pooh Bear was asked by Rabbit to help organize a hunt for something that was lost. As "organdize" was puzzling to Pooh Bear, Rabbit explained it by saying, "It is what you do to a Search when everyone doesn't look in the same place at the same time."

Probably no economic encyclopedia contains a better general definition of organization than the one Rabbit gave Pooh Bear in my youngsters' favorite classic. I have found that they heed the bunny's advice when they rifle my pockets at the evening homecoming. Thus babes are learning the touchstone of efficiency.

"My company is well organized in that territory" is the stock phrase denoting acumen, activity, and alertness in our commercial world. "His faculties and talents are well organized" is said in explanation of a successful bond salesman who had no more brains to begin with than we. "When the sun rises in the west our farmers will be perfectly organized" wisecracks the skeptic whose scheme for rural relief died in the committee room.

Pooh Bear's brain was made of fuzzy woolen rags and he lamented his woeful lack of knowledge and appreciation of organization. You and I know brains made of stouter stuff wherein no gleam of the glamor pertaining to organization has penetrated.

There was a time when things of importance "just happened," like the weather and the mumps, and folks drifted along with the current of life's stream unharrassed by organizers or efficiency experts. Of course, in those days a number of events occurred like the Magna Carta and the discovery of America, wholly without the aid of sublimated steering committees or business executives as we know them today. When such "accidents" occur today there is always somebody or some group of somebodies willing to admit that it was a carefully planned procedure brought about by systematic surveys, campaigns, and conferences.

We know now why Moses didn't reach the Promised Land, although the testament tries to hush it up. The truth has leaked out. Like a good many other Methodist preachers since, he was a great exhorter and a fanatic for fresh water, but he simply didnt' have his own organization with him one hundred per!

WHILE we are tracing the organization spirit, we might as well start with the original organizer. Referring back of Moses' time in the sixth chapter of Genesis, notice that a man named Noah built a barge of gopher wood and covered it with pitch. Then, with Shem, Ham, and Japhet as efficiency experts, he tried his best to form a bone-dry association. Only a few human beings had sense enough to join, but he signed up the entire zoological kingdom in less than one week. After the flood subsided Noah forgot the pledge and drank efficiently of julep juice, merely to commemorate a return to normalcy. His sons thought it was a poor way for a national hero to behave, but they should have made allowance for the fact that he was six hundred years old. Perhaps when we reach that age we shall also possess his capacity for organization and the same enjoyment of it afterwards.

Tradition made the first great trade-marks, for there was no organization or advertising as we know them in all their glory. Men and their materials earned famous reputations through a queer monopoly of a kind not known today. This may seem odd until you look back a bit.

There was Damascus steel, Newcastle coal, Parisian gowns, Turkish harems, Norwegian sardines, French mushrooms, and Arabian horses. There stood Roman noses, German sauerkraut, Swiss watches and Swiss yodels, English plum pudding, Spanish shawls, Nuremberg toys, Jewish money, and Scotch thrift.

CUSTOM and precedent, with little or no active competition, led our ancestors to think in bromide terms like those. The era of a Carnegie to wrest the glory from Damascus blades or a Flo Ziegfeld to show us that feminine pulchritude could flourish outside of Turkey came to us when mankind first became vicariously organized. Since then we Americans have produced and profitably purveyed sardines made out of carp, sauerkraut from Wisconsin cabbage, watches from Elgin and elsewhere, and silk gowns from wood pulp!

It would take a research artist to unravel the skein of organization which has become the warp and woof of the loom of life.

The first vague outlines appear in the annals of tribal rites and ceremonies. In the nomadic reign of terror and savagery men presumably "lost their heads" over the matter even as some do now. We have some traces of it left in the Pueblo snake dance and the drum ceremony of the Ojibwas.

Its next stronghold was in the mili-

(*Turn to Page 59*)

Note how the cattle have reached through the fence to get pasture fertilized with 500 lbs. of 0-16-20 and 2,500 lbs. of limestone, while in back of the man where no fertilizer was applied, the cattle did not reach through the fence.

Better Pastures

By G. L. Schuster

Agronomist, Delaware Agricultural Experiment Station

ACCORDING to the 1925 agricultural census there are 53,250,000 acres of farm land in the New England and Middle Atlantic states. Thirty-eight per cent of this land is in pasture and 44 per cent is in other crop land. The balance is land not actually under cultivation or used as pasture. In this same territory there are about 6,500,000 animal units or about one animal unit to three acres of pasture.

The animal products such as all dairy, sheep, and goat products amount to $3,000,000. The total livestock value is nearly $449,000,000 exclusive of products.

The value of all crops for the section is given as nearly $517,000,000. These figures are important because they show that the New England and Middle Atlantic section as a whole has a large livestock and pasture project.

Pasture land is important. What is being done to conserve and improve the pastures? At the winter meeting of the New England Agronomists in New York about 100 agronomists and others interested in agriculture gathered together to discuss the improvement of pastures.

White of Pennsylvania has made a study of the feed units (digestible nutrients) produced in a pasture vs. a grain rotation on DeKalb, Volusia, and Westmoreland soils with various treatments. As a general average the pasture produced 10.9 per cent greater weight of air dry matter, 7.4 per cent more digestible nutrients, and 189 per cent more digestible crude protein than the grain rotation. Potash produced an increase of 29 per cent in feed units in the pasture and 43 per cent increase in the grain rotation. Nitrogen increased the nutrients 37 per cent in the pasture and 6 per cent in the rotation. The NPK treatment increased the nutrients in the pasture 9 per cent over that of reinforced manure but the manure treatment was 9 per cent more effective than the NPK in the grain rotation. The average computed acre values of pasture resulting from the various treatments are: no treatment $3.57; CaP $25.20; CaPK $32.31; CaNPK $40.92; and CaMP $35.84.

Misner states that the cost of pasturing an animal unit in New York State is from $4.00 to $8.00 per season and that the cost of maintaining pasture land is about 8.3 per cent of its value. The net value per acre of pasture in terms of milk production was $11.37 per acre. The average crop return for the period 1923-27 was $1.00 per acre or a return of about 40c per hour for time when all costs including labor were excluded.

Sprague made a pasture survey in New Jersey during 1926-27 of 264 pastures in representative sections of the state. Using the feed units produced as a measure, he found that the Coastal Plain soils supported the best pastures; the Glacial Lake and River Terrace soils were nearly as valuable and that Glacial soils were the least productive. The abundance of Kentucky bluegrass and white clover was correlated with productivity. The average yield per acre per year was 1,065 feed units or the equivalent of 2,330 lbs. of alfalfa hay. The 48 better pastures averaged 2,823 feed units. Lime, manure, and commercial fertilizers were used more on the best pastures than on the pastures generally.

Haskell took some typical rock-bound, weed-grown permanent pasture in Massachusetts that probably had not been plowed for more than 100 years and fertilized it in 1921 and again in 1922. In June of 1923 the animals were taken off for a three-week period and the three-week growth was harvested and analyzed. The fertilizer treatments and results are given below.

Haskell says, "The greatly increased yield of protein on the best treated plot is most significant, with a total production equal to that contained in 2,400 lbs. of wheat bran. The cause of this is of course the stimulation of clover and the suppression of the weeds brought about by the use of lime and fertilizer." Haskell concludes that while it is impracticable to translate the above figures into terms of profit and loss because we have no means of knowing how long a time fertilizer will continue to show benefit, yet a pasture which is in a weedy or run-down condition because of a lack of plant food can be brought back to a productive condition only by the use of plant food.

Cooper and others have pointed out the importance of climate and soil in regulating pasture flora. Kentucky

Fertilizer treatment	Dry matter per A. lbs.	Protein per A. lbs.
Superphosphate 960 lbs.; no lime	863	122
Superphosphate 960 lbs.; limestone 2,400 lbs.	1,050	196
Muriate of potash 160 lbs.; no lime	676	140
Muriate of potash 160 lbs.; limestone 2,400 lbs.	1,023	238
No fertilizer; no lime	703	103
Limestone 2,400 lbs.	766	138
P 960 lbs.; K 160 lbs.; no lime	1,272	262
P 960 lbs.; K 160 lbs.; limestone 2,400 lbs.	1,576	387

uegrass is the most widely dis-
ibuted dominant pasture plant in
ie northeastern states. It is soft and
ılatable and grows best on soils which
e well supplied with potassium, cal-
um, and phosphorus.

Such plants as Kentucky bluegrass
ıd white clover seem to prefer ni-
ate nitrogen or a complex favorable
ır the production of nitrates and are
ɔt to dominate on soils which are
ell supplied with calcium, potassium,
ıosphorus, or other materials of a
milar nature. Such plants as red
scue, redtop, and Rhode Island bent-
ass may utilize ammonia nitrogen to
lvantage and thus dominate acid
ils. These soils probably contain
rge amounts of magnesium, alumi-
ım, manganese, and silicon.

The amount of available material
a given soil for plant food may
eatly influence the mineral content
f the crop. The food value of a crop
rown on a soil
ell supplied with
ıch materials as
ılcium, potassium,
ıd phosphorus,
ıay be superior to
crop supplied
ith those mate-
als commonly
resent in acid soils.
rops like alfalfa,
over, timothy,
ıd bluegrass
rown on limestone
ɔil would be ex-
ected to have a
igher feeding
alue than when
rown on less
roductive acid
ɔils. Such plants
alfalfa, clover,
ıd bluegrass be-
ɔng to the group
ıat absorbs large
mounts of potas-
um, calcium, etc.

Maynard points
ut that the failure
f the grazing industry in certain areas has been due to a deficiency of the herbage in certain essential elements which results in a type of malnutrition and disease where animals obtain all their food from pasture. Many experiments have shown that certain mineral deficiencies in pasture grass can be made good by fertilization and that the troubles occurring in grazing animals as a result of these deficiencies can thus be prevented or cured. This deficiency may be overcome by feeding a mineral supplement but it would seem to be more desirable from a nutritional and livestock management standpoint to pasture grasses sufficiently rich in the essential elements so as to require no supplement. In some cases, however, it would no doubt be impracticable to meet such conditions by adding mineral fertilizers to the pasture land.

What Potash Did.

Left: No fertilizer
Center, 2,500 lbs. limestone
500 lbs. 0-16-0
Right, 2,500 lbs. limestone
500 lbs. 0-16-20

Nitrogen supplies the leafy vegetable growth of plants. It may be looked upon as supplying the factory in which the other elements operate. Therefore nitrogen should be available for pasture production. The soil type and its management will determine largely how much, if any, nitrogen should be added.

Archibald has found that pasture plots fertilized and grazed intensively materially increased in the production of dry matter and the nitrogen, calcium, and phosphorus in the dry matter. Cooper has pointed out that for soft pasture grasses like Kentucky bluegrass and white clover

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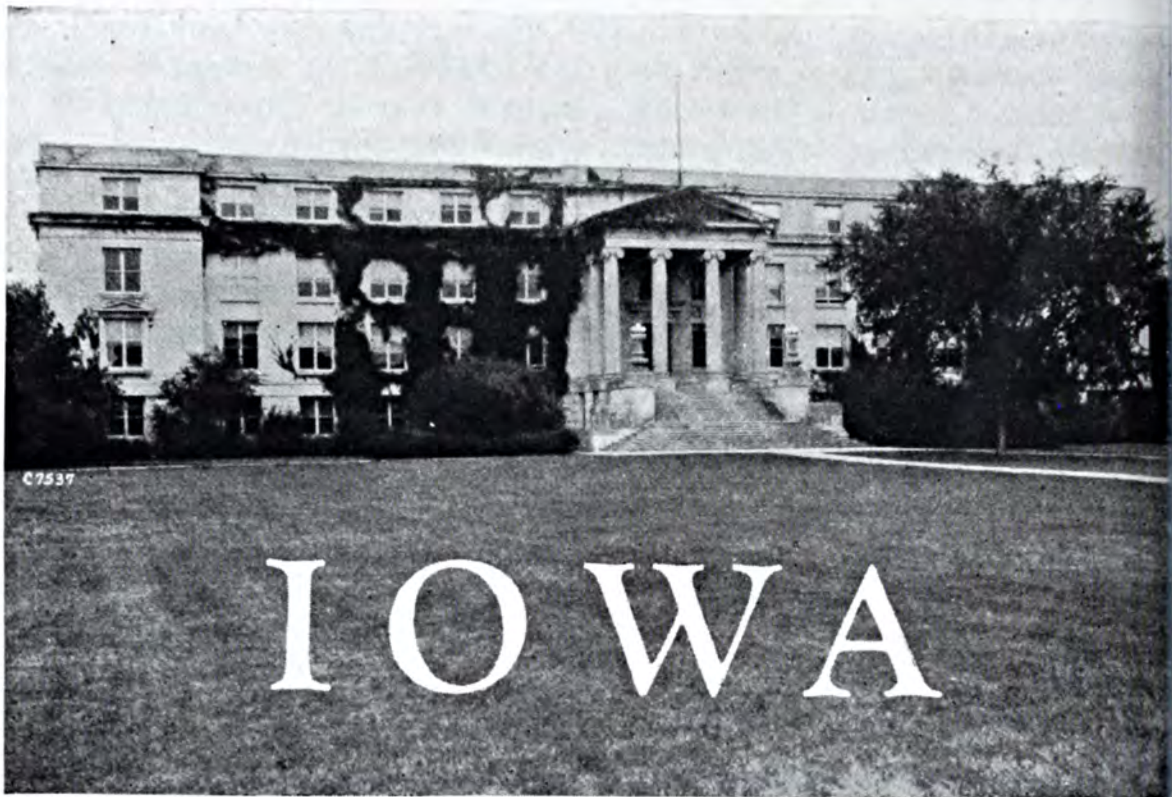


IOWA

¶ The thirty-fifth of our experiment station stories

By Blair Converse

Bulletin Editor, Iowa Agricultural Experiment Stati

ONE hundred and eleven men and women—members of the staff of the Iowa Agricultural Experiment Station—are working today in the laboratory and in the field on more than 200 specific problems of agriculture.

Although not all of them are full-time employees of the station, this personnel and the number of projects upon which they are at work make a striking contrast to the staff and the experiment station program described in the first station report published in May, 1888.

These 40 years have seen not only a remarkable growth in the work of the station and the support which is given to it, but they have seen as well —and herein lies the reason for the continued support—the contribution to the state and to agriculture generally of ideas which are of inestimable value. The agriculture of Iowa has been enriched by literally scores of millions of dollars through the work of the station.

To take only three or four ex amples. The last Yearbook of th United States Department of Agricu ture estimates that three varieties c oats developed at the Iowa Statio were grown in 1924 on at least 6,000 000 acres in the Midwest. These oa averaged at least three bushels to th acre better than old varieties. I these figures are anywhere near accu rate—and they are too low, if any thing—this one service of the statio gave to the farmers who grew th oats an increased income of ove $6,000,000 in a single year.

The Iowa system of soil manage ment is the result of many exper ments, with many types of soils an crops. Soil surveys have been mac of about three-fourths of the coun ties of the state and reports of thes surveys with detailed colored soil maps have been published for 55 coun ties. Besides the experiments wit soils conducted at the agronomy farn near the campus, about 100 cooperative soils experiment fields have been established on private farms in all parts of the state. These various efforts have furnished a tremendous mass of data concerning Iowa soils and the problems of their management. From these data the station has developed recommendations which are carried to the farmers of the state through the station publications and the extension service.

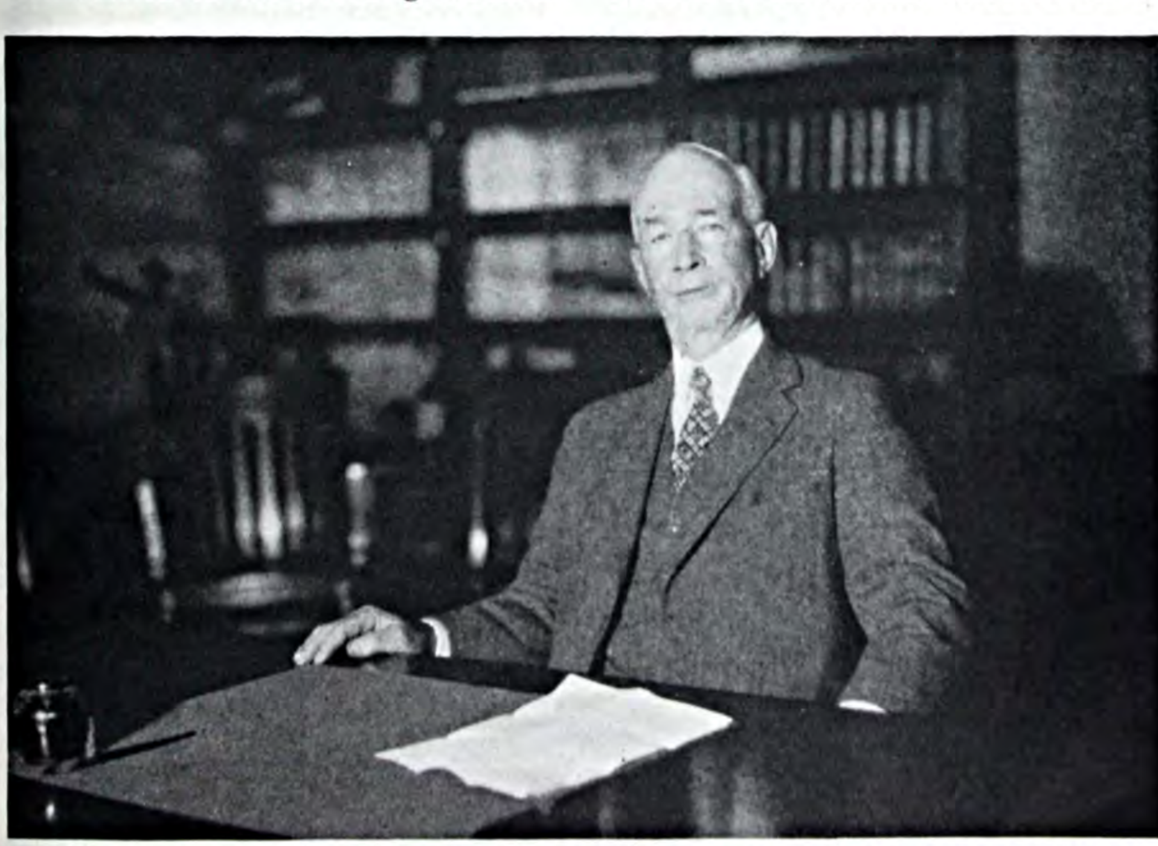
Another experiment which has run over a number of years and which has been the basis of recommendations which have added much to the income from dairying in the state as well as in other states is the so-called Arkansas experiment, in which the records of the progeny of scrub cows crossed with purebreds have been carefully kept and compared with the production of their dams.

The foundation animals used in this experiment were bought some 15 years ago in an isolated region of Arkansas. They possessed no blood of an improved dairy breed. The progeny of two of the foundation cows have now been carried to the fourth generation. The butterfat production of the two scrubs was 169 and 193 pounds respectively. These cows were bred to purebred bulls, as were their daughters. A daughter of the first, in the third generation, gave a butterfat yield of 439 pounds. The granddaughter of the other scrub gave a yield of 402 pounds.

This experiment has done much to convince farmers of the importance of the purebred sire. Not only were the grades of the first, second, and third generation more abundant producers than their dams, but they were more economical in their use of feed and they returned greater profits over feed costs.

It is interesting to trace, through the 30-some volumes published by the station, the development of the experimental work. Through the years it has undergone a "settling down" and a balancing process. It took some time, apparently, for the investigators to discover the fields of research most vital to Iowa agriculture.

The station work has gradually grown in two directions. In one direction it has become more broad and



C. F. Curtiss, dean of agriculture and director of the Iowa Agricultural Experiment Station fundamental. For example, the soils section is still working on a basic survey and analysis of the soils of the state; the economic section is developing a basic study of the geography of Iowa agriculture as well as a type of farming study.

In another direction the research work has become more and more refined and specific. As one problem has been solved, the workers have gone on to an even more restricted and specific problem.

It is not difficult to imagine the state of mind of the members of the first station staff back in 1888. With no previous work—at least in Iowa—to build on, with the whole state a virgin field as far as agricultural research went, with practically no equipment with which to work, with only a small piece of unbroken prairie as an experimental field, they had a fascinating and a difficult task.

The first director was R. P. Speer. Under him were four full-time station workers and six members of the college faculty who gave a fraction of their time to station work.

In the first bulletin of the station, published in May, 1888, Director Speer gives a brief summary of the lines of investigation he plans to take up. The station, he says, will conduct work with sugar beets, will endeavor to find and propagate cereal plants and grasses suitable to the Iowa climate, and it will test out drainage, sub-soiling, green manuring and crop rotations. The station botanist and the assistant director are to go on specimen hunting trips into the "new states and territories further west."

"We expect," Director Speer continues, "to be disappointed very often in the results of our experiments, but hope to strike a lead once in a while which will enhance the agricultural interests of the state."

Director Speer's modest hope has been realized, not only by himself and his co-workers of the early days of the station, but by the hundreds who have followed them.

In the spring of 1891 James Wilson, later to become the first secretary of the United States Department of Agriculture, succeeded Mr. Speer as director of the station. C. F. Curtiss, a recent graduate of the college, became Director Wilson's assistant. When Director Wilson went to Washington, Professor Curtiss became director of the experiment station and dean of agriculture, positions which he still holds.

For 32 years the station has had the advantage of the consistent policy and consecutive effort given to it by Director Curtiss. In his early experiments under "Tama Jim" Wilson, Dean Curtiss was primarily concerned with livestock problems. Due to this interest and the outstanding importance

Cattle Feeders' Day at the Station's animal husbandry farm.

[o]f the livestock in[d]ustry in Iowa, ex[p]eriments in the [f]eeding, breeding, [a]nd management of [li]vestock have al[w]ays played an im[p]ortant part in the [w]ork of the sta[ti]on. It was the [Io]wa station which [d]eveloped the self-[f]eeder system of [f]eeding livestock; [i]t was to the fore [i]n the experimenta[t]ion with mineral [m]ixtures and hog[g]ing down corn. [L]iterally hundreds [o]f experiments [w]ith all phases of [a]nimal husbandry [h]ave been con[d]ucted. The an[n]ual swine and cat[t]le feeders' day at [t]he station, at [w]hich the experi[m]ental results of the current year [a]re explained, have become important [e]vents attended each year by 1,200 to [1],500 farmers. But animal hus[b]andry has not been permitted to [o]vershadow the other work of the sta[t]ion. As it is now organized, the sta[t]ion consists of 15 sections: agricul[t]ural engineering, agricultural eco[n]omics and farm management, farm [c]rops, soils, animal husbandry, dairy [h]usbandry, poultry husbandry, bac[t]eriology, botany and plant pathology, [c]hemistry, dairy industry, entomology, [g]enetics, horticulture and forestry, [a]nd vegetable crops.

W. H. Stevenson, vice-director of the Iowa Agricultural Experiment Station.

The station now has an annual ap[p]ropriation of about $350,000, of [w]hich $60,000 comes from the fed[e]ral government. The total includes [s]ome $40,000 realized each year from [t]he sale of livestock, crops, and other [p]roducts.

The station is now well provided with land upon which to conduct its experiments. The college and experiment station domain consists of 1,994 acres, 250 of which are occupied by the campus proper. All of the farms lie within easy distance of the campus. The 200 acre Agronomy Farm is laid out into soil and crops test plots. Recently a $20,000 storage and laboratory building was erected on this farm.

The Animal Husbandry experimental farm of 180 acres is a part of the equipment of the animal husbandry section. The Dairy section has a 280-acre dairy farm. Smaller amounts of land are under the direction of the horticultural and forestry section, poultry husbandry, agricultural engineering, vegetable crops, and other sections. Last year the agricultural engineering section rented a farm near the college, which it is handling as far as possible with mechanical power.

Each year the Iowa Station publishes from 25 to 40 bulletins and circulars. These publications are of four sorts: "regular" bulletins, for general distribution but dealing with original research work; circulars, popular publications, not necessarily dealing with original research; research bulletins; and county soil survey reports.

In 1927 the station distributed 120,000 each of its bulletins and circulars and 25,000 research bulletins.

In the first year of the station an

(*Turn to Page 53*)

Good Alfalfa Needs Plenty of Potash

By Ford S. Prince

Agronomist, New Hampshire Agricultural Experiment Station

POTASH has given the most benefit to alfalfa of any fertilizer element tried out in an experiment conducted by the New Hampshire Experiment Station on an outlying experimental field in Greenland, N. H.

On plots seeded in 1926 and from which two cuttings were made in 1927 and 1928, those receiving 150 pounds muriate of potash at seeding and a similar top-dressing in 1928 have outyielded the check plots by 1,761 pounds.

The field on which these plots are located was a worn-out hay field, unplowed areas of which yielded less than 400 pounds of hay per acre in 1926. For a number of years prior to its use for experimental purposes the field had not been cultivated.

The area on which alfalfa was seeded was plowed in the fall of 1925, limed and manured in the spring of 1926, harrowed until June, and seeded June 23. No crop was harvested that year, the first cutting being made in June, 1927.

Increased Yields

A basic treatment of two tons of ground limestone and 20 tons of manure was made over the whole field, then certain plots received two additional tons of lime, 20 more tons of manure, nitrate of soda, superphosphate and potash, alone and in combination so that a fairly complete test of these materials is under way. In all there are 12 different combinations of treatments, with one check plot in every four, making 48 twentieth-acre plots in all.

Thus far, potash has been the chemical which has given the greatest ir crease in yield. In fact it has stimu lated the yield of alfalfa almost much as 20 tons of manure where th increase has been 2,082 pounds for th four cuttings.

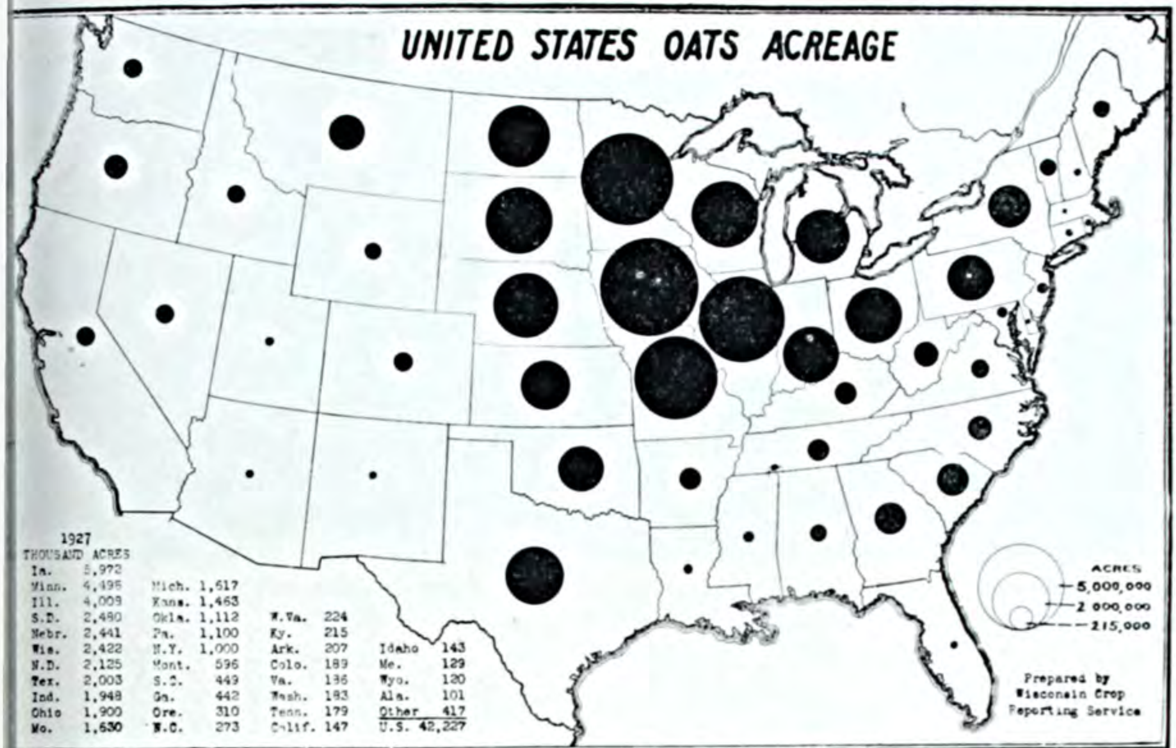
The increases from both potash an manure have been consistent, showin a greater yield in every cutting.

The increases as recorded probabl do not tell the whole story, for th alfalfa grown with potash has stoo up much better than that which ha received heavy applications of manur particularly in the first cutting When alfalfa lodges, the under leave mould, and in extremely wet weathe such as that which prevailed in 192 the stems begin to decay. In this even weights do not give an accurate meas ure of feeding value.

Winter-Killing

No winter-killing has been ex perienced on these plots except wher small patches of ice stood at some tim during the winter of 1927-28. Ther was no correlation between this diffi culty and fertilizer treatment. If however, potash should prove to b valuable in future years in preventin winter-killing, as it has in certai other experimental tests, it shoul prove to be doubly valuable as an al falfa top-dressing.

Summing up our work in this ex periment so far, it would seem tha where manure has been used at seed ing, or on the crop before, that firs attention should be for the potash con tent of the fertilizer both at seedin down and for later top-dressings.



OATS

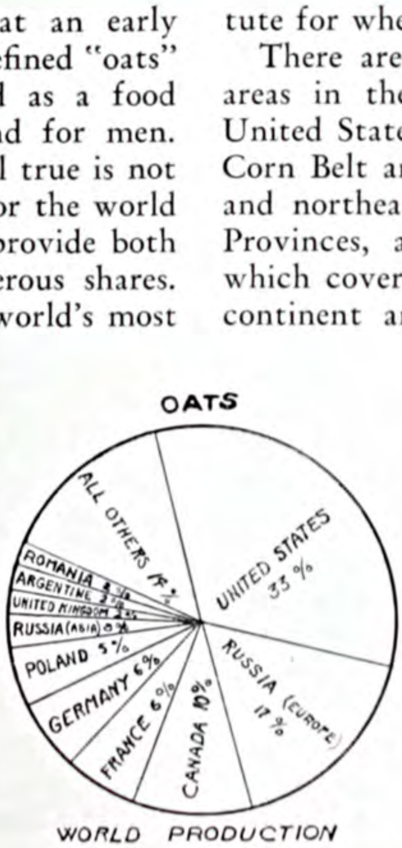
Fourth of this series

By *Walter H. Ebling*

Agricultural Statistician, Wisconsin

THE story is told that an early English dictionary defined "oats" as grain used in England as a food for horses and in Scotland for men. Whether or not this is still true is not much of an issue today, for the world produces enough oats to provide both man and beast with generous shares. Oats, though one of the world's most important grains, does not enter extensively into our commerce, but is in the main consumed where grown, it being produced largely as a feed crop. A minor use for human food, particularly in the form of breakfast cereal, is of course well known. Oat flour too is made and was commonly used as a substitute for wheat in the World War.

There are two large oat producing areas in the world—the one in the United States which is heaviest in the Corn Belt and extends northwestward and northeastward into the Canadian Provinces, and the other in Europe which covers a very large part of the continent and extends eastward into Asiatic Russia. Only minor areas are found in other continents of the world. The oats in Europe is spring sown and often used extensively on the regions of poor but moist soils to which it is better adapted than other grains.



The United States grows about one-third

(*Turn to Page 52*)

Farmers examining a top-dressing demonstration at Sandersville, Ga., where $1.60 worth of muriate potash returned $13.30 in extra seed cotton.

Top-Dressing Cotton with Potash

By Sid Noble

IN the southeastern cotton belt the comparatively new idea of giving cotton supplementary applications of potash as top-dressings is apparently coming into real favor. The practice seems to gain impetus in proportion to the number of farmers who try it.

Three years ago potash top-dressing demonstrations on cotton were started on a small scale under the supervision of J. N. Harper and H. T. Maddux of the Agricultural and Scientific Bureau of the N. V. Potash Export My. In 1927 the demonstrations were increased to 40 and placed on farms in North Carolina, South Carolina, Georgia, and Mississippi. The results were amazing. Each $1 invested in extra potash returned an average of $8 in extra seed cotton.

Such results were good reasons for extending the demonstrations in 1928 to more than 200 farms in 11 states, with most of them concentrated in southeastern states. This increase the aggregate area of test plots for th three years to a total of nearly 2,50 acres.

The excellent promise of the bene ficial results to be obtained from top dressing cotton with extra potash indicated by the two previous year results, was well fulfilled by the re sults from the increased number of tests in 1928.

$5.50 for $1

For the three years, where potas top-dressing was applied in addition t the farmers' regular cotton fertilize it increased yields on 95.5 per cent. o the farms. An average of abou $5.50 in extra seed cotton was ob tained for each $1 invested in ext potash. The farmers found that the could profitably apply an average o 3½ times as much potash to cotton they had applied in the past.

In spite of the handicaps of excessive rain, boll weevil, and tornado damage, the top-dressed plots averaged more than 1,000 pounds of seed cotton per acre.

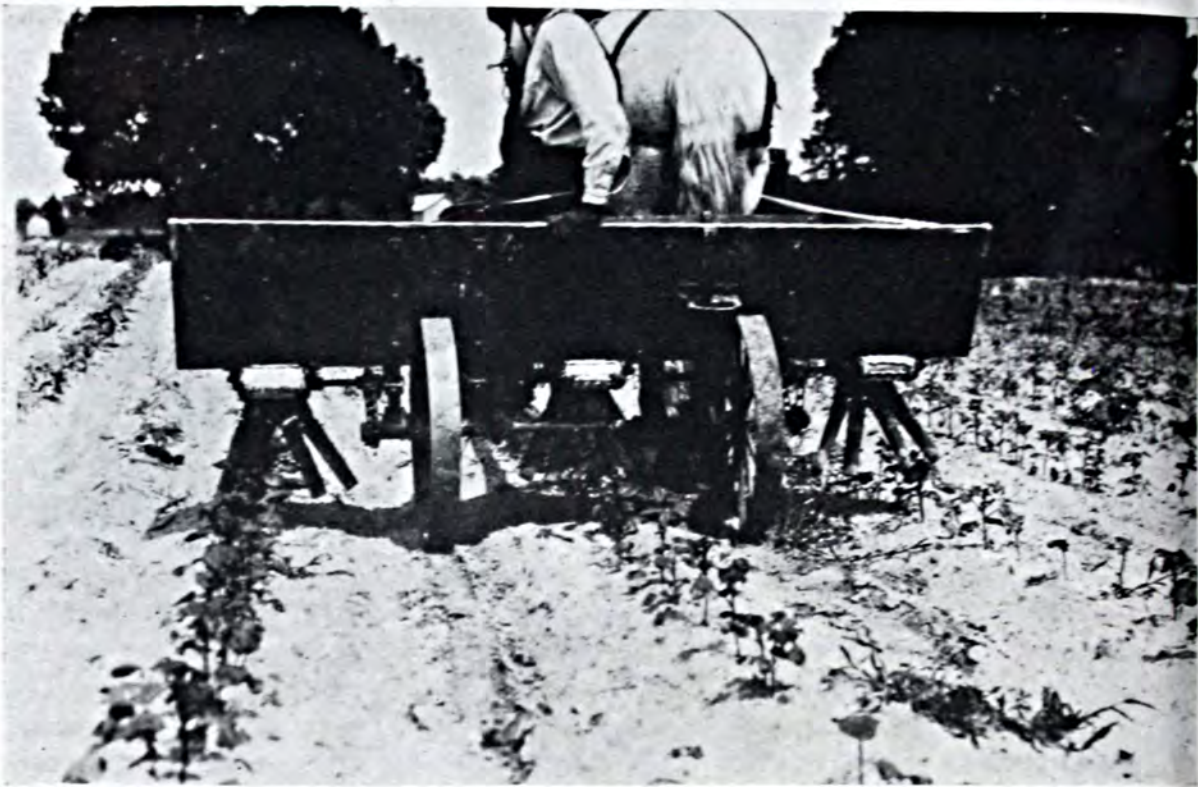
Every effort was made to carry on the demonstrations under average field conditions on average soils. Each demonstration received the same cultivation as the cotton on the remainder of the farm. Two plots of uniform land were selected on which the previous fertilizer treatment and cropping system had been the same. To both plots the farmer applied his regular cotton fertilizer. Just after chopping he top-dressed one plot with potash, the amount varying from 50 to 128 pounds of muriate of potash per acre. On some farms kainit was used.

In most cases the plots were one-half to one acre in size. However, in many instances a potash top-dressed tenant farm of 15 acres of cotton was compared with another tenant farm of equal area and as nearly uniform conditions as possible but not top-dressed with potash. This was done to determine whether or not the potash top-dressing idea was applicable to the average southern farm unit—the tenant farm.

Demonstrations were placed on all of the major cotton producing soils of the South. These varied from clay loams and silt loams to sandy clay loams, sandy loams, and sands. Some demonstrations were on alluvial loams and limestone soils. Potash top-dressing gave good results on all of these soils. In fact it appears from the results that the previous fertilization and cropping of a particular soil has as much influence upon its response to potash as does the soil type itself.

The effect on a soil of previous methods of fertilizing and cropping is illustrated by a demonstration on the Taylor Farm at Summerville, Ga. The soil, a silt loam lying along a stream, had produced corn for several years without being fertilized. When the cotton was planted, 800 pounds of 12-4-4 were applied to three plots. Plot 1 was a check. Plot 2 was top-dressed at chopping with 64 pounds of muriate of potash per acre. At the same time plot 3 was top-dressed with 128 pounds of muriate of potash per acre. Plot 1 yielded 1076 pounds of

This cotton on the farm of Cokers Pedigreed Seed Co., of Hartsville, S. C., has been fertilized for three years with 700 lbs. of 10-3-3 and top-dressed with nitrate of soda and potash. The three rows in the foreground have had their leaves picked off to show how much open cotton is on the stalks throughout the entire field. In spite of the fact that the stalks are fast maturing fruit they are still green and growing, and have not shed their leaves.



Mr. W. T. Moss of Youngsville, N. C. rigged up a new kind of distributor for putting out his potash top-dresser.

seed cotton per acre; plot 2 yielded 1242 pounds; and plot 3 yielded 1746 pounds. Although the cotton on plot 1 received 800 pounds of fertilizer containing 4 per cent potash it began to show signs of rust early and toward the close of the season many immature bolls were noticeable.

A study of the demonstration results shows that on heavy clay soils small additions of potash gave no apparent returns while large applications gave outstanding yield increases.

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Mr. John R. Witt (right), Alabama Master Farmer, examining his 20-acre plot, top-dressed with potash.

Potash *for* Potatoes

By F. L. Musbach

Professor of Soils, Wisconsin College of Agriculture

THE humble tuber ranks high as a source of cash income in Wisconsin. In 1927 the farmers of the State derived 18¼ million dollars for the crop from 260,000 acres, an average of $70.00 per acre. The crop is grown in every county of the State, but the bulk of the surplus comes from a number of developed centers in which the crop is grown intensively. Good cultural practices are followed by these growers. The yields are also considerably higher in these areas, as witnessed by the 10-year average acre yields for 1917-1926:

	Bushels
Average for the State	107.4
Langlade county (N. E. Section)	141.0
Barron county (N. W. Section)	122.1
Waupaca county (Central) ...	115.3

In these sections, represented by the counties enumerated, fertilizers are depended upon to assist in making the better crop yields obtained. In Langlade county in 1928, 2,800 tons, Barron county 600 tons, and Waupaca county about 500 tons were used. While some of this tonnage is used on crops other than potatoes, yet this is the crop chiefly fertilized.

Potato growers are keenly interested in fertilizer analyses, and during the past five years a marked change in not only the kinds, but also the amounts to use, has been brought about. Prior to 1922, the 3-8-6, 3-10-3, and similar ratios were considered "potato specials." In 1922 the popular 5-8-7 was introduced and this brand is at the present time one of the most widely used fertilizers. In 1923, the 3-10-10 was licensed, and in the years following other analyses carrying relatively more plant food per ton have been introduced.

Some of these changes have been brought about by the experiences and results secured in other states. The 5-8-7 came from Aroostook county, Maine, where this brand has been found popular and used to the extent of about 90 per cent of the total fertilizers consumed. In this connection

POTASH MADE MORE NO. I's

No.	Treatment	Acre Yields in Bushels		
		Barron Co.	Langlade Co.	Price Co.
		No. 1's	No. 1's	No. 1's & No. 2's
1	Manure	47.9	182.6	166.3
2	Manure & 4-8-6	135.5	....	....
3	Manure & 5-8-7	143.6	364.7	280.7
4	Manure & 3-8-7	137.4	390.8	301.6
5	Manure & 3-8-10	150.3	434.9	306.0
6	Manure & 3-10-10	168.3	435.5	302.2
7	Manure & 3-12-12	185.8	481.2	....

it might be stated that any particular combination under one set of conditions may not be the most profitable in another section where conditions of soil, methods of farming, etc., may be quite different.

In order that first-hand information might be obtained as to kinds of fertilizers which produce highest yields, trial plots were started in a number of the intensive districts of the state. In the table are indicated the yields for various treatments for 1928 in three of these sections.

Barron County

The field on which this test was conducted had been cropped from 30-35 years. About 10 loads of manure top-drest on clover sod were plowed under. Soil is a silt loam with heavy subsoil. The yield of U. S. No. 1's (Cobblers) on the manured plot is low, due chiefly to the unfavorable weather conditions in the fore part of the growing season. June was decidedly cool and 50 per cent above the average rainfall fell. The plots receiving 500 lbs. of commercial fertilizer in addition to manure, however, were not affected in like manner, though the yields were reduced. Perhaps one of the best insurance policies against loss from the elements is the use of fertilizer, and farmers who were present at the time the plots were harvested appreciated this fact. Each of the various brands were used at a profit even when the increased yield, due to fertilizer, was valued at 30c per bushel—the market price when the crop was harvested.

The table also reveals the need of higher potash analyses under the conditions obtaining the past year, confirming the results obtained on similar soil in the county in 1927. Whether even higher potash fertilizers may be used profitably remains to be worked out in the future.

Five years ago the Almena growers (Barron county) began the use of fertilizers and each year its use has increased. In 1928, 26 carloads wer distributed in the district.

Langlade County

This county is one of the mos intensive potato growing sections o the state. In fertilizer tonnage th county ranks at the top. Th 1928 test plot was on typical An tigo silt loam. The field had bee cropped 30-40 years, was in pastur and manured in 1927, but received n further manure for the crop in 1928 Excellent yields of Cobblers (U. S. No. 1's were secured as indicated i the table. The use of commercia fertilizers at the rate of 680 lbs. i the row has been found profitabl The seasonal conditions were unfavor able as was the case in Barron county and illustrates again the importanc of abundance of quickly availabl plant food when needed in order t secure highest yields. This soil agai indicates a potash deficiency as indi cated by comparing plots 4, 5, and 7 In plot 7 the higher phosphorus con tent also may have been a factor i producing the yield approaching th 500-bushel mark. Whether the potash limit has been reached is an unsolved question. Another pertinent query related to it is whether both the nitrogen and the phosphorus should be increased when the potash is boosted This problem of ratios of plant food is indeed an important one, and much remains to be done in solving it. From the data now available it appears, however, that the potassium content of the mixtures such as 4-8-6 and 5-8-7 is not sufficient for maximum yields. Then too, under our diversified conditions of growing the crop, less nitrogen seems to be required.

Price County

Price county farmers are interested in Triumphs, chiefly, in supplying the Southern seed trade. The crop in 1928 was grown on sandy loam soil, ideal for potatoes. The land has been cropped less than 25 years.

HIGH POTASH MADE BEST YIELDS

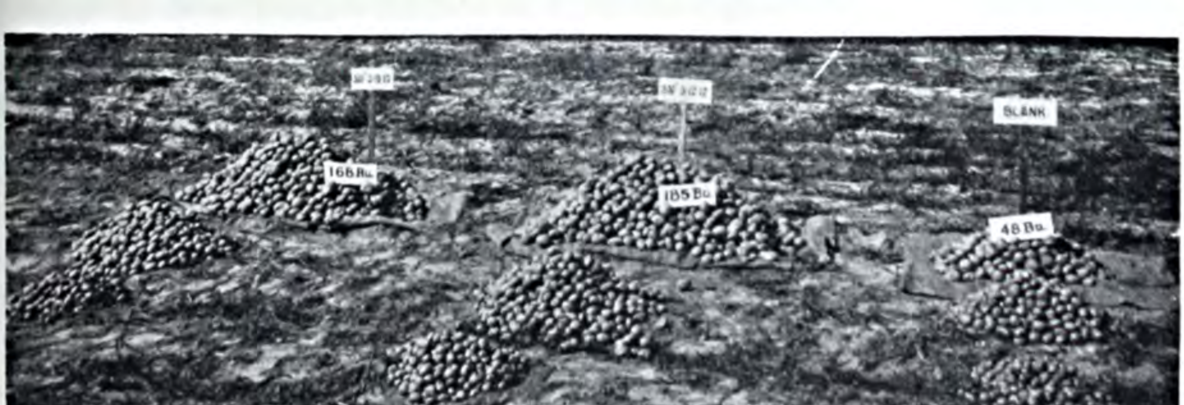
Treatment	Barron Co.	Langlade Co.	Price Co.
Manure	47.9	182.6	166.3
Manure & Medium Potash Av. Plots 2, 3, 4.	138.8	377.7	291.1
Manure & High Potash Av. Plots 4, 5, 6.	168.1	450.5	304.1

and has been maintained in good state of fertility. Clover is grown regularly. In 1927 a good second crop was turned under and 10 tons of manure disced in in the spring of 1928, supplemented by 500 lbs. of commercial fertilizer. In the table is shown the yields of the total crop, both No. 1's and No. 2's. Again it will be noted that the fertilizer supplement with manure served to boost the yields very handsomely. Some inconsistencies appear in the results, yet the results as a whole show the imperative need of supplying plant food with liberal proportions of potash.

In the table above is given a summary based upon the previous table.

In the table 6-7 per cent potash fertilizers have been designated medium, and 10-12 per cent goods as high. These are purely arbitrary terms and further work may show profit with even higher potash analyses. In fact a number of results in the Langlade county district have shown best yields from the use of fertilizers carrying 18 per cent of potash.

In the Barron district the high potash goods showed an increase of 29.3 bushels over the medium, in Langlade 72.8 bushels and in Price, 13 bu. It should be stated that these results are secured from soils which have not been subjected to heavy potash fertilizing. The continued use of high potash fertilizers may in time show less response to potash. This much appears certain, that fertilizer analyses can not remain static. The conditions under which potatoes are grown change. This applies not only to soil, but cultural practices as well. In Aroostook county, Maine, late results secured by the Experiment Station show that higher nitrogen fertilizers are indicated. The Maine growers are now using 5 per cent ammonia materials. It is only by continued study of this problem in the potato belts that worth while information may be secured on this very important phase of the potato business.



The results of three Barron county, Wisconsin, tests. All of the plots received 10 loads of manure. The blank is the manure plot only which yielded 48 bushels of No. 1's per acre. The plot at the left, in addition to the manure, received 500 pounds of a 3-10-10, and yielded 168 bushels per acre of No. 1's. The center plot received, in addition to the manure, 500 pounds of a 3-12-12, and yielded 185 bushels of No. 1's per acre. (See table on page 17.)

New road cuts and ditches are always welcomed by the soil survey man. From these he can obtain the best possible idea of the surface soil, subsurface, and subsoil, the underlying strata, and also the color, texture, and structure of these.

Agriculture Today

V. Soils and Fertilizers

By Frank George

INCREASED farming efficiency through greater production per acre and per man is regarded as one of the notable agricultural achievements of the past decade. In a time of increasingly fierce marketing competition, farmers have striven for lower costs of production through increased acreage yields and mechanized labor.

Fundamental prerequisites of increased crop yields, according to Dr. A. G. McCall of the Federal Bureau of Chemistry and Soils, are a knowledge of the soil and what it can be made to yield. To date, more than half the arable land of the United States has been surveyed for this purpose. Using the soil survey as a basis, the Division of Soil Fertility is engaged in determining the fertilizer requirements of the different soils and the application of these results to different crops and cropping systems.

In the more recently settled sections of the country, Dr. McCall says, the soil survey reports and maps are used largely by new settlers in the selection of suitable farm lands. In the older agricultural sections, farmers are using the surveys in studying the soils of their farms and in planning soil management practices for increased acre crop production. County agricultural agents are using the surveys to advise farmers with regard to specific farm practices suited to the various soil types and soil conditions. Experiment stations and agricultural college workers are using the reports in locating outlying experimental fields.

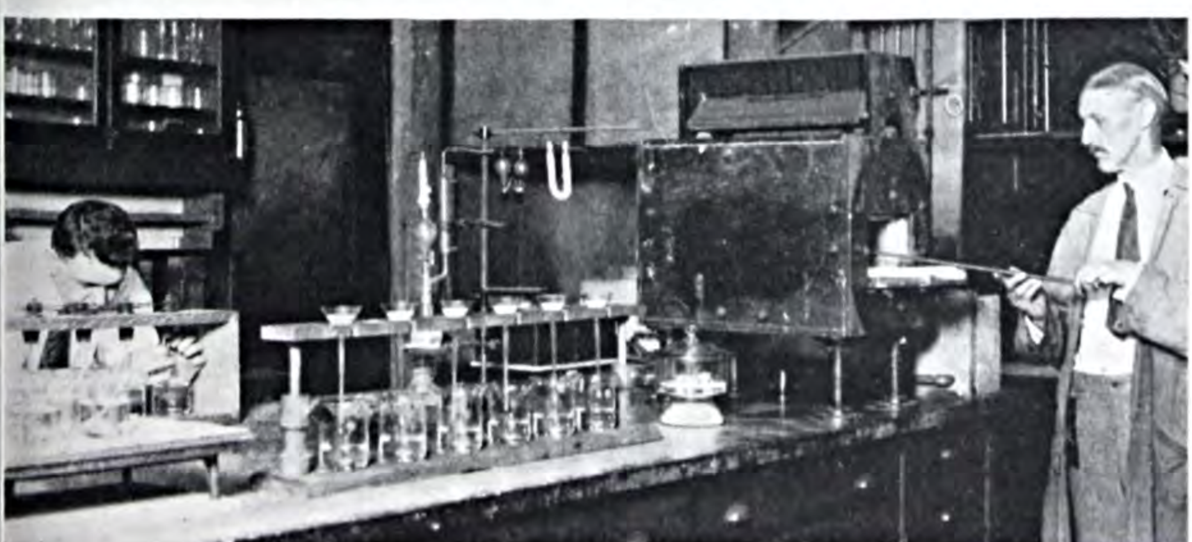
The results of a soil survey recently made of an area in southeastern Idaho tended to discourage the promotion of a proposed irrigation district. Facts brought out in a survey in Eldorado county, California, aided in the identification of lands suitable for the extension of the pear-growing industry. A survey of the Chico area in California has shown that some soils which have decidedly calcareous subsoils are closely associated with a serious physiological trouble experienced the past few years in prune orchards, locally known as "die back."

In southeastern Ohio, hillside slipping of soil and subsoil materials in the extensive Upshur soils of that region has demolished sections of recently laid concrete roads. Field investigations showed the necessity of determining the character of peculiar properties of the soil materials in relation to the proper construction or treatment of highway subgrades in order to prevent future damage to roads under similar conditions.

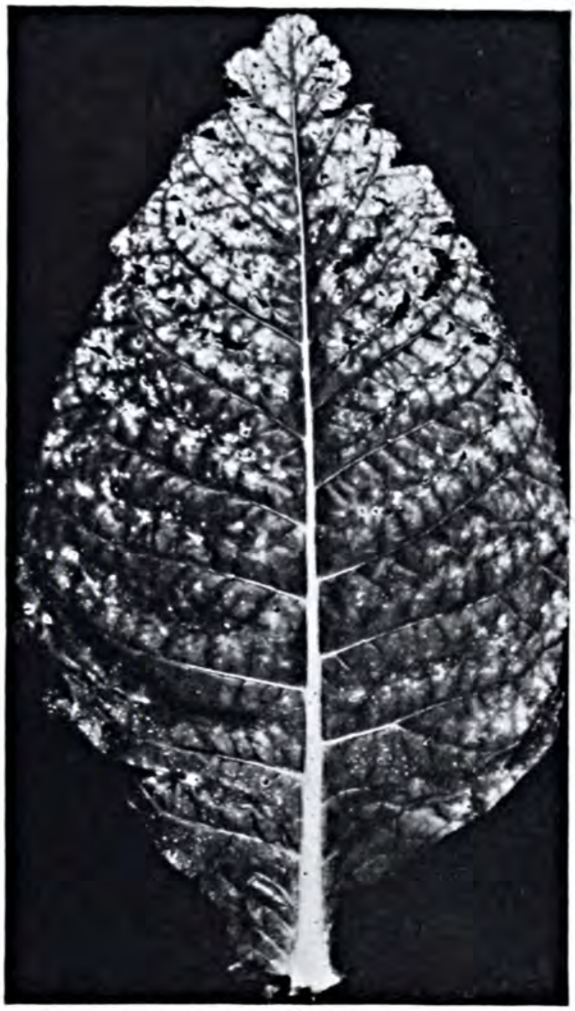
A nation-wide plan looking to the best utilization of American soils has been formulated by Dr. McCall, the basis of which is an inventory of the soil fertility of the country and an accounting of the particular assets and liabilities of the soils by regions and, more intensively, by States. The program includes the completion of the soil survey already in progress, fertilizer research based on the soil survey, a study of methods for the control of soil erosion, and a survey of the soil organic matter of the United States.

The cooperation of the States is urged in this program, in measuring the value of the soils and soil types in practical terms of agricultural production in each of the great soil regions of the United States, long enough to make possible, through accumulated data, the elimination of accidental and temporary conditions which control crop yields.

For better and more effective use of fertilizers, Dr. McCall would divide the agricultural areas of the United States into nine regions on the



A large number of chemical analyses must be made to classify the different soils of the United States.



Leaf of tobacco plant, showing effects of potash hunger, particularly the loss of green color which begins at the tip and margins and advances toward the base. Numerous small yellow or brown specks usually appear in the bleached areas, and these tend to grow together, forming large blisters. The dead tissue eventually breaks, forming ragged edges and holes between the veins.

basis of soil relationships, climate, and agricultural practice, with the scientific data on these regional differences, as recorded in the soil surveys, the foundation for further studies and practical adaptation of fertilizers to soils.

The work of the regional director would be supported in each State in his region, while the State would be expected to furnish assistant agronomists to carry out the State's part of the program. The County Agent would cooperate in the selection of the experimental fields and take the work to the farmers by arranging local meetings and inducing the farmers to visit the experimental fields.

"Under our present economic conditions," Dr. McCall says, "agriculture must continue to depend in a large measure on the organic matter of the soil to supply the nitrogen and the necessary conditions within the soil, and so long as these conditions prevail, soil organic matter will continue to be synonymous with soil fertility." He declares there is an annual loss of 9,000,000 tons of nitrogen from the soil, of which amount only 260,000 tons are now returned in the form of commercial fertilizer.

Soils and Plant Diseases

One important phase of the newer soils research work concerns the relation of soil types to the development and spread of plant diseases. Cooperative work with the division of plant pathology of Texas during the past field season covered a study of the relationship of soil types to root rot of cotton. Preliminary results indicated a definite relation between certain soil types and the development and spread of this disease in Texas.

Recent studies of the chemical properties of soils have shown that laboratory examinations of the exceedingly fine particles known collectively as soil colloids can be used for predicting how soils will behave under given cropping systems and in certain engineering projects, such as road building. Closely correlated with the chemical work, the soil-physics laboratory is making investigations of the important physical properties of the soil, such as moisture relations, aeration, heat absorption, texture, and the physical effects of different amounts and proportions of colloidal material.

A recent study of the use of fertilizers on tobacco is an example of the type of practical soil and fertilizer research now being conducted by the Federal Department of Agriculture. The general conclusion reached in this study was that "it is true that tobacco plants may attain good size when supplied with only comparatively small quantities of potash, but the leaf produced is likely to be of poor quality and perhaps light in weight.

"The plant must develop a large leaf area within a short period of time, and potash is an efficient aid in maintaining the health and vigor of the leaf. Without sufficient potash the leaf begins to lose its normal green color, especially at the tip and along the edges, and soon small specks of dead tissue may appear. The specking may spread rapidly over the leaf, many of the specks uniting to form large spots of dead tissue, and because of uneven growth the leaf surface becomes rough and puckered.

"The tip and edges of the leaf tend to curve downward and often the edges become broken and ragged. The quality of the product is greatly injured when these symptoms of potash hunger develop. Evidence of potash hunger commonly begins in the lower leaves of the plant, but may occur on plants of large size, and in this case only one or more of the middle leaves may show the diseased condition."

In the Connecticut Valley where heavy fertilizing of tobacco is practiced, ample supplies of potash are usually used. In most other sections, and particularly on the lighter sandy soils of southern tobacco-growing districts, the investigators declare, experiments indicate that somewhat more potash than is now generally used would give profitable returns.

"Even where no symptoms of disease are seen," say the Federal experts, "an increased supply of potash may improve the quality of tobacco. A liberal supply tends to give a smooth leaf of fine texture which 'fills out' better in ripening. For smoking

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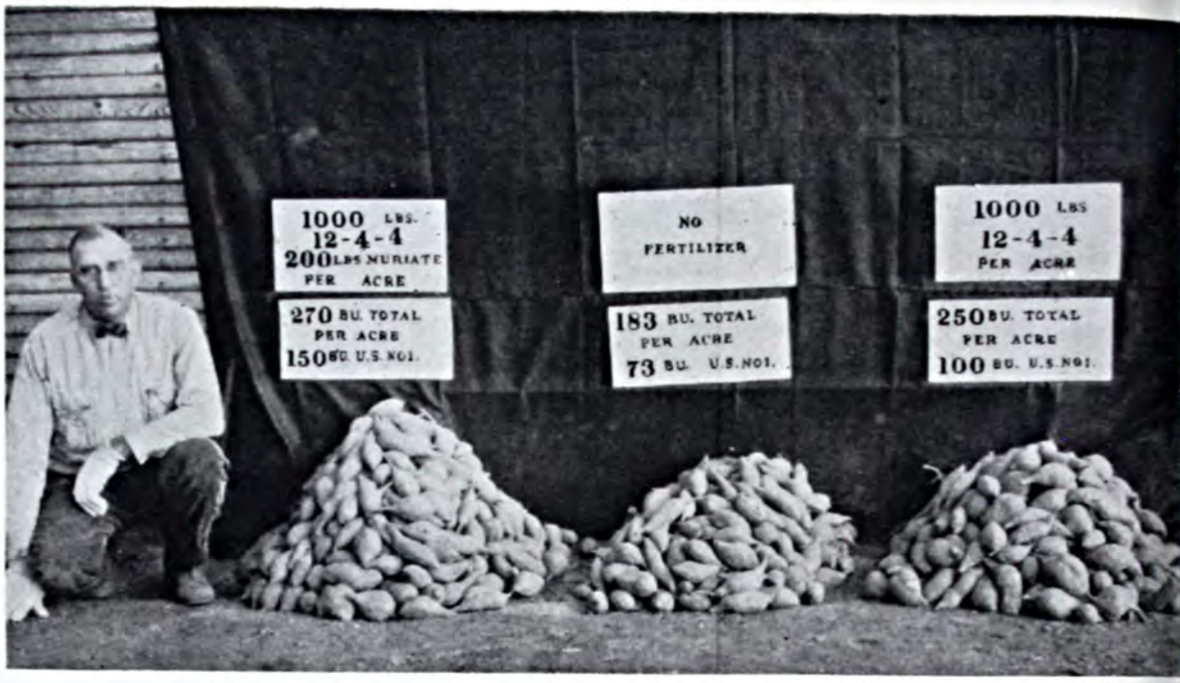
A plant of Maryland tobacco suffering from potash hunger.



Fertilizer made the difference in number of bushels of U. S. No. 1's.

Profits *from* Sweets

By H. K. Thatcher

Former District Extension Agent, Arkansas College of Agriculture

THE element of success in the growing and marketing of sweet potatoes is in being able to produce a large per cent of merchantable potatoes. The cost of production must, of course, be at a minimum, but it costs no more to produce a large number of U. S. No. 1 potatoes than it does to produce the same number of No. 2's. In most cases it is the U. S. No. 1 eating potatoes that bring in the money to the producer, although sometimes seed potatoes can be sold at a good price and the culls can be fed to livestock with profit. Most growers depend upon the eating potatoes that they can sell for their profit, and it is to the production of this type of potatoes that our thoughts are directed.

The United States grades for No. 1 potatoes specify, within certain limits, in size and quality of the No. 1 grade. There is such a wide range between the limits in size of the No. 1 grade that the grower who desires to top the market must size his potatoes within the grade. The minimum length of 4 inches and the minimum diameter of 1¾ inches, contrasted with the maximum length of 10 inches and the maximum diameter of 3½ inches, make a grade that is not pleasing to the average buyer. The grower must either separate the sizes within the grade or handle his production in such a manner that he gets uniform size potatoes.

There are other things than uniformity of size to be considered if the potatoes are to meet the grade requirement and present a pleasing appearance to the buyer. They must be smooth of skin, regular in shape and free from any serious defects or diseases. In a word every potato must be in such a condition that there is no waste when cooking and eating.

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Corn Chlorosis

By J. P. Jones

Research Professor of Agronomy, Massachusetts Agricultural College

A STRIPING of the leaves, the tissue between the veins turning yellow, the tissue immediately surrounding the veins remaining green, these briefly are the symptoms of magnesia hunger in its early stages on corn.

In the later stages the symptoms become more magnified, with the intervascular tissue losing practically all its color and finally turning brown as it approaches death. The yellowing spreads to include most of the vascular tissue.

In the quite severe cases the leaf appears with both the vascular and intervascular tissues near the border of the leaf brown and lifeless. Further removed from the border toward the midrib, only the intervascular tissue is brown and lifeless, the veins still retaining some of the green and yellow pigments. In the section nearest the midrib the intervascular tissue is yellow, still showing evidences of life, while the veins appear normal green in color. The final results of these disturbances in chlorophyll formation are early maturity and depression in yield.

Soil fertility men have not paid much attention to magnesia hunger on crop plants. This has been due to the fact that the amount of available magnesia contained in the soil, together with that added from time to time in the form of lime, sulphate of potash magnesia, and vegetable organic fertilizers, have been sufficient to supply the magnesia needed for most crops. The case described here occurred on one of the old fertilizer test fields at the Massachusetts Experiment Station and illustrates that unless magnesia is added in some form, its deficiency in the soil is likely to show itself in time.

Garner and his associates* have reported a similar case of magnesia starvation on tobacco to that observed at the Massachusetts Experiment Station on corn. They observed magnesia hunger, or sand drown, to be prevalent in many of the tobacco fields of the South and also in those of the Connecticut Valley. The leaf symptoms of sand drown are very similar to those of magnesia hunger on corn. The reason they appear quite different is due chiefly to the difference in the distribution of the vascular and intervascular tissues characteristic of the two types of plants. In tobacco the leaf is of greater economic importance than in corn and consequently injury to the leaf may be more serious The injury to the tobacco leaf generally affects quality more than yield. With corn the yield of grain is the principal economic character affected.

The field on which the chlorosis of corn was noted had been used about 30 years for a fertilizer test. The test consisted of a comparison between two types of complete fertilizer, one relatively high in potash and low in phosphorus, and the other relatively high in phosphorus and low in potash. The materials used were practically free of magnesia. The cropping system consisted of two years of corn followed by two years of hay. Although manure was a by-product of this system,

* Garner, W. W.; McMurtrey, J. E.; Bacon, C. W.; and Moss, E. G. Sand Drown, a Chlorosis of Tobacco Due to Magnesium Deficiency, and the Relation of Sulphate and Chlorids of Potassium to the Disease. Jour. Agr. Res. 23:27-40. (1923).

Showing variation in degree of magnesia hunger in corn leaves—leaves numbered from left to right: 1, extreme chlorosis; 2 and 3, medium chlorosis; 4, slight chlorosis; 5, normal green—non-chlorotic.

none was applied during the entire period. Lime was used at the rate of one ton per acre of air-slaked lime in 1900; at the rate of one ton per acre of agricultural lime in 1907; and on the north half of the field at the rate of two tons per acre of ground limestone in 1921.

Study to determine the cause of the chlorosis was undertaken in 1924. Preliminary observations showed the chlorosis to be confined chiefly to the south half of the field. The north and south halves of the field had been given the same treatments with the exception of the lime applied on the north half in 1921. The apparent reduction of the chlorosis by the use of lime suggested the possibility of aluminum toxicity being the cause. Lime had been shown by the Rhode Island and other work to be a corrective for aluminum toxicity. In further support of the aluminum hypothesis, the chlorosis was noted as being strikingly similar to that obtained by Hoffer* when solutions of aluminum salts were injected into the corn plant.

The possibility of a disease being a factor in causing the chlorosis was also given consideration. Observations were made and no disease that might be considered the casual agent was found.

The chlorosis appeared to be a response due to the lack of some essential nutrient. The commonly deficient nutrients, nitrogen, phosphorus, and potassium, were adequately supplied in the fertilizer applications. In view of the work of Garner and his associates with tobacco, magnesia was suspected as being deficient. The conditions which were described as favoring sand drown were quite comparable to those under which the chlorosis of corn developed. The lime applied in 1921 contained about 5 per cent magnesia. This suggested another possible explanation of the effects of lime on the chlorosis.

In attacking the problem, attempt was made to show that the lime either prevented the chlorosis through counteracting aluminum toxicity or

* Hoffer, G. N.; and Carr, R. H. Accumulation of Aluminum and Iron Compounds in Corn Plants and Its Probable Relation to Root-rots. Jour. Agr. Res. 23:801-823. (1923).

Table 1.—Influence of Lime and Magnesium Sulphate on the Proportion of Chlorotic Hills.

Treatment	1924 Per cent	1927 Per cent	1928 Per cent	Average Per cent
Limed	1.40	4.18	17.21	7.60
Unlimed	65.33	80.16	90.12	78.54
Magnesium sulphate	22.72	10.79	2.25	11.92
Limed+magnesium sulphate	1.94	2.39	3.38	2.57

hrough furnishing needed magnesia. To do this, cross treatments of magnesium sulphate were made in the field. In the greenhouse corn was grown on soil known to produce chlorosis in the field, treated with chemically pure lime, with magnesium sulphate, with agricultural lime containing about 5 per cent magnesia, and with high applications of superphosphate. Chemical analyses were also made of the chlorotic and non-chlorotic plants taken from the field.

The results of the field work are summarized in table 1 to show the effect of lime, magnesium sulphate, and the combination of lime and magnesium sulphate in overcoming the chlorosis. In order to evaluate the effects of the different treatments, counts were made of the chlorotic and non-chlorotic hills. Four plots were averaged each year to give the figures shown in the table.

In 1924 when lime was used, the proportion of chlorotic hills was so small as to be negligible; in 1927 there was a slight increase; and in 1928 there was a very noticeable increase. If lack of magnesium be the cause of the chlorosis, the increase of 1928 is what might have been expected. The magnesia applied in the lime about eight years before was probably becoming exhausted. In cases of low available magnesia, heavy rainfall, such as that of the growing season in 1928,

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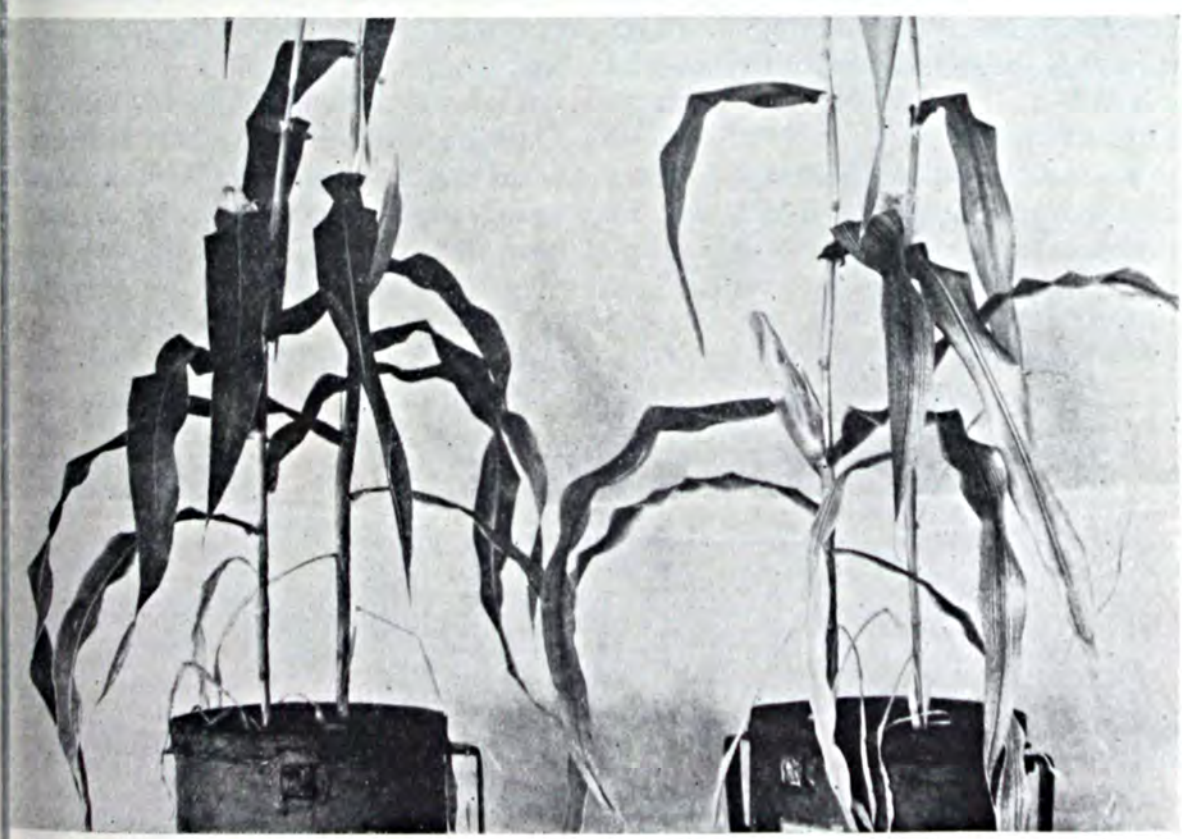

Soil taken from chlorotic area in field. To the pot on the left 400 lbs. per acre of magnesium sulphate were added. The pot on the right received no magnesium sulphate.

Mr. Peckham plowing down rye to enrich the soil of his "Garden in the Woods."

Farming Without Manures

By A. E. Wilkinson

Professor of Vegetable Gardening, Connecticut Agricultural College

WITH the increased scarcity of stable manures and the ever rising price of this commodity, gardeners are faced squarely with the task of raising vegetables without natural manures. How this is being solved is being demonstrated in the work of a number of men in New England.

One of the best examples is that of a friend of mine named Frank E. Peckham of East Norwich and Preston, Conn. I say East Norwich and Preston because Mr. Peckham lives in East Norwich, but the farm I wish to talk about is located six miles away in Preston.

Six or seven years ago, Mr. Peckham found in a wooded section of Preston 24 acres of pasture and meadow which had particularly valuable features for vegetable raising. There were some brush on this land and some trees; some of it was in a very high state of cultivation. These were the bad features. Very few men, therefore, would have selected it for vegetable raising. The good features were a sandy loam with a very high water table, land which was level easily cultivated, without stone, and a location that was ideal because very few could find it as it was more than one-half mile from a state road through the woods and not near neighbors.

This was too far away for Mr Peckham to draw stable manures. Since he had given up the use of horses and the family cow, no manures were available from home sources, and he said he would not buy. I am sure that not one pound of stable manures has been used on this farm during the period of Mr. Peckham's ownership.

There were a few spots on this farm, so low that water would stand in them after heavy rains, that needed draining. About 1,500 ft. of tile were placed in these low areas, and adequate drainage was given.

The first year the trees were taken out, the brush cut and burned, and the entire soil plowed, harrowed limed, fertilized, and a soil improvement crop planted. Buckwheat was

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Record Tomatoes

By G. R. Cobb

Salisbury, Maryland

THE average yield of canning tomatoes on the Eastern Shore is about 200 baskets (5/8 bushel) or 3-1/3 tons. But the Smith family, Allen, Maryland, well-known truckers, far surpassed this yield when they produced 5,154 baskets on 10¼ acres. This is an average of over 500 baskets per acre or more than twice the average yield on the Shore.

Instances are numerous where larger yields have been secured from individual acres, but so far as any record can be obtained, this is the largest yield ever produced on a piece of land more than 10 acres in area. It is much easier to produce a large yield on one or two acres than it is to raise a similar amount on large areas.

In talking with Marion Smith, the fact was brought out that he and his co-workers believe that tomatoes need much more potash than is being used by the rank and file of growers. On this particular piece of land a mixture analyzing 4 per cent nitrogen, 8 per cent phosphorus and 10 per cent potash was used direct on the tomato crop; but the field received, during the season, 600 pounds of a 5-8-5 mixture, the same amount of a 6-6-6 commercial fertilizer plus 600 pounds of the 4-8-10 mixture.

This 10-acre plot was first planted to beans and before the beans were harvested tomatoes were set between every other row, thus following the "companion cropping" method which affords more than one crop on the same piece of land at the same time. Before the beans were planted, 600 pounds of a commercial fertilizer mixture analyzing 5-8-5 were applied, and later on during the growing season a like amount was used as a side or top-dressing, but this was higher in nitrogen and potash for it analyzed 6-6-6. Thus up to this time the land received 66 pounds of actual nitrogen, 84 pounds of phosphorus, and 66 pounds of actual potash, equivalent to

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Here are 18,000 baskets of tomatoes ready for the use of a Maryland cannery.

The South's Convention

By R. H. Stinchfield

UNDER sunny February skies, 1,500 agricultural workers from all ove the South gathered in Houston, Texas, February 5-7, to discuss thei problems, make plans for the future, and pay tribute to the pioneers in exten sion work. The meeting will be recorded as the 13th Annual Convention o Southern Agricultural Workers. It was more than that for it was the Silve Anniversary Celebration of Cooperative Demonstration Work.

The oldest member in point of service, George Banzaff, Milam county, Texas, who is accredited with the longest period of unbroken service of any county agent in the United States, was present to meet and shake hands with the youngest members. Mr. Banzaff, who began his work in 1908 in Milam county, is still serving that county as farm agent, a fine record of efficient cooperation.

Everyone seemed to know everyone else, and the most cordial spirit prevailed throughout the three-day meetings. As one correspondent saw it, "Bronzed agents, decked out in big hats of the Panhandle-Plains region, mingled with dapper county agents from Kansas and the eastern states. Grizzled veterans of the early work in Texas swapped experiences with the younger men and women agents who are on the firing line today spreading the doctrine of sound agriculture." High officials of the United States Department of Agriculture and directors and specialists from 22 states were registered among the delegations which made up the official attendance. The Cotton states were probably best represented as would be expected since Southern agriculture is so closely built around King Cotton.

Honor Dr. Knapp

A dominant note of the general sessions was the tribute to Dr. Seaman A. Knapp, the grand old man of Southern extension work. To Dr. Knapp was given much of the credit for the present efficiency and impor tance of demonstration work. Al most every speaker, with reverenc and pride, referred to the untiring ef fort of this pioneer worker.

The Ten Commandments of Farm ing upon which Dr. Knapp built hi work were reviewed and accorded a safe and sound today as they were 2 years ago:

1. Prepare a deep and thoroughl pulverized seedbed, well drained; breal in the fall to a depth of 8, 10, or 1 inches, according to the soil, with im plements that will not bring too mucl of the subsoil to the surface.

2. Use seed of the best variety intelligently selected and carefull stored.

3. In cultivated crops give th rows and the plants in the rows space suited to the plant, the soil, an the climate.

4. Use intensive tillage during th growing period of the crops.

5. Secure a high content of humu in the soil by the use of legumes barnyard manure, farm refuse, an commercial fertilizers.

6. Carry out a systematic cro rotation with a winter cover crop o Southern farms.

7. Accomplish more work in day by using more horsepower an better implements.

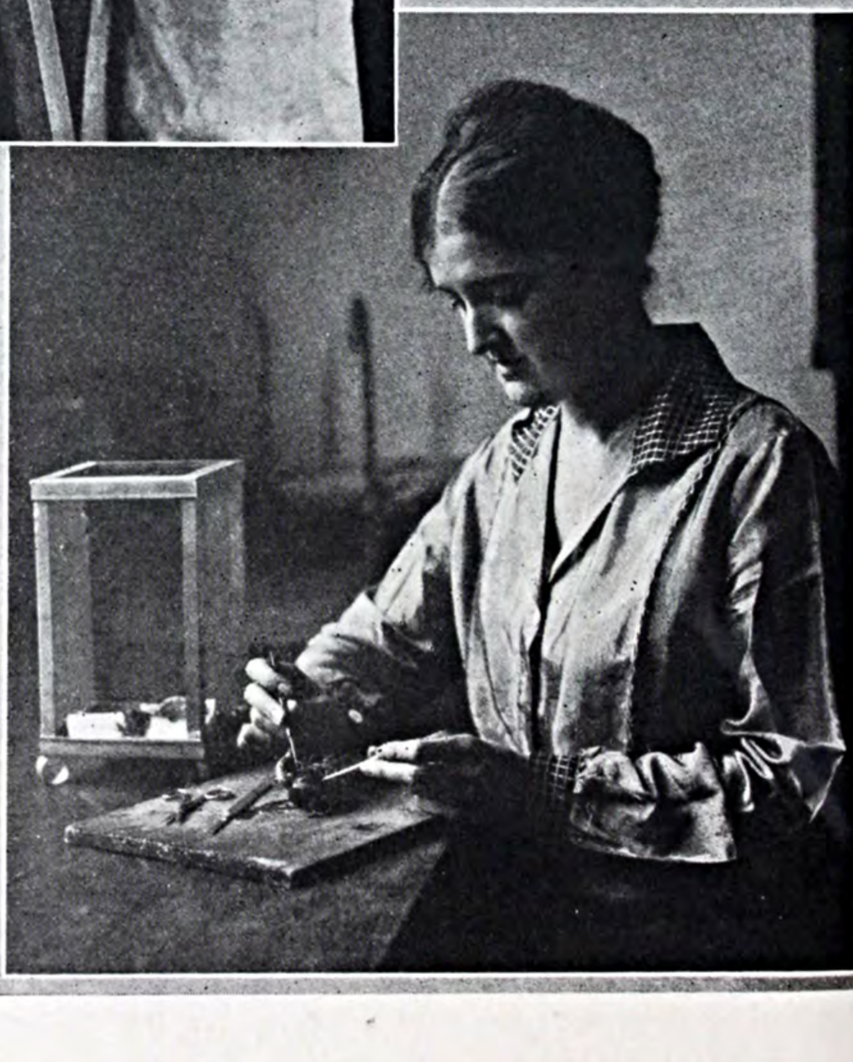
8. Increase the farm stock to th extent of utilizing all the waste prod ucts and idle lands of the farm.

(*Turn to Page 54*)

Look out, below!

PICTORIAL

Left: The American mule did not have its origin in Missouri as a great many people suppose. The mule population in this country was started by a Spanish jack presented to George Washington by the King of Spain and now thousands of mules are exported annually to Alfonso's country. This year the U. S. Department of Agriculture is putting on a big exhibit at the Ibero-American International Exposition at Seville, Spain, and one of the decorative features of a section of the exhibit is a model of the royal ancestor of the American mule. The picture shows Mrs. Margaret R. Roller of the Office of Exhibits, U. S. Department of Agriculture, putting the finishing touches on the model.



Right: Miss Eloise Cram belongs to the rather small group of women scientists. She is one of the helminthologists of the Bureau of Animal Industry, U. S. Department of Agriculture. In case you don't know what this particular "ologist" is, her work has to do with the internal parasites of animals. The results of her investigations are known to parasitologists in many countries.

Right: Stanley P. Young of the Biological Survey, U. S. Department of Agriculture, who has charge of the Government predatory animal hunters. Each pin on the map shows the location of a hunter. Mr. Young, too, was once represented by a colored pin.

Below: A committee from the U. S. Department of Agriculture viewing an exhibit of new seedling potatoes developed by the department, some of which are resistant to mosaic, leafroll, late blight, and other potato diseases. Left to right: Dr. L. C. Corbett, principal horticulturist; Dr. E. C. Auchter, principal horticulturist in charge, Office of Horticultural Crops and Diseases; Dr. Wm. Stuart, in charge of potato investigations; Dr. A. F. Woods, director of scientific work; Dr. C. F. Clark, associate horticulturist in potato investigations, who grew these potatoes at the department's trial grounds at Presque Isle, Maine.

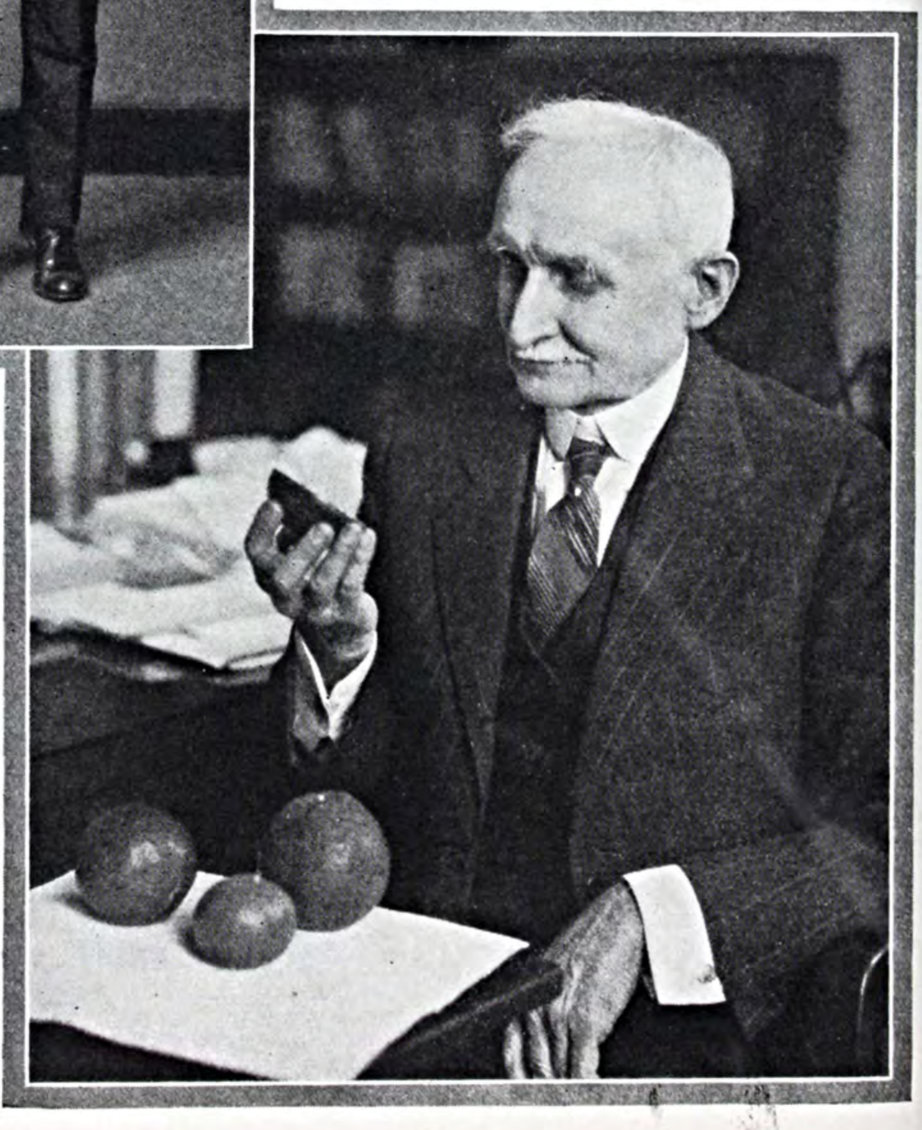
Scene in a cornfield showing the work of the stalk cutter and corn borer destroyer, a machine that i[s] equipped with a rapidly rotating cutting drum which tears the cornstalks into inch lengths.

The machine, which was invented by David E. Ross and constructed by the Agricultural Engineering Department of Purdue University, is expected to do much to help keep the corn borer in check.

The winners in a Hoosier pest extermination contest in which some 300 youngsters were enrolled. It is figured that the saving to the state's taxpayers as a result of the crusade is more than $507,000. yearly.

Farmers at Pine Village, Indiana, welcoming the Limestone Special which distributed 33 cars of limestone at one time to the farmers of Fountain and Warren counties.

Left: This man is not attempting to do away with himself. It is Post Office Inspector D. F. Angier, demonstrating a halter-like apparatus which the manufacturer had been selling to gullible "shorties" who long to be longer. The manufacturer no doubt had visions of becoming a financial giant, but a fraud order from the Post Office Department put an end to the business.



Right: Tasting is a method of determining differences that is as old as man, but nevertheless it is used extensively by scientists in the U. S. Department of Agriculture. Here is Dr. W. A. Taylor, chief of the Bureau of Plant Industry. tasting some oranges developed from introduced varieties.

The Editors Talk

Fertilizer Prices

Well distributed prosperity for all social groups is pretty largely founded on a right price relationship between a long and varied range of commodity prices. Marked changes in price for any given commodity are usually followed by changes in the relative prosperity of different groups. The farmers, of course, have been the largest group most affected in recent years by adverse price relationships.

A concrete and most instructive instance of this is brought out in the field of fertilizer prices as published in the reports of the Pennsylvania Department of Agriculture. These reports give the selling price per ton of the fertilizers and fertilizer materials collected by the inspectors.

From this data the average retail price of muriate of potash in Pennsylvania, 1910-14, was $45.62 per ton. But for the five years, 1923-27, the average retail price for muriate of potash was higher, namely, $48.01 per ton. At the same time that the retail price was higher, the wholesale price was lower. Why? The reason is quite simple. The costs of distribution from ports and factories to the farmers have increased. Distribution costs are primarily freight rates and wages. Freight rates are practically twice prewar. Weekly earnings of some factory workers for 1923-27 averaged 228 per cent of prewar. During the same period the index number of the cost of distributing food averaged 185 per cent of prewar. The percentage increase in the cost of distributing fertilizers has been about the same as the percentage increase in cost of distributing food. The important and significant point is that high wages have added, not only to the cost of manufacturing and mining fertilizer materials, but also to the cost of distribution to the farmer. The same general trend applies to other fertilizer materials.

Therefore, in territories where the farmer is now paying more for fertilizers than in 1910-14, he is not necessarily paying added profits to manufacturers and mixers, but he is paying for the increases in urban wages and freight rates.

The surprising thing is not that retail prices of fertilizers may have increased a little over prewar; the surprising fact is that the prices are as low as they are.

Progress in Research

The price of progress is research. The sooner our civilization decides to increase the price, the quicker will be our progress.

Too little credit is accorded research; too little recognition given to the patient worker who obscure in his laboratory gets his life's satisfaction from the service which he is rendering civilization. True, we have our Edison, Marconi, Einstein, and others whose works are watched and heralded on the pinnacles of fame. But what about the hundreds, sincere and ready to devote their best efforts to countless problems if our civilization will but pay the price of research?

America's phenomenal expansion during the past generation has not been in political influence and power alone. It has included almost every human activity. The many significant discoveries and inventions which have contributed so much to our knowledge and comforts are but the fruits of research.

Through science mankind has been freed from the slavery and drudgery of labor. Every industry should have its highly efficient research organization. Agriculture, that most basic of all industries, has felt the influence of the research mind. The chemist has worked his miracles in this field. Pure food regulations, the recovery of valuable products from waste products of the farm, chemicals for disease and insect control, plant food requirements in our soils, these and a hundred others are the product of his efforts. However, it does not need much thought to realize that the surface has just been scratched and that there are as many more problems challenging the time and effort of inquisitive minds.

The story of science is that of Man ever fighting to conquer Nature. With science Man has a powerful weapon with which to fight. Once a victim of Nature's whims, today he can almost be the master. His success depends upon his knowledge of science and his ability to make practical use of such knowledge. The farmer who makes use of scientific knowledge outsteps the one who does not. But Agriculture needs to catch up and get in step with the other industries.

Progress in research means moving forward—advancement. The problems of keeping pace with the demands of industry demand increased activity in the research field. Only by progress can industry be assured the security of its dividends. Progress we must have or else fall into a state of social, intellectual, political, commercial, and agricultural decay. The power and world influence of nations will surely pass with the passing of national resources, for poverty is helpless and ignorance is the inevitable result of poverty.

The price of progress is research.

Green Gold

The greatest need of the American livestock farmer is better utilization of his land resources to the ultimate realization of bigger returns for labor and investment.

One step leading to better and more profitable production of livestock is the improvement of our native pastures. Our pasture lands are not adequately fertilized. Our soils have deteriorated and expenditures for feed increased to a point seriously threatening the dairy and livestock industry.

Continuous removal of plant food in meat, milk, and wood has impoverished much of our pasture acreage to the stage of utter starvation. Undesirable grasses, weeds, moss, and brush have taken possession, and pastures once capable of supporting one cow or animal unit per acre, now require anywhere from 5 to 25 acres for each animal unit.

European farmers are far ahead of American farmers in the management and care of the pasture lands. Their success has been due largely to intelligent use of balanced fertilizers. Statistics record that the number of acres required to support one animal unit in the following countries are: Belgium .91, Great Britain and Ireland 2.65, Germany 1.24, Denmark 1.46, and Holland 1.60. What these countries have done certainly should be possible in this country.

There are approximately 231,000,000 acres of humid grassland pastures in the United States, and more than 80,000,000 animal units. These animal units are an economic resource only in so far as they can be efficiently fed.

Green Gold, a film strip issued by the National Fertilizer Association, portrays in a most convincing manner the possibilities for pasture improvement in the New England states. The same fundamental problems exist in other regions. The solution of these pasture problems are vital to the stabilization of the livestock industry and American agriculture. Properly handled, our poverty stricken pastures will turn *Green Gold* into *Real Gold.*

A National Challenge

No better statement of the obligation of our present generation to the welfare of the generations to follow is to be found than a recent statement by Glenn Frank, President of the University of Wisconsin. We hear a great deal about reforestation and the conservation of our other natural resources; we hear, and that is about as far as the matter goes. President Frank challenges our intelligence and places upon everyone, and especially upon the farmer, an obligation to see that the resources of our American continent which are the basis of our culture, are not exploited to the extent of robbery from the civilization which must follow. President Frank states his challenge as follows:

"One cannot touch even lightly the conservation problem without a sense of coming into the presence of one of the nation's really fundamental problems that touches the lives of all of the people of the State.

"The conservation movement is primarily a symbol of the fact that, in Wisconsin specifically and in the United States generally, we are today in the twilight zone between the exploitation of the American continent and the enrichment of an American culture, using the term culture in a broad sense of the whole fabric and feel of our common life.

"We must, if we are to do more than play at conservation, substitute stable and scientific agriculture for an unintelligent raping and ruining of the soil; we must substitute intelligent forestry for mere timber slashing; we must dress the land that we have deflowered. To date, we have been little more than salesmen of our natural resources; today, we are challenged to become statesmen of our natural resources! This, as I see it, is the real challenge of conservation, and it will involve a sweeping reform of the American mind, as well as reforestation of our denuded areas."

Speaking of Leaders

Leaders are found and not made, as most successful country agents and extension men have already found. Every county agent who has succeeded has done so largely because he sought the active cooperation of the natural leaders of his county.

Most of the men who have failed when placed in positions of leadership in agriculture have done so because they have felt that their bounden duty was to become the big show. They have not taken into consideration the value of cooperation with the natural leaders in the community.

It is not always easy to discover these forces. They may be uncouth or they may be cultured, old men with a great deal of experience or young men who by pure dint of personal magnetism, physical prowess, or mental keenness have gathered a following. Nevertheless, it is well worth the while of any one who would be an influence in agriculture to seek and become acquainted with these natural leaders.

No paid agriculturist is worth his salary except for his ability to marshal the natural leaders of his section into a tug-of-war team which will pull for those things which mean improvement.

Many a cooperative has failed because the support of the real leaders of the community was not solicited. Many a small local has discontinued operation because more thoroughness was not put into its canvass for membership. It is well then for every leader to remember that the more natural leaders that he can enlist in his cause, the greater will be the chances of its success.

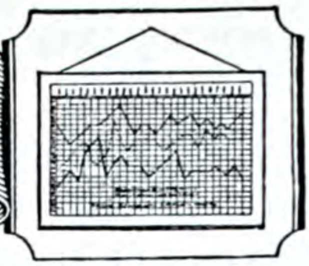
JEFF wants his readers to send him some topics to write about. He hasn't run out of ideas—not by a long shot. He feels, however, that it might be more fun to write something for some one in particular. If you have an idea which you would like to have Jeff discuss, send it along to him, addressed in care of this magazine.

HOW BIG IS AN ACRE OF LAND?

I ONCE asked an old gardener how much land he had and he said with pride that he had one acre; and he added, "It is a wonderful acre; it reaches to the center of the earth in one direction and it takes in the stars in the other." This man's farm included not only the pot of gold at the end of the rainbow, but it contained the entire rainbow.

The size of an acre of land varies directly with the size of the man who manages it. The larger the man, the larger the acre. I do not know that anyone has yet determined how large an acre of land really is; but judging from the size of a plant that a woman grows in a potful of soil, it must exceed all calculations that have yet been made. . . . A man is not the best farmer until his acre grows larger every year, in produce or in serenity or in both.—Dr. Liberty H. Bailey in "The Harvest."

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

HEN HAS SWEET TOOTH

Some experimental work and the experience of poultrymen in Vermont show rather good results from feeding cane molasses to chickens. A. W. Lohman, extension poultry specialist of the University of Vermont, says it makes unfavorable conditions for the development of bacterial troubles in the small intestine. Most of the poultrymen are feeding the molasses in the dry mash, about 4 per cent bringing the best results. Some flock owners are using it in liquid milk with good effect. It can be used with water in making a wet mash. When fed to laying hens it has a tendency to increase egg production and seems to improve the general health and appearance of the flock. The experimental work shows that in all-mash starting and growing rations 5 per cent of cane molasses is best.

HUNT FROST-RESISTANT SPUD

Because of frequent losses of potatoes on peat land, which is subject to many summer frosts, vegetable breeders of the University of Minnesota have set about finding or developing a hardy spud that will shake off these light frosts and push on to the production of a profitable yield. It's an important job these plant men have before them, for the State has all of 9,000,000 acres of peat lands, most of them now idle. It is easier to maintain the productivity of peat lands than other lands in the State, and yields in seasons when summer frosts did not get the crop have been two and three times as much as on other soils. About 100,000 potato seedlings are to be tested in cold chambers at the University to see if there are any that will withstand temperatures 4 or 5 degrees colder than present potato varieties will stand.

"JUICE" AIDS THE DAIRYMAN

The increasing use of electricity on the dairy farm was emphasized recently by T. E. Hienton of Purdue University in an address to the annual agricultural conference. He listed the following uses: milking cows, separating milk, pumping water, shelling corn, grinding grain, elevating hay, filling the silo, husking, shredding, washing bottles, refrigeration, lighting, heating water, and pasteurization by running a current of electricity through the milk.

HIGH YIELDS FROM HYBRID CORN

Ordinary field-selected, open-pollinated seed corn was far behind hybrid seed of inbred strains in producing yields in Iowa last year. This repeats previous results in the state-wide corn yield contest. In the northwest district a hybrid entry yielded 110 bushels to the acre. In the central district of extreme southern Iowa two hybrid entries each produced 120 bushels an acre. The best yield for the open-pollinated corn in the northwest district was 94 bushels, and in the central district of the extreme south the best this ordinary field selected seed did was 106 bushels. Throughout the 12 districts into which the State was divided, the hybrid seed beat the open-pollinated by from one to ten bushels an acre. In two preceding years about the same results were obtained except in one district.

SLOW FEATHERERS DON'T GROW FASTER

That slow-feathering Rhode Island Red chickens grow faster than chickens that feather faster has been a popular belief. But the Experiment Station of the University of New Hampshire says this belief is contrary to the fact brought out by a series of tests. The experimenters divided a group of 1,016 fifteen-day chicks into two groups, one of slow featherers and one of rapid featherers. At the end of the test the rapid feathering chicks averaged .2034 of a pound apiece, while the other group averaged .2003 of a pound. When the chicks became pullets and cockerels 65 days old the rapid feathering pullets weighed .36 of a pound more than the slow feathering ones, while the rapid feathering cockerels weighed an average of .20 of a pound less than the slow feathering ones. Similar results were obtained from a second test.

CROPS DAMAGED BY OILY DUST

Dust from oiled dirt or gravel roads injures crops near the highway, according to James Johnson, horticulturist at the University of Wisconsin. Tobacco, potatoes, and the common garden crops are easily damaged, while corn and small grains have proved resistant. The bad effect of the oil dust sometimes extends as far as 100 feet from the roadside. Growth of the plants is checked by leaf damage which seems to stop the development of the web while the veins continue to grow and "growth cracks" form. It is thought that some of the damage may be the result of toxicity of the oil. When roads are thoroughly oiled, little dust forms and the damage is not noticeable; skimpy oiling doesn't stop the dust, but merely tinges it with oil.

COOPERATIVE SPREADS NEW FRUITS

With 1,000 members scattered throughout the world, the New York Fruit Testing Cooperative Association, with headquarters at the Experiment Station at Geneva, performs a service to the horticultural world which the station has not always been in a position to render. It propagates and distributes the new fruits originated at the station and offers membership and service to anyone interested in the propagation of new fruits. The Geneva Station has named 95 new fruits, including 32 apples, 8 pears, 4 plums, 2 cherries, 1 nectarine, 19 grapes, 13 raspberries, 1 gooseberry, and 15 strawberries. Fifty of these new ones are now on the market, and the Testing Association has had much to do with bringing this about. This year the association is offering for sale 70 worthy new fruits.

LIME-SULPHUR MAKES FATTER CHERRIES

Wisconsin cherry growers have been using Bordeaux mixture to fight leaf spot. Now experimenters at the University of Wisconsin have concluded that in many orchards it will probably pay better to use lime-sulphur. They have shown that usually the cherries are heavier when the latter spray is used and the increased weight is in the flesh and not in the seed. The gains vary with the season and location and growers must try out both sprays.

Foreign and International Agriculture

Apple Anthracnose

By E. R. Bewell, B. S. A.

District Agriculturist, Courtenay, British Columbia

DURING the summer of 1926, I visited several farmers and fruit nen in this section of the country in egard to the work being done with ertilizers. One outstanding item of nformation which I had gathered rom horticulturists working in orchards along the Pacific Coast to the outh was that by using plenty of potash in an orchard anthracnose of apple trees could be controlled. This was apparently a new idea in the territory which I was visiting, although I was advised that it had been proved 25 years earlier and had been advocated n this section. Apparently, this control measure had been forgotten and pruning and spraying had been the chief method employed in recent years.

I have advocated this old proven method of using potash to build up a hardier and stronger tree that would be resistant to disease, during the past two years, but it was not until the spring of 1928 that I got anybody really interested enough to try it out.

Mr. C. W. Leedam, Courtenay, who s making a specialty of growing flower seeds, bulbs, etc., rented a place close to Courtenay, and asked me to go out to the place and look the trees over. I went and found that I had visited the ranch two years earlier and had advised the owner to apply some potash to the trees. He did not do so, but when I advised Mr. Leedam to apply potash, he told the owner who was still living on the land and he got a 100-pound bag of sulphate of potash and treated all the trees.

When I saw the trees about the end of April, there was one tree in particular that looked as if it were about to die. It was a Yellow Transparent and was out in bloom, and there were no leaves on the tree while all the other trees were in full bloom and out in leaf. The Yellow Transparent looked as if it were nearly dead but was trying to produce another crop before it died. The bark looked dead and was covered with anthracnose cankers with a lot of dead branches in the tree.

The Treatment

The owner of the orchard dug a trench around the trees about five feet from the trunk and put the fertilizer, about five pounds of sulphate of potash, around each tree in the trench, and apparently watered the orchard as he had water laid on. The trees were pruned, taking out dead wood, etc.

I did not see the trees or pay any particular attention to them until Mr. Leedam advised me that the tree so nearly dead, was improving wonderfully and had a crop of apples. I went to see it again and found it had developed a good hardy leaf growth. The bark was greatly improved and there was quite a crop of apples on the tree. There was every indication that the tree had almost completely recovered.

A recent visit to see the tree disclosed very few signs of any new infection of anthracnose and the old scars were healing over, so it appears that we have got hold of a good idea that will help control this disease which is bad on the Coast of British Columbia. At the same time, I feel that this addition of fertilizer will help produce bigger crops of apples of better quality, also that a fair crop can be produced most every year and a big crop occasionally, instead of a fair crop every other year as under present conditions, and practically no crop in the years between.

To follow up this work, I am carrying on this same work in four orchards, but have had part of the fertilizer applied in the fall so that greater results may be noticed during the com ing year. It will take a few yea however, to prove that by using fe tilizer, especially sulphate of potas a bigger crop of better quality fru can be produced annually, on accou of the trees being properly mature healthy, and more resistant to diseas

I might also add that our Coa soils are mostly very acid on accou of a great shortage of limestone. Th are also deficient in potash and pho phoric acid, so it is no wonder fru trees are weak and an easy prey disease. They come to maturity an into production much earlier than i places where cold winters prevail, o account of the mild winters whic greatly lengthen the yearly growin period and practically eliminate a dor mant period.

I have often wished that I had take a photo of the tree so nearly dea last spring, and again with the cro of apples with the tree out in lea The contrast was so great that it wa almost unbelievable.

Profits from Sweets

(*From Page* 24)

There are several factors that influence the production of the type of sweet potato that the market desires. First, they must be free from defects and diseases. The first prerequisite of clean potatoes is to plant only disease-free slips. Only certified slips should be used. Plant them on ground that has not been in sweet potatoes for the past seven or eight years and that does not lie so that water drainage from former potato fields can drain upon it. Even then disease may be in your soil carried there by birds or animals. Second, the potatoes must not be too big in size because the market generally wants a medium potato. Size can usually be controlled by crowding in the row. Usually about 15,000 slips per acre are required, this number giving a slip to every nine or ten inches in the row. Crowding eliminates the jumbos. Third, the physical condition and fertility of the soil have a great deal to do with the production of clean uniform potatoes. Tight clay soil will not permit the production of a sizable smooth potato. Too rich sandy soil will cause large rough potatoes and too thin sandy soil will give a very low yield.

From experiences I have had in past years and from the results of a test plot that I had last year, a reasonably fertile sandy loam or silt loam soil

(*Turn to Page* 49)

REVIEWS

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

ertilizers

The purpose of standard fertilizer commendations is to aid farmers in ie selection of fertilizers best suited their needs and to reduce the unit ost by use of high grade fertilizers. accomplishing this the Fertilizer ispection Service of the University f Maryland has gone a long way in s Control Service Bulletin No. 130. represents in a very practical way ie demands of the users of fertilizers.

"Agricultural Liming Materials," State 'me Inspection Service, University of Mary-nd, College Park, Md., Control Series, No. 29, Nov., 1928.

"The Substitution of Stable Manure by ertilizers, Green Manures and Peat, III," gr. Exp. Sta., Kingston, R. I., Bul. 216, ug., 1928, Burt L. Hartwell and F. K. randall.

"The Mineral Content of Feeds, Soils and 'aters of South Carolina," Agr. Exp. Sta., lemson College, S. C., Bul. 252, Dec., 1928, H. Mitchell, J. D. Warner, and K. S. orrow.

"Pulverizing Limestone on the Farm," Agr. xp. Sta., Knoxville, Tenn., Cir. 23, Dec., 928, F. D. Jones.

"Commercial Fertilizers in 1927-28 and heir Uses," Agr. Exp. Sta., College Station, ex., Bul. 387, Oct., 1928, G. S. Fraps and E. Asbury.

"Experiments with Fertilizers on Rotated id Non-Rotated Crops," Agr. Exp. Sta., Col-ge Station, Tex., Bul. 390, Dec., 1928, E. Reynolds.

oils

"Terracing Farm Lands," Agr. Ext. Service, aleigh, N. C., Ext. Cir. 173, Dec., 1928, T. Holman.

"Value of Lime on Cecil Clay Loam Soil," gr. Exp. Sta., Raleigh, N. C., Bul. 261, Jov., 1928, C. B. Williams, S. K. Jackson, T. Meacham.

"Value of Lime on Norfolk Sandy Loam Soil," Agr. Exp. Sta., Raleigh, N. C., Bul. 262, Nov., 1928, C. B. Williams, H. B. Mann, R. E. Currin, Jr.

Crops

Looking through the new bulletins on crops for special mention of fertilizer practices for this issue, we find that William Stuart of the United States Department of Agriculture, in an article on cutting the cost of potato production, appearing in the January number of the American Potato Journal, has this to say: "But the best prepared seed bed will not give high yields unless the soil has sufficient available plant food. Barnyard manure will supply a portion of this plant food. However, barnyard manure is an unbalanced plant food. It is too high in nitrogen and too low in phosphorus and potash. The best practice usually is to plow under eight to ten tons of manure per acre and to apply a commercial fertilizer rich in phosphorus and potash. The amount to use must be governed by the natural fertility of your soil."

Farmers in the South planning to grow some soybeans and wondering about fertilization of this crop will find information in the revised Extension Circular 127 of the North Carolina State College of Agriculture and Engineering. The title of the bulletin is "Soybean Growing in North Carolina." Outside of its fertilizer recommendations, the bulletin contains a comprehensive treatment of the other problems incident to success with this legume crop which is growing more and more popular.

The new Annual Report of the Director of the Wisconsin Agricultural Experiment Station, Wisconsin bulletin 405, "What's New in Farm Science," points out that potash and phosphate fertilizer added to fields sown to alfalfa greatly increased the ability of the alfalfa to withstand winter-killing. The result of many of the experiments in Wisconsin will be welcomed by farmers in localities where severe winters test the hardiness of farm crops.

Other new crop bulletins of the month include:

"Cotton Spacing—I. Studies of the Effect on Yield and Earliness," Agr. Exp. Sta., Fayetteville, Ark., Bul. 230, *Jan.,* 1929, *J. O. Ware.*

"Linkage Studies in Barley," Agr. Exp. Sta., Fort Collins, Colo., D. W. Robertson.

"Annual Report of the Director," Agr. Exp. Sta., Newark, Del., Bul. 158, *Nov.,* 1928, *C. A. McCue.*

"Pumpkins and Squashes," Mass. Agr. Col., Amherst, Mass., Ext. Leaflet 101, *Dec.,* 1928, Paul W. Dempsey.

"Environmental Factors Influencing Wheat Production in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 297, *July,* 1928, *W. B. Kemp and J. E. Metzger.*

"On the Corn Frontier," Agr. Exp. Sta., Crookston, Minn., Spec. Bul. 120, *June,* 1928, *R. S. Dunham.*

"Experiments with Sugar Beets," Agr. Exp. Sta., Bozeman, Mont., Bul. 215, *July,* 1928, *D. A. Savage and LeRoy Powers.*

"Some Outstanding Accomplishments of the Montana Agricultural Experiment Station," (34*th Annual Report*), *Bozeman, Mont., F. B. Linfield.*

"Systems of Livestock Farming for the Mountain Region of North Carolina," Agr. Exp. Sta., Raleigh, N. C., Bul. 260, *Oct.,* 1928, *R. J. Saville.*

"Available Publications," Agr. Exp. Sta., Fargo, N. D., Cir. 85, *Jan.,* 1929, *F. F. Monroe.*

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"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XIV, No. 1, *Jan.-Feb.,* 1929, *Whole No.* 136, *F. A. Welton and V. H. Morris.*

"Director's Biennial Report — 1924-26,*" Agr. Exp. Sta., Corvallis, Ore., J. T. Jardine.*

"Annual Report of the Western Washington Experiment Station, Exp. Sta., Puyallup, Wash., No. 10-*W, New Series, Oct.,* 1928.

"Blueberry Growing—A New Industry Washington," Agr. Exp. Sta., Pullman, Wa Pop. Bul. 144, *Dec.,* 1928, *D. J. Crowley.*

"Thirty-Eighth Annual Report," Agr. E Sta., Pullman, Wash., Bul. 229, *Dec.,* 19 *Edw. C. Johnson.*

"Tobacco Plant Beds," State Col. of A and Eng., Raleigh, N. C., Revised Ext. Fol No. 8, *Jan.,* 1929, *E. Y. Floyd, E. G. M and James F. Bullock.*

Economics

In Colorado Bulletin 346, "So Colorado Tax Problems," by L. Moorhouse and Burton D. Seeley, cooperation with Whitney Coombs the United States Department of Ag culture, a study has been made of tax system of Colorado with spec reference to agriculture. Among interesting findings it is pointed that in 1918 the general property ta on ranch farms were 22.7 per cent the net rent. For the two years 19 and 1926, the tax averaged about per cent of the net rent.

The increase in the price of app from 1896 to 1910 stimulated ap production in the United States. T expansion was rapid in the West a many trees were planted. Since plantings of this period have come in bearing, the apple industry has been as prosperous. These are some the facts pointed out in Bulletin 2 "An Economic Study of the Apple dustry of Utah, 1926 and 1927," W. Preston Thomas and P. V. Card The authors believe that probably peak of production has about be reached and the future trend will somewhat downward.

Diseases

"Vascular Structure and Plugging of falfa Roots," Agr. Exp. Sta., Fort Coll Colo., Bul. 339, *Oct.,* 1928, *E. L. LeCl and L. W. Durrell.*

"Seed Treatment of Irish Potatoes," A Ext. Service, Raleigh, N. C., Ext. Cir. 1 *Jan.,* 1929, *G. W. Fant.*

"Spraying Experiments with Bush L Beans," Agr. Exp. Sta., Geneva, N. Y., E 558, *Nov.,* 1928, *E. E. Clayton.*

"Cotton Diseases of Special Importance Tennessee, and Their Control," Agr. E Sta., Knoxville, Tenn., Cir. 24, *Jan.,* 19 *C. D. Sherbakoff.*

Insects

"The Fruit Tree Leaf Roller in Western New York," Agr. Exp. Sta., Geneva, N. Y., Bul. 561, Dec., 1928, S. W. Harman.

"The Bagworms of Texas," Agr. Exp. Sta., College Station, Tex., Bul. 382, July, 1928, Frank Morton Jones and Harris Braley Parks.

Corn Chlorosis

(From Page 27)

has been shown to intensify the symptoms of magnesia hunger on tobacco. Thus the response to the lime treatment indicates that the chlorosis was due to a lack of magnesia.

On the unlimed area there has also been an increase in the proportion of chlorotic hills, but not as marked on the limed area. The percentage of chlorotic hills, however, has always been many times higher and the chlorosis of a much more extreme type.

The observation on the magnesium sulphate plots has been exactly the reverse of that for the limed and unlimed plots. The chlorosis has been getting less each year. In 1928 only 2 per cent of the hills were affected as contrasted with 23 per cent in 1924. The magnesium sulphate, at rates of 200 pounds per acre in 1924 and 1927 and 400 pounds in 1928, was applied in the spring in each instance, within about 10 days of the time of planting the corn. It decreased the chlorosis about 43 per cent in 1924, 70 per cent in 1927, and 88 per cent in 1928. Lime, on the other hand, decreased the chlorosis for the same years by about 64, 76, and 73 per cent respectively. Where magnesium sulphate was used in addition to the lime, the chlorotic hills remained about constant for the three years, averaging about 2.6 per cent.

The effect the chlorosis had on yield is shown in table 2. Considering the average, it is apparent that the yield of corn where magnesia was added either in lime or in magnesium sulphate was increased about 16 to 23 per cent over that on the unlimed area receiving no magnesia.

The yields of corn on the limed and magnesium sulphate plots were very close. The stover yields on the contrary do not show a very great difference between the plots receiving and those not receiving magnesia. The low yield in grain was associated with the high proportion of chlorotic hills.

The work in the greenhouse was designed to clarify that done in the field by answering the following questions:

1. Was the capacity of the lime to counteract aluminum injury in any way responsible for its ability to over-

Table 2.—Relation of the Chlorosis to the Yield per Acre of Corn and Stover.

Treatment	1924		1927		1928		Average		Chlorotic
	Corn	Stover	Corn	Stover	Corn	Stover	Corn	Stover	hills
	Bu.	Lbs.	Bu.	Lbs.	Bu.	Lbs.	Bu.	Lbs.	Per cent
Limed	33.5	1864	38.5	1901	37.0	2112	36.3	1959	7.60
Unlimed	27.2	1749	36.4	1820	25.0	1676	29.5	1748	78.54
Magnesium sulphate	31.4	1826	39.6	1980	31.4	1828	34.1	1878	11.92
Limed+ magnesium sulphate	33.9	1945	37.7	1785	32.5	1879	34.7	1870	2.57

come the chlorosis?

2. Was it the magnesium in the lime that counteracted the chlorosis?

In answering the first question, soil was taken from the chlorotic area of the field and treated in pots in the greenhouse with chemically pure lime and high applications of superphosphates. In the amounts used, both the lime and superphosphate have antidotal effects on aluminum toxicity. But when corn was planted, just as much chlorosis developed as in the pots where neither of these corrective treatments was applied. A determination of pH was made on the soil and found to be about 5.3. Soil with such a degree of acidity, according to the reports of other workers, would not likely contain enough active aluminum to injure corn, a plant naturally very resistant to this toxin.

Further evidence was secured by growing lettuce on soil from the chlorotic and non-chlorotic areas of the field. The lettuce grew equally well on both of these soils. Lettuce is rated as an aluminum sensitive crop and if aluminum were associated in any way with the chlorosis, the soil from the chlorotic area should have shown poorer growth. This, together with the fact that aluminum antidotes had no influence on the chlorosis lead to the conclusion that aluminum was not a factor in causing the chlorosis.

In answering the second question, the pots to which the chemically pure lime was applied were compared with those receiving magnesium sulphate, agricultural lime, and the check. The magnesium sulphate completely overcame the chlorosis; the agricultural lime did almost as well; but the chemically pure lime had no effect, the chlorosis on the pots where it was used being just as extreme as on the check.

In checking further on the aluminum and magnesia hypotheses, determinations of aluminum and magnesia were made on chlorotic and normal plants. Of the several determinations made, no significant difference could be detected in the aluminum content of the chlorotic and normal plants. In some instances there was actually more aluminum in the normal than in the chlorotic plant. The magnesia on the other hand was always higher in the normal plants. The MgO content of the normal leaves ran around .33 per cent while that for the chlorotic leaves was .11 per cent, about three times as great.

Thus the work of the field, greenhouse, and laboratory all fit together in showing: (1) that aluminum toxicity was not the cause of the chlorosis; (2) that the soil through long continued use of fertilizers free of magnesia has become deficient in this important plant nutrient; (3) that furnishing magnesia either in lime or magnesium sulphate counteracted the chlorosis; and (4) among its other uses lime has also the important role of improving crop growth by furnishing magnesia.

Sulphate of Potash Magnesia

Although recognized chiefly as a source of potash, sulphate of potash magnesia is also considered a practical means of supplying magnesia on soils deficient in this nutrient. It is now being used successfully for tobacco in the Connecticut Valley in the dual capacity of furnishing some of the potash and much of the magnesia required to prevent sand drown. While not used in the experiments reported above, the experience with sulphate of potash magnesia in controlling sand drown of tobacco is good evidence that when used in the proper amounts it will prevent the chlorosis on corn. For the average soil deficient in magnesia it has been estimated that applications of 20 to 24 pounds per acre of magnesium (Mg) or 30 to 40 pounds per acre of magnesia (MgO) are sufficient to prevent magnesia hunger on either tobacco or corn.

Profits from Sweets

(*From Page* 44)

ould be selected and then that soil lanced in plant food by a liberal use commercial fertilizer.

Since it is the number of U. S. No. s that count, any increase in yield ithout a corresponding increase in e percentage of No. 1's will not suf- e. The figures of the test presented re are to determine what value, if y, the addition of a liberal applica- on of potash had with reference to e percentage of U. S. No. 1's. Three ots were used for the test. One was ft as a check without any fertilizer, e other two plots received each an plication of 1,000 pounds of a 12-4- fertilizer, with one of the fertilized ots getting an additional application f 200 pounds of muriate of potash r acre.

The unfertilized acre produced a tal of 183 bushels of which 73 ushels were U. S. No. 1's, slightly less an 40 per cent of the total. The re with the 1,000 pounds of 12-4-4 ave a total yield of 250 bushels of hich 100 bushels or 40 per cent were . S. No. 1's. The acre which received addition to the 1,000 pounds of 12- -4 the 200 pounds of muriate of pot- sh produced a total yield of 270 ushels with 150 bushels or 55 per ent U. S. No. 1's.

The potatoes in this plot went through a severe drouth lasting from June 24 until August 18 and, no doubt, the percentage of No. 1's in all of the plots was cut down.

One thing was very striking in the fertilized plots and that was that the No. 1's ran well to a uniform size and were comparatively free from blemishes and deformities. In the acre that received the additional 200 pounds of muriate, there was not a single jumbo nor a deformity that the strictest grader would not pass as a No. 1. One noticeable thing in favor of the potash was that there was not the slightest trace of any skin disease on the potatoes.

On another acre plot of potatoes, not in connection with this test I gathered a total of 276 bushels of which 46 per cent were No. 1's. This acre received no fertilizer of any kind but while the yield was satisfactory and the percentage of No. 1's good the size and shape of the potatoes were not all uniform.

My conclusions are that the liberal application of fertilizer and especially the additional application of potash will pay for itself in quality of potatoes alone to say nothing about the increase in production as a whole.

Record Tomatoes

(*From Page* 29)

00 pounds nitrate of soda, 500 ounds superphosphate, and 150 ounds of muriate of potash.

Experimental work and farm prac- ices have shown conclusively that uality tomatoes can be grown only hen sufficient potash is present as acking potash the tomatoes "puff," arge splits occur, the flesh is not as firm, and yields are not large. Nitrogen and phosphorus are needed, but too much nitrogen causes a large amount of leaf or plant growth with consequent decrease in fruit production.

Tomato growers have been using a commercial mixture analyzing 4 per cent of nitrogen, 8 per cent of phosphorus, and 4 per cent potash. Results have shown that this is an unbalanced mixture and that the potash should be increased for best results both as to yield and quality.

Canning tests during the season of 1928 by the J. H. Dulany and Sons Packing Company at Fruitland, Maryland, showed that a mixture containing 20 per cent potash packed out many more No. 3 cans than where less potash was used. For example, based on a 300-basket yield per acre, the 20 per cent mixture would pack out and did pack out 400 more cans, per acre, than did a mixture containing 10 per cent potash. At the prevailing prices this represented a bonus of $60 per acre from improvement in pack due to the increased potash. The cost of the extra potash was paid by increased yield.

Realizing the need of potash for tomatoes, the Smiths used a 4-8-10 mixture on their 10-acre field. That their belief was correct is shown by the yield obtained and also by the quality of the fruit as delivered to the canning house. The plants made sufficient growth, showing that they had received enough nitrogen, and the set of fruit, especially the crown set which is so important, was large enough to justify more potash.

The total production of this 10-acre field will be interesting as it illustrates what can be done on a small acreage.

As stated beans occupied the ground during the early part of the season and they yielded 2,590 hampers or an average yield of about 250 hampers per acre. At $1.50 per hamper, which is far from being a high price, this crop would have turned $3,885 gross.

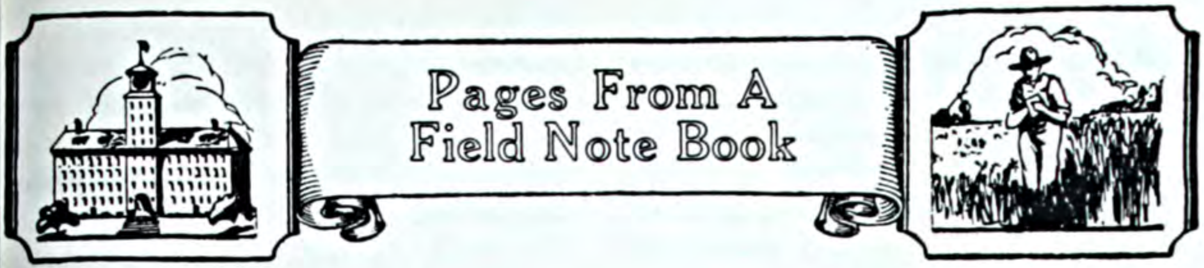
March

The tomato crop was not all s to the canning house, but some of was shipped to market in 12-qu crates and 36-quart crates. Need to say, these choice fruits brou more than canning house prices, basing the tomato crop on cann house prices, which were 25 cents basket, the total returns from tom toes grown on these 10 acres wo reach $1,288.50, or a grand total $5,173.50 from 10 acres.

An average of $500 per acre sur justifies the use of fertilizer, comp ion cropping, and careful tillage.

It is interesting to see just wh fertilizer this piece of land receiv during the season. The three app cations totalled 1,800 pounds contai ing 90 pounds of nitrogen (actua 132 pounds of phosphorus, and 1 pounds of potash. This would equivalent to 600 pounds nitrate soda, 825 pounds of superphospha and 252 pounds of muriate of potas

Looking at the problem in anoth way the plant food applied during t season would analyze based on t practically 4 per cent nitrogen, 6 p cent phosphorus and 6 per cent po ash. This is approaching what som folks consider t ideal ratio, a 1- 1, but needless say that a 1-1 ratio will not a swer for all crop at least so far present inform tion and know edge is concerne However the r tio above show the trend towar increasing th potash so that equals at lea the percentage o phosphorus con tained in com mercial fertilizer



Fertilizers *on a* Stock Farm

By E. E. Reynolds

Washington, D. C.

THE opinion still prevails that commercial fertilizers have no place on stock farms where large quantities of stable manure are produced. My experience, however, leads to the conclusion that where commercial fertilizers are used as a supplement to manure, with a full understanding of soil and crop requirements, they will return highly satisfactory dividends on the investment. In fact, with most livestock manures, two elements most economically supplied by commercial fertilizers, potash and phosphorus, are absolutely essential to make a well balanced plant food.

A number of years ago I had the supervision of a 300-acre horse farm. The stock consisted of 125 to 140 horses, seven or eight cows, and from 300 to 600 fowls. Large quantities of feed were purchased in addition to the hay, grain, and root crops produced on the farm.

The manure from this stock was hauled out onto the farm, being largely used on the plowed land. The owner, a city man, held to the then popular belief that with such an abundance of stable manure there was no necessity for buying commercial fertilizer. But the results proved conclusively that heavy applications of manure do not solve the farmer's soil fertility and crop production problems.

On the Dunkirk fine sand, the prevailing soil type, the oats and hay, which were the two principal crops, made a rank growth in favorable seasons, but lodged badly. They gave trouble in cutting, and much grain, straw, and hay was of poor quality. The corn, whether for silo or husking, lacked substance, and yields of root crops were disappointing.

After some persuasion the owner of the farm gave his permission for the purchase of enough commercial fertilizer of about an 0-12-6 analysis to cover a 20-acre oat field at the rate of 350 pounds to the acre.

A good implement for the even application of commercial fertilizer.

The results were so convincing that thereafter the use of commercial phosphate and potash as a supplement to the stable manure became the regular farm practice. There was little lodging of grain or hay, and the yields of hay, grain, and straw were largely increased, with a decided improvement in quality. The paddock, pastures, and old alfalfa fields were rejuvenated and brought into productiveness, and the feed bills were cut far below the cost of the chemical fertilizers.

Agriculture Today

(*From Page* 23)

purposes, good burning qualities are essential, and, other things being equal, the combustibility of the leaf is more or less proportional to its content of potash. In this respect the form of potash used in the fertilizer is of considerable importance. The chlorine contained in muriate of potash under some conditions tends to stimulate the growth of tobacco, but if present in large proportions it injures the burning qualities of the cured leaf and may even produce injury in the field.

"The quantity of the potash in the fertilizer required for best results will vary, of course, with the type of soil, the system of cropping followed, and other factors. For average conditions on most of the light tobacco lands, and with normal rates of fertilizing, however, better results probably will be obtained with a minimum of 40 to 60 pounds of potash per acre than with the lower rates now commonly used. It appears that in most cases the potash content of the fertilizer should exceed the content of ammonia by two or more units."

The growing appreciation of the essential nature of fertilizers in agriculture, as agents for conserving soil fertility and increasing farm profits by effecting the reduction of acreage cultivated and the increase of yields per acre and per man power, demands an increasing fund of fundamental data regarding the properties of soils and fertilizers. Accordingly, the Federal department is conducting research on the chemical and physical properties of the newer fertilizer materials, their interaction in mixtures, behavior in storage, and their suitability for use in fertilizer drills. The aim is to discover and overcome the practical difficulties involved in the production and use of concentrated fertilizers, which are now rapidly replacing the lower grade mixtures formerly used.

Oats

(*From Page* 13)

of the world acreage. Russia is second and Canada ranks third. In the Corn Belt, where the bulk of the crop is grown, it is spring sown and fits into the rotations unusually well. Most commonly it is planted after corn. Because of its hardiness, it thrives on a wide range of soils, and while the densest acreage is found in the Corn Belt, it is grown to some extent in all states. The southeastern states and a narrow strip along the

Pacific Coast have winter sown varieties. Yields are best in the spring sown areas, particularly in the northern areas of the main belt.

In the United Kingdom 24 per cent of the cropped land has been devoted to oats, and in Sweden 23 per cent. Its unusual adaptability to a wide range of soil conditions makes it a favorable grain in regions of poor soils or very cool climates. In Sweden the crop is said to be grown almost up to the Arctic Circle.

In the United States oats ranks third in acreage, corn being first and wheat second. In 1927, 42,227,000 acres were grown, about a third of the world total. Its distribution in America is not greatly unlike that of corn, the bulk of the production being in the Upper Mississippi Valley, where the crop seems to find very favorable conditions. Its denser acreage area, however, extends somewhat farther northward than does the Corn Belt proper.

Its popularity in the Corn Belt is due not only to the productiveness of the crop in this region but also to the ideal manner in which it fits into the rotation with corn. Spring wheat does not thrive very well in this section, and winter wheat needs to be sown before the corn can readily be removed from the land. A spring sown grain, therefore, is most satisfactory to follow corn in the rotation and the oat crop fits this requirement well.

Iowa

(*From Page* 11)

experimental orchard was set out. Since that time horticultural investigation, especially with apples, has been an important part of the work of the station. The chief purpose of these investigations has been to produce varieties of apples adapted to Iowa conditions of climate and soil. Under S. A. Beach, vice-dean of agriculture and chief of the horticultural section from 1905 to 1922, considerable progress was made. Since the

Looking across the plots at the Iowa agronomy farm.

death of Dean Beach the section has announced a number of named varieties, which have met with considerable favor.

Recently some very important work has been done by the plant pathology section in the development and testing of disease treatments for seed. Increased corn yields of about five bushels to the acre have been secured by the use of the dust treatments recommended by the station.

A visit to the station agronomy farm in the summer or fall is highly interesting. It lies on rather level ground, its test plots forming a checker board of yellow and green. Some 40 of the 200 acres are devoted to soils experimentation. Here various kinds and combinations of fertilizers are compared with untreated plots. One important piece of investigation is with crop rotations. Certain crops have been grown here with long and short rotations for a period of 10 years. It has been demonstrated that a three-year rotation of corn, oats and clover yields much greater economic returns than a two-year alternation of corn and oats. This was found true on both the treated and untreated plots. Four and five-year rotations likewise, showed generally better results than the three-year.

Across the road from the soil plots are the crops experiment fields. Here have been bred several very valuable strains of oats. More recently the station has developed and distributed a new variety of winter wheat which has shown up very well in yield tests.

Perhaps as important to Iowa as any other work with which the crops section has had to do is the locating of high-yielding strains of corn, including the new hybrid strains. Each year several hundred samples of corn are tested on 12 testing fields located in different parts of the state. The planting and harvesting of the corn are supervised, although the plots are located upon the land of cooperating farmers. The yields of all of the samples are ascertained and the results announced each year at the time of the college's Farm and Home week. The beneficial results of this test are especially evident in northern Iowa where outstanding strains of yellow corn have been found.

The South's Convention

(*From Page* 30)

9. Produce all the food required for the men and animals on the farm.

10. Keep an account with each farm product, in order to know from which the gain or loss arises.

Other Knapp epigrams which one heard repeated around the Convention included: "It is impossible to impress upon anyone that there is dignity in residing on a farm with impoverished soil, dilapidated buildings, and an environment of ignorance." "The income of the farm can be increased from three to five-fold by the use of improved methods." "Double the crop to the acre and halve the cost." "The basis of the better rural life is greater earning capacity of the farmer." "The least worthy monument to a man is a granite block or a marble shaft. They represent the dead man's money and the kindness of friends. The true monument is what the man has accomplished in life. It may be a better gate, or house, or farm, or factory—put his name on it and let it stand for him."

There were too many important side meetings, banquets, and addresses at the general sessions to accurately report here; and there were many views on the present agricultural situation. L. W. Baldwin, President of the Missouri-Pacific Railway Com-

ny, believed that since the greatest
oblem of the farmer is the market-
; of what he produces, the answer
this problem will be found in wide-
ead education and an intelligent
ninistration of the natural law of
pply and demand, rather than in
y effort to repeal that law or ob-
n relief through the use of some
nporary stimulant.

C. A. Cobb, Editor of the *Southern*
ralist, stated that though there are
ne who are apparently bewildered
the agricultural unrest of the pres-
t, there is nothing strange at all
out it. It simply means that intelli-
nce in agriculture has arrived at a
riod where it is able to think clearly
d that seeing clearly, it is not afraid
strike and strike hard at the
ackles which have bound the indus-
y down so long.

E. C. Brooks, President of the North
rolina State College of Agriculture
mpared agricultural distress—famine
th agricultural distress — over-
oduction, and said that the farmer
still hugging to himself the delusion
at some day he, unaided by mer-
ants, bankers, and other business
en, may be able to control his prod-
ts. They are controlled by the flow
money to the consumers and this
w is governed to a degree by all
asses of producers and consumers.
herefore, it is absolutely essential
at the farmer cooperate freely and
timately with other producers and
her business men.

John Fields, Vice-President of the
deral Land Bank at Wichita, Kansas,
ted two conclusions of Dr. Seaman
Knapp—first, that most failures in
rming are on the business side and
t on the scientific side; second, that
large proportion of the vast wealth
eated annually from the soil ulti-
ately enriches the city instead of im-
oving and developing the resources
the country. He came to the con-
usion that if every farm family
roughout the United States would
spend less than its income in 1929, its relative position would improve many times more than it will be benefitted by whatever legislation is likely to be enacted. In other words, keep the income ahead of the outgo.

R. R. Moton, President of Tuskegee Normal and Industrial Institute, whose audience was made up of fully one-fourth negroes, said that there could be no successful solution of the Southern farm problem unless such a plan included the development of the negro farmer to his utmost usefulness through education. Keeping his audience well amused with anecdotes and such sallies as—negroes not only excel in the death rate and in spending money, but they can always beat white folks in singing negro songs, Dr. Moton also introduced the serious thought that the solution of the racial problem can and will be most successfully worked out below the Mason-Dixon line.

There were many other important and prominent speakers.

The Agronomy Meeting

Of especial interest to the agronomic field was the meeting of the agronomy group at which J. F. Duggar of Alabama Polytechnic Institute discussed the development of agronomic work in the South. He divided southern agriculture into six periods—First, the slavery period in which brawn not brain, determined our agricultural destiny. The second period, extending from the close of the Civil War to the establishment in 1888 of the American system of agricultural experiment station, he termed the preparation period. This period was notable for the introduction and adoption of the tenant system. He then carried his review on through the years in which extension work and the influence of agricultural colleges developed, and state universities played such an important part in building up the present agriculture of the South, through the violent fluctuations in prosperity since 1920, to our current period in which research and the activities of agronomists working in behalf of the farmer are recognized as so vitally important.

After the convention about 350 of the attendants took advantage of an educational trip South in the state to Edinburg, where they were met by automobiles and taken through the lower Rio Grande valley. Citrus groves and truck farms, beauti semi-tropical homes, and most ger hospitality on the part of the reside of the valley were features of the tr The day closed with a short trip i Mexico and a wild game dinner Matamoras at which Marte R. Gom Mexican Secretary of Agricultu welcomed the visitors and told th something of the extension work agriculture which is being done Mexico.

Farming Without Manures

(*From Page* 28)

the first crop. This was plowed down early and a crop of rye followed. The rye was wintered over and in the spring of the second year, it was plowed down. A small amount of fertilizer and a crop of soybeans were sown in the spring of the year. This in turn was plowed down and barley and oats followed. These were plowed down and rye followed planted very late for a winter-cover crop. This rye was plowed down in the spring of the third year and a wide variety of miscellaneous vegetable crops was planted on this soil. Previous to the planting the soil was again tested for lime needs according to the crop to be planted, and the soil condition was corrected by applications of lime.

During these two years of soil improvement, each crop grew better than the preceding one. These crops were just the thing needed for the soil. The frequent plowing and working of the soil also were highly beneficial.

Mr. Peckham did not look for exactly bright results the third year with his miscellaneous vegetable crops but he did plant beets, carrots, parsnips, lettuce, spinach, celery, beans, cabbage, endive, tomatoes, peppers, sweet corn, and a few others. All of the 24 acres were covered with veg table crops. Of course heavy app cations of fertilizer were used. M Peckham favors the 5-8-7, althou he did use some other fertilizers. least a ton per acre was used on almo all of these crops, and 3,000 lbs. slightly more, were used on celery.

Mr. Peckham is a careful garden and gives good care throughout t season. He was greatly pleased by t crops harvested. In every instan they were equal to any crops that had ever grown. They showed no effects from the lack of stable ma ures. They were of as large size, of good color, of as good quality an all other characteristics as any simil varieties grown elsewhere.

In the fall, as the crops were ha vested, rye was sown on the groun The sowing of rye in the fall has b come an annual practice. This rye not plowed down in the spring whe it is small, because Mr. Peckham us this land for late crops more tha early crops. He has waited each ye after the third until the rye is a least as tall as a man. It is the plowed down. When criticised fo allowing the rye to grow so tall, M Peckham's answer has always been "I agree with you, perhaps I do no get my greatest benefit from the rye in the year when it is plowed down, But I do get all the advantages of the rye in the next year or two thereafter."

It is now almost seven years since this work was started, five years of intense vegetable cropping, and I can state very honestly that just as good crops are now being grown as were grown at first. I see no reason why they cannot continue to be grown on this farm by the practice followed by Mr. Peckham, that is, a cover crop for soil improvement purposes and heavy applications of commercial fertilizer balanced properly by liming as needed by the individual crop.

Top-Dressing Cotton

(*From Page* 16)

Such results are contrary to the general belief that little potash is needed on clay soils. They give further support to the statement that previous methods of fertilizing and cropping of a soil seem to exert as much influence upon the response of a particular crop to potash as does the soil type itself.

A Better Ratio of Lint

As to the beneficial effects of potash top-dressing on the cotton plant the farmers conducting the demonstrations found that the top-dressed cotton produced healthy, sturdy plants which put on squares very early. These plants set more squares for larger yields, and their shedding was reduced to a minimum. Their bolls were bigger and the cotton was easier to pick. The extra potash absolutely controlled rust and helped control wilt.

By ginning the cotton from their plots separately some farmers discovered that the extra potash increased the ratio of lint to seed. A typical case is that of J. W. Baxter, manager of the Kildare Farms at Huntsville, Ala. On one plot, fertilized with 600 pounds of 15-5-5 and 100 pounds of nitrate of soda per acre, he produced 1,500 pounds of seed cotton. The same yield was produced on another plot receiving the same fertilizer treatment plus a top-dressing of 50 pounds of muriate of potash. The 1,500 pounds of seed cotton, without the extra potash, ginned out 454.4 pounds of lint, while the 1,500 pounds that got the extra potash ginned 490 pounds of lint from 1,350 gain of 20.6 pounds.

N. S. Wolfe of Mt. Olive, N. C. ginned 490 pounds of lint from 1350 pounds of seed cotton which had been fertilized at the rate of 600 pounds of 8-3-3 and 100 pounds of nitrate of soda per acre. The same amount of seed cotton fertilized the same way but top-dressed with 100 pounds of muriate per acre produced 530 pounds of lint, or a gain of 40 pounds.

Mr. Wolfe had 20 acres of cotton in each plot. If both plots had produced at the rate of 984 pounds per acre with no gain in yield for extra potash, the difference in the amount of lint for the 20 acres would have been 584 pounds. At 18c per pound this is $105.12. The extra potash for the 20 acres cost less than $50.

Extra Potash at Planting

In view of the fact that the top-dressing demonstrations were concentrated mainly in the Southeast, a series of 30 demonstrations were placed in Tennessee, Arkansas, Mississippi, Louisiana, and Texas, in which varying amounts of potash were used under cotton at planting time. In each demonstration were three plots: plot

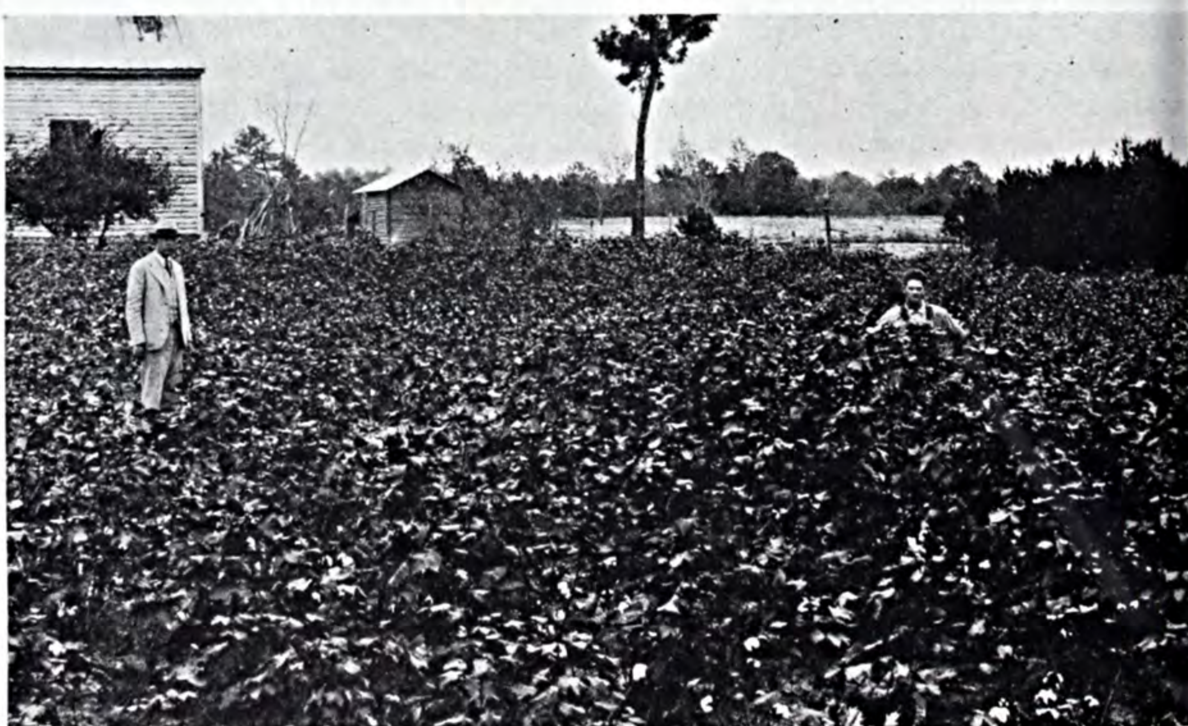
Farmers visiting the Taylor Farms (2,000 acres of cotton) at Summerville, Ga. One acre fertilized with 800 pounds of 12-4-4 and 100 pounds of nitrate of soda per acre produced 1,076 pounds of seed cotton. Another acre with the same fertilizer and 128 pounds of muriate of potash top-dressing produced 1,746 pounds.

1 in each case received 600 pounds of 8-6-0 per acre; plot 2 received a like amount of 8-6-4; and plot 3, the same amount of 8-6-8. The average yields for the 30 demonstrations were:

FERTILIZER PER ACRE	SEED COTTON PER ACRE
600 pounds 8-6-0	850 pounds
600 pounds 8-6-4	990 pounds
600 pounds 8-6-8	1,092 pounds

These results run counter to the belief held by many southwestern farmers that relatively large amounts of fertilizers will not pay under average conditions. Note that the variation in actual potash per acre was 24 pounds. This is more potash per acre than is used by most southeastern farmers.

Wherever extra potash is used in large amounts it seems to disrupt a few long accepted theories of fertilizing cotton. And it does this with the unanswerable argument of extra cash produced by extra yields and extra quality.



A top-dressing of 100 pounds of muriate of potash per acre returned Mr. J. E. Ross of Durham, N. C., $33.60.

Better Pastures

(*From Page 7*)

rate nitrogen is most desirable ause of the physiological relationps and that for the hard grasses e redtop and bent-grasses amnia nitrogen is desirable. He ewise states that the so-called soft sture plants require an abundance such elements as potash, calcium, d phosphorus. This is borne out Haskell's findings in rejuvenat- old pastures with fertilizer appliions and by White in his work with iegrass pastures. Haskell obtained greatest increase in dry matter d protein content from an applican of phosphorus, potash, and lime d attributes to it the remarkable rease in white clover. White obned the greatest computed acre lue from applications of calcium, osphorus, potash, and nitrogen. Sprague also obtained the highest number of feed units on pastures where lime, manure, or commercial fertilizers were used.

Full nutritive value cannot be realized in pastures unless there is plenty of succulent grass with a high protein and mineral content and where feasible it is best to produce it by fertilizer applications rather than by the use of mineral supplements in the feeding ration.

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Organization

(*From Page 4*)

ry orders and tribunals, the usage of arfare and the rigorous discipline of med camps. It finds echo in the lley slaves toiling for the Corsairs d the Volga boatmen trudging on eir leaden pathway. Gradually the ern habits of militarism and slavery panded to industrial centers in the iddle Ages, first with the Hanseatic eague and then with the trade guilds d the apprentice era, haunted with rk Hogarth reminders.

Then in the American Colonies me the Whigs and Tories followed y the Mugwumps and Free Soilers. ut after the Civil War the returning ldiers, because of a surfeit of dismal rill masters, inoculated the nation with a spirit averse to organization. For a decade or two afterward the chief allegiance was to the lamp-lit conclaves of the Masons, Odd Fellows, and the Good Templars. The West had to be conquered and plowed which was a job for lonely, self-reliant pioneers.

To be sure, there were "organized sports" and "standardized play" among our settlements. However, they went by other names. Somehow, they managed to enjoy themselves without the direction of the rural sociologists who now interfere with our foolish hours of idleness and try to make our festivals "community conscious" or something equally pedantic.

Even in my time there lived a fractious fiddler by the firelight whose lively right arm in a ragged calico shirt sleeve made jumping shadows that fluttered on the wall to the rhythm of his squeaky music. Little did he know about the wave of reformation that would soon replace him with the saxophone performer and the social chairman. He received his heavenly harp before we organized the orgy and made it dull and efficient.

THE only open protest I make against organization is when they try to coordinate, clarify, and classify my hours of ease. I am willing to be standardized and monotonized in a church or a skyscraper, but I still insist on being inconsistent and incoherent in my occasional silly moments. One must have *some* relief from regulators.

Spontaneity and freedom of motive were the reasons for what few organizations our ancestors created. They ruled the organization and made it representative because it was a movement built from the grass roots by the sod busters. They didn't have to hunt for reasons and they seldom wrote a tiresome constitution and by-laws just to give some lame duck a pond to swim in.

Now we are beset on all fronts, and from behind as well, by a plaguing surplus of special purpose organizations that have attained the proportions of an epidemic. They are often born illegitimately and prematurely. They operate under beguiling names and purposes. They strike at our credulity and seldom fail to lasso the complacent and uninformed and drag them into the corral to be hog-tied and branded.

If farmers are under-organized, I fail to see it out our way. If manufacturers or merchants or salesmen are unorganized, I hate to think what may happen to their work when the professional zealots finally bec satisfied that the zenith of zeal been attained.

Every day I have a chance to j something. My humble mail-box my ordinary office is cluttered w circulars of appeal, defiance, alarm. If such an avalanche comes a mere onlooker like myself, pray w sort of tidal wave must flood sanctums of the great and the n great?

Let me glance over this litter envelopes before they are kicked u opened into the discard. There societies for the conservation of constitution; orders of personal erty; associations pledged to def state rights and others to prom federal solidarity; societies to irrig lands and others to drain them; co mittees to change the calendar a others to correct the coinage; bure to better business and to get big budgets; and relief foundations old horses, habitual drinkers, and u read authors.

I marvel at the wonderful store enthusiasm and nervous energy quired by somebody to turn out th vast schemes and get funds enough buy stamps. It is really a challen to efficiency engineering to get su men and such minds where the pow of their kick-off and recoil might put to useful purposes.

PRESIDENT HOOVER has pro ised to tackle the super-pow problem some day, but we propose get him to lay aside such trivial thin and coordinate the coordinators, su vey the surveyors, standardize t standardizers, and reorganize the o ganizers. If he does a masterly job it with enough elimination to it, l success in 1932 is going to be a cinc

I quote no less an authority th Sears, Roebuck & Company's catal when I say that production has ru far ahead of consumption. If yo prefer to stick to Montgomery Wa ahead, it amounts to the same ıg. Wise gentlemen in every trade ɜpt the bootlegging and undertak- lines are complaining of this un- ling and distributing commercial dition wherein production keeps about 20 per cent ahead of con- ıption.

'he reason is indeed obvious to ned minds like mine. It is because ry known effort and seductive ɜme has been bent toward wheed- ; the last nickel from our pockets ɔugh a series of organizations in le that the world has never wit- ;ed before. Whereas, in consump- ı channels no organized effort has n put forth to check unwise ex- ditures or show a beginner how to gle his dollars so that a few of m fall back into his reserve fund.

Recently I attended a salesmen's vention of a national manufactur- concern. All day long the speak- from the different production and ing departments gestured and gy- ɜd on the platform in their shirt sleeves and taunted the slower sales- men for not getting every red cent of the "vast potential market" which exists out in the moss-grown mort- gage belt.

Mechanization of industrial proc- esses have been accompanied by in- creased capitalizations and the throw- ing together of giant mergers. No industry seems exempt from the spell of bigness and simplicity combined, the desire to reach out into wider fields and to keep down overhead at the same time. The inefficient folks are suffering, as are the inefficient competitors of such industrial mam- moths. This is not an age, however, when sentiment is accepted as logic, and hence the man who wants to be charitable toward the unemployed or the bankrupt finds himself with no means to organize such a crusade.

Well paid employment of Ameri- can citizens, or at least of the major- ity of sane citizens, is indeed a very desirable thing. It must be main- tained or the purchasing power which those coatless salesmen yelled about will suffer a sudden total eclipse. Where will some of our executive organizers and our office efficiency boys find themselves when there is no longer an expanding rate of consumption on a high standard of living basis?

Some of these bright mornings the leaders of the go-get-'em factions will wake up to the fact that no business is any stronger or sounder than the social structure upon which the nation stands. Some of them have gnawed so close to the core already that they may find the seeds of progress in their teeth before they know it. Will they spit them out or chew upon them thoughtfully? That depends. They may do as Adam did—try to pass the buck to some woman!

All this furore about farm relief is only one sector of the conundrum circle. I know many industrial employes who are having a harder time to pay for their bologna than any hayseed and still have enough left to plunk down a dollar a week on an eight-cylinder gas eater. The only way they can keep the factory wheels turning in some other plant so that brother workers may keep busy is to organize a household budget. When that fails they sneak down in their shirt tails some night and empty the baby's bank.

Sometimes when I see how successful all this super-power organization for production and salesmanship has been with industry—in one direction only—I am happy enough to hug my mother-in-law because farm folks have been so blamed slow about it.

And yet the bucolic clan has made its blunders likewise by following bell-wethers who tinkled a false note of hope. "Do as business does and chart your courses" has been the plea of sweaty orators at farmers' picnics. I never followed their argument much further than the climax because I had urgent business over near the sinkers and salads. However, I gathered that something was wrong somehow sor where, so I pulled a baby or two of the ice cream cans and felt c tent. As I am longer on social ol gations than statistics, I need offer excuse for my actions.

Revolutions and resolutions are separable from any bona fide orga zation. They have to show that one exists before they can move have the other adopted. But did ever strike you that some of world's best revolutions and reso tions have been brought about by dividuals acting alone, and later oculating somebody else with same germ. It costs far less, t which to men of my name and nat is a weighty argument.

NEITHER science nor philosop has provided for substitutes common sense. That is, or should as much your individual possession mine, although I am willing to adr that you *have* had serious handica If you have it, organize it!

Guard that iota of common se like your coal bin, or whatever e that is precious down in your cell Hold fast to it and exercise it fu at home and abroad when you asked to endorse something that sembles a cross between a Russian t fight and a multilateral treaty! Yo brain was provided to keep you *out* organizations just as much as to g you into them.

Yet when the time comes to acce your part in some enterprise that h social justice and fair play sticki out all over it with no jokers in t preamble, grab your share of t wheel and push.

People who adopt individual co mon sense as their first birthright not apt to get their fingers sticky wi a mess of pottage.

And whatever you do, don't them elect you on the board. Th are apt to be slivers in it!

Ceresan is the only disinfectant now needed to control 9 diseases of 5 cereals. Applied as a dust. Economical to use. Harmless to seed and seed drills.

Illinois Experiment Station Proves CERESAN Effective

IN discussing the advantages of a dust treatment for the control of oats and barley stripe, Dr. Benjamin Koehler, writing in the mimeographed leaflet, "New Seed Treatment for Oats and Barley," just published by the Illinois Agricultural Experiment Station, ascribes the failure of the old formaldehyde treatment in giving good results to the following:

"(a) failure to mix the formaldehyde solution thoroughly with the oats; (b) mixing the formaldehyde solution in wrong proportions and thereby killing the seed; (c) if rainy weather sets in soon after making the treatment, the oats can neither be sown nor dried properly, and considerable injury to germination is likely to occur. Dust treatments are more foolproof and convenient because (1) they come prepared ready for use, (2) no subsequent drying of the grain is necessary, (3) treatment can be made at any time prior to seeding regardless of freezing temperature, and (4) as dust treatments already are becoming standard for the treatment of corn and wheat, the process is simplified by using the same method and apparatus for the treatment of all these crops.

"It (Ceresan) has been tried during the last two years and gave perfect (oats) smut control both years. Yield data were obtained only in 1928, and these are given in the summary below. The increases in yield were greater than could be accounted for by smut control alone. . . . Apparently, it also controlled some of the oat seedling diseases in addition to smut."

	60-Day Oats bus. per A.*	Big 4 Oats bus. per A.*
No Treatment	64.3	67.6
Wet formaldehyde	70.0	79.0
Ceresan	78.1	86.7

* **Average of 10 replications.**

Ceresan is effective in controlling such diseases as bunt or stinking smut of wheat, flag smut of wheat (seed-borne), stripe disease of barley, loose smut of barley in certain six-rowed winter varieties, covered smut of barley, loose smut of oats, covered smuts of oats, kernel smuts of sorghum and seed-borne stem smut of rye.

Other Du Bay Seed Disinfectants are Semesan Bel, for seed potatoes and Semesan Jr., for seed corn.

SAMPLES FURNISHED

Plan your seed treatment projects now. We will furnish gratis samples of any or all of our disinfectants to those Cooperative Agricultural Extension and Vocational Agricultural Workers who will plant demonstration plots of treated and untreated checks and report to us the results of disease control and yield increases. Send a list of crops to be treated with request for samples and descriptive literature to the address below.

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YOU CAN'T PLEASE 'EM

A chorus girl, deliciously pretty, but decidedly lowbrow, somehow found herself at a very select party given by a famous society woman.

The girl, lonely and uncomfortable as a fish out of water, because of her utter ignorance, was leaning against the wall, framed against the dark oak, when the hostess took pity on her.

"My dear," she said, kindly, "you look just like an old Rembrandt."

"Well," retorted the stupid beauty, sharply, "you don't look too darned snappy yourself."—*The Pitchfork.*

A Scotchman, not feeling so well as usual, called on his family doctor, who looked him over and gave him some pills to be taken at bedtime. Whiskey was also prescribed for his stomach's sake, a small glass to be taken after each meal.

Four days later Sandy again called on the doctor, stating he was feeling no better.

"Have you taken the medicine exactly as I instructed?" the doctor inquired.

"Weel, doctor," replied the patient, "I may be a wee bit behindt wi' the pills, but I'm six weeks ahead wi' the whusky."—*Wroe's Writings.*

Daughter: "Mother, do you want me to put the parrot on the back porch?"

Mother: "Positively no! Your father is repairing the car in the back yard."—*Ex.*

BRIDEGROOM SLIPPED

A colored woman was telling friend of a wedding she attended. Sh told of the bride's white satin gown slippers, veil, flowers, and everythin she could think of. "What did th bridegroom wear?" asked the friend.

"Well, you know that good-for nothing nigger man never showed u at all," she said.

Minister: "I hear, Paddie, they'v gone dry in the village where you brother lives."

Paddie: "Dry, mon! They'r parched. I've just had a letter fron Mike, an' the postage stamp was stucl on with a pin."—*Schaefer Magazine*

Modern Girl: "I understand tha the girls of your time 'set their caps for men, Grandma."

Grandma: "Yes, child, but no their knee-caps."—*The Pathfinder.*

"Young Rose 'Awkins is goin abaht sayin' you're in love with 'er 'Arry. Is that right?"

"Garn! Don't tike no notice o 'er! I may 'ave give 'er a clip or tw over the ear, but that's all thert is in it."

Boss: "There's two dollars missing from my desk drawer and no one bu you and I have a key to it."

Office Boy: "Well, let's each put dollar back and say no more about it —*The Enamelist.*

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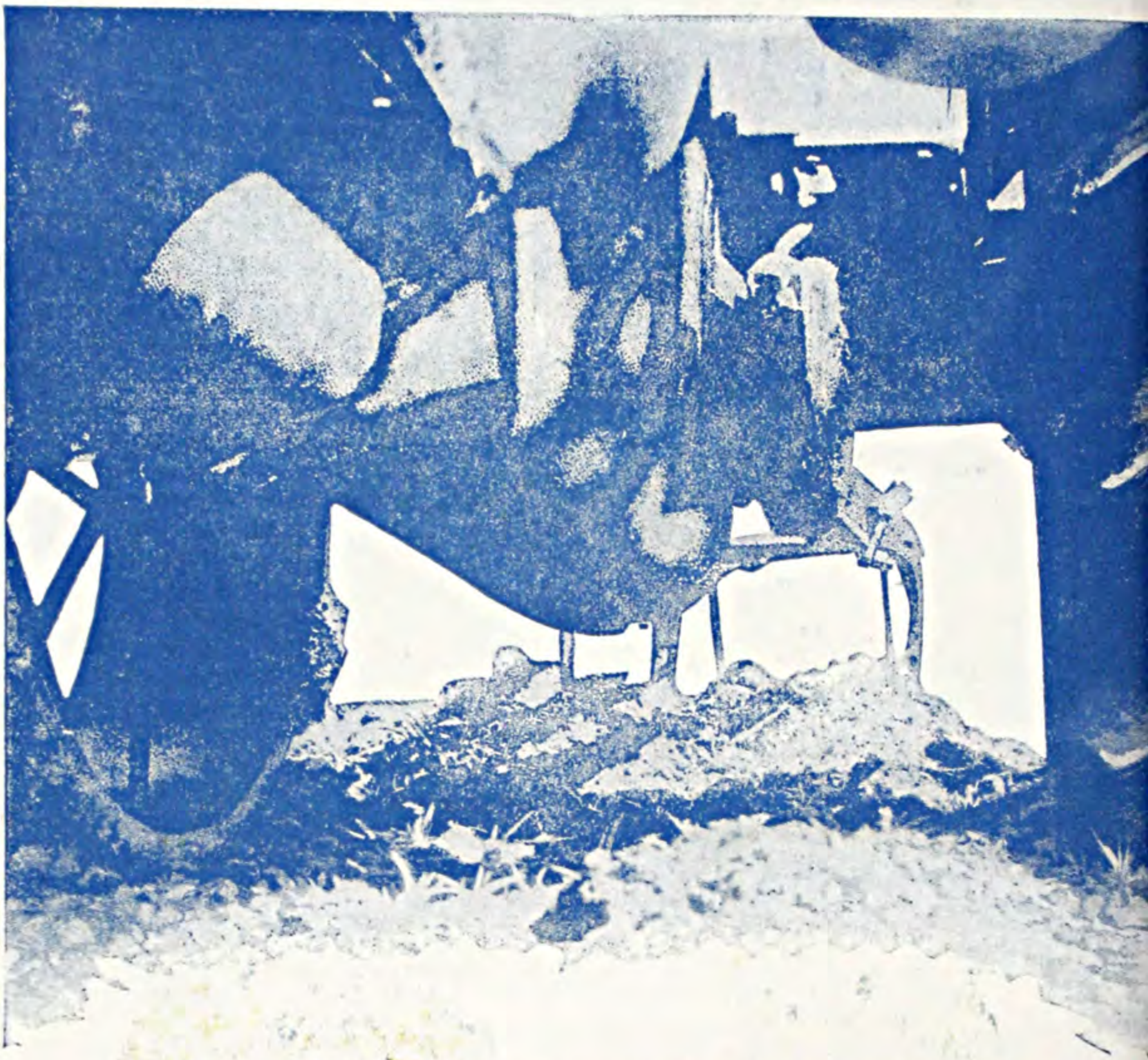

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The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Managing Editor* Sid Noble, *Editor*

Editorial Offices: 19 West 44th Street New York

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Agricultural and Scientific Bureau

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of Amsterdam, Holland

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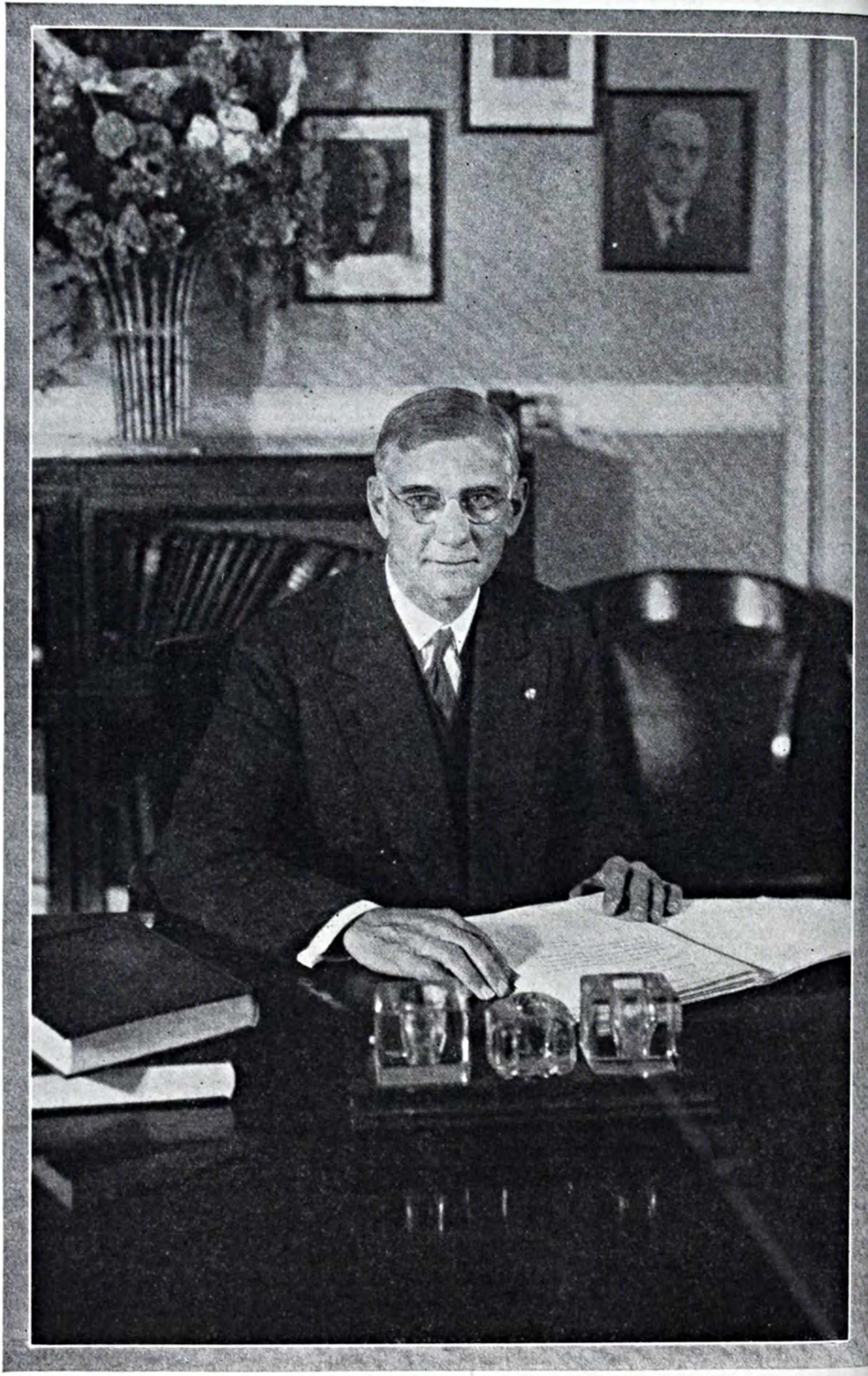

Arthur Mastick Hyde

The new Secretary of Agriculture comes to his important duties well equipped with experience as former Governor of Missouri, able farmer, and business man.

Better Crops with PLANT FOOD

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Call it April,
Spring Fever, or

Ennui

By Jeff McDermid

IT is the parlor word for languor or laziness, depending upon whether you are poetic or prosaic, rich or otherwise, French or Yankee.

It is a perfectly good legitimate mood for professional neurotics, hotel clerks, telegraph boys, and old maids. It is indigenous to fat men and hot climates and is responsible for more "grandmothers' funerals" than the chiropractor. It has ruined more resolutions and league standings than John Barleycorn, and is more popular with congressmen than farm relief.

Ennui is East and Pep is West, and ne'er the twain shall meet. In the North it follows a hard winter and an empty pork barrel, while in the South it goes with mint julep and is an inherited privilege.

It is the cause of idle conjectures in lieu of constructive thoughts, as for instance such as these:

If a fellow figured out the barrels of liquor consumed in a year the result would be staggering.

If you are interested in antique furniture count the wooden knobs on the president's cabinet.

Why did I pay the ice man ten dollars in arrears and then hire a roofer to knock an icicle avalanche off my gables for twenty dollars in cold cash?

Why do insurance men keep tab on your age when you'd like to forget it?

What does a tax bill feel like when

it is delinquent?

Sundry cogitations of no consequence give vacations to our overwrought cerebral processes. Hence ennui is a boon to us whose privilege it is to enlighten the world—and fill the wastebaskets.

After all, it may be a boon to exist in a mental vacuum. Some of my old friends in the asylum tell me it is, and await my capture with suppressed emotion. They envy my large circulation and wonder how much longer I will be able to deceive the world and retain my liberty. Strange to relate, one of those inmates has invented perpetual motion in the midst of his ennui, and still another has found food for thought in the congressional record. I expect to apply there for a chance at the simple life during April —the month of great expectations.

APRIL! Month of good hopes, fair poetry, and bad roads. The season of rug beating, floor scrubbing, and postponed homecomings. The returning time of the birds, the pedler, and the rejected manuscript. Taps for the coal man and reveille for all manner of summer brigands. The interval between winter zest and the discarded vest. The interlude between fur coats and beach disclosures. In April who can be sane without ennui anyway?

As I intimated heretofore, why *be* sane? It is un-American, perhaps unpatriotic—and least *declasse*. You'll get no more lucrative employment at least in *my* line by virtue of sanity, and all the world is headed the opposite way anyhow—all but yourself! Why persist in being dull and practical, mathematical and obtuse, involved and enigmatic, ambiguous and drabbily consistent? For once be a darned radical and go barefoot with a rag on your big toe and a patch on your pants!

Take Diamond Dick, Wordsworth, and Keats, pack along the jug of home-made, and slice the loaf under Omar's bough! Hunt for dandelions, pussywillows, and fish-worms, but don't bother about cooking the greens, filling the vase, or baiting the hook. Hate school hours, chores, and girls as of yore, and find content in a world made to order for men and liberty! Try this for half an hour and see how nice it seems to regain consciousness.

I haven't tried it myself for almost thirty years, but why need you be a failure likewise?

Ennui and inertia are *not* the same. True, ennui suggests repose, but I know absent-minded men who are very active physically, and many a hustler after all is inert when it comes to accomplishment.

Ennui is a temporary disorder or a mental relaxation, as you please; but inertia is a veritable disease of stagnancy. A dose of ennui hurts no one and helps a heap betimes, while chronic inertia is the perpetual gumbo on the prairie schooner of progress.

Cultivate ennui but eradicate inertia; but don't get them mixed!

Americans are at fault because they fail to sense this vital difference between the two states of mind. If Frenchmen invented ennui, they performed a service that will outlive their salads and snappy stories.

Americans are often pitiful when they imitate the European or Canadian in fits of luxurious languor. We eat tea and toast at seven A. M. but never at the office. We are always on the go but never arrive. Our callers in work hours never hang up their hats or nestle comfortably for a chat —if they do, we despise them! We pay others to play for us and pray for us, but we can't hire someone to rest for us! "Better to wear out than to rust out" and "he died in the harness" are our enterprising ideals. Who said we don't need ennui, anyway?

Of course, there are different kinds of ennui, but I refuse to endorse them all. The best way to get a slant at this is to imagine a hotly contested

(*Turn to page 61*)

24 Tons *of* Tomatoes

Is a Big Yield for One Acre

By E. R. Lancashire

Extension Specialist, Ohio College of Agriculture

HOWARD HARPER, of Indiana, might well be called a "Tomato King," for he has produced a yield of 24 tons of tomatoes per acre. That this yield was not a matter of chance is an established fact. In the same field, other acres produced at the rate of 20 tons, while still other acres produced at the rate of 16 and 17 tons per acre.

The way Harper jumped the yields from 16 to 20 and finally up to 24 tons per acre is a story of the employment of good tomato growing practices plus the use of additional applications of potash.

That Harper is a real tomato grower can be understood by his reaction to the high yield made by the state winner in Indiana's "Ten Ton Plus Tomato Club." He called upon the writer one winter day and brought with him the canning factory operator with whom he did business. After the usual get acquainted conversation which takes place between the agricultural extension men and the men who operate the farms, Harper began his story somewhat in this way:

"About 50 miles east of here I am operating a farm. Part of it is usually in tomatoes for the canning factory.

Mr. Harper receiving a $110.00 gold watch presented by E. R. Lancashire for the "Ten Ton Plus Tomato Club."

The tomatoes on the left represent the high potash plot. Those on the right represent the 2-12-12 plot.

For several years now my yields have been in the neighborhood of 10 tons per acre.

"I noticed in our paper that you folks at the college are putting on a tomato growing contest. I noted also that my yield of last year was more than that of the high yield man in the club.

"Our trip here today is for the purpose of getting into that contest. We want all the information there is on the tomato growing game. Some one will have to step right out if he beats us next year."

By "us" Harper referred to himself and his son. His prophecy was fulfilled. Harper and his son won the contest and received a fine gold watch as a reward for their efforts in addition to a cash bonus of several dollars. Harper received all that he asked for and something in addition.

This something in addition which the Harpers received was an invitation made some months later when their willingness to cooperate was well established. The invitation was one dealing with a fertilizer demonstration which the Horticultural Department of Purdue University wanted to try.

Experiments extending over a three-year period showed that potash was usually deficient on the black rich-looking soils of Tipton county, Indiana. The question was how much potash was profitable on such soils.

Accordingly, one of the fertilizer companies was invited to mix up some special goods. The standard recommendation of the "Ten Ton Plus Tomato Club," is 500 pounds of a 2-12-6 fertilizer applied broadcast just before the tomatoes are set in the field.

Three special mixed fertilizers were made for Harper. They were a 2-12-8, a 2-12-12, and a 2-12-16.

These special fertilizers were put on broadcast at the rate of 500 pounds per acre and were worked into the upper two inches of surface soil just before the plants were set to the field. A part of the tomato field was laid off into three plots. These plots were long, about one-half the length of the field. The width of each plot was about 40 feet.

No attempt was made to obtain experimental evidence as the experimenter would look at the problem. The three plots of exactly the same size and treated exactly the same in every way, except that of the fertilizer analysis used, were laid out for demonstrational purposes. Harper kept track of the number of boxes of fruits picked and the dates of each picking made.

Difference Noted Early

Early in the season a difference in vine appearance could be noted by Harper and the several people who knew about the demonstration. This vine development continued to be distinguishable right up to harvest time. The first pickings were made on the plot which received the 500 pounds of a 2-12-16. So earliness of ripening was one of the first results obtained. The plot which received the 2-12-12 was second in the matter of time of picking.

(*Turn to page 50*)

RHODE ISLAND

Experiment Station

By *Basil E. Gilbert*

Kingston, R. I.

THE General Assembly of Rhode Island in 1863 passed resolutions authorizing the Governor to accept the landscript (120,000 acres in Kansas under the Congressional "Agricultural Land Grant Act") and to transfer the same to Brown University at Providence. The income from the $50,000 received for the land was used for scholarships until the principal was transferred to the College at Kingston in 1894.

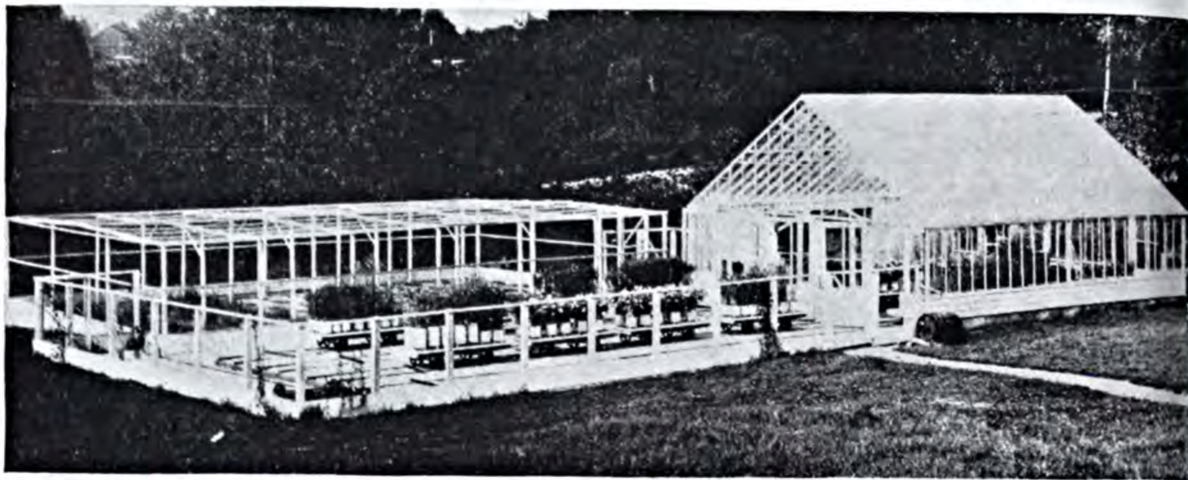
On March 23, 1888, the Rhode Island Legislature passed an act establishing a State Agricultural School on an independent basis. The township of South Kingston and citizens of the village of Kingston therein having each donated $2,000, it was decided to locate the School and Experiment Station at Kingston. The State Agricultural School soon became the Rhode Island College of Agriculture and Mechanic Arts and later the Rhode Island State College.

Charles O. Flagg was Director and Agriculturist of the Station until November 1, 1897. He was succeeded by Doctor Arthur A. Brigham who occupied the positions until September, 1902. Doctor Homer J. Wheeler was appointed Director to succeed Doctor Brigham, and placed in charge of field experiments, to be later given the title of Agronomist in 1904. Doctor Burt L. Hartwell succeeded Director Wheeler as Chemist in 1907 and as Director and Agronomist in 1913. He served in these capacities until 1928. Doctor Basil E. Gilbert was appointed Director and Plant Physiologist in February, 1929.

Basil E. Gilbert, Director, Rhode Island Experiment Station.

Previous to the increase of Federal funds following the passage of the Purnell Act in 1925, the main activities of the station were confined to production problems. Crop and soil relations under field and greenhouse conditions along with studies on diseases and inheritance of poultry formed the outstanding interests of the station during this time.

In connection with the agronomical research of the



Summer Vegetation House, Rhode Island Agricultural Experiment Station.

Rhode Island station, chemical researches and glass-house investigations have, for many years, been closely associated with field experiments. A few of the more outstanding lines of investigation in which progress has been made may be of interest.

Although American literature had recognized that very wet soils or peat or muck might be acid, it remained for the Rhode Island station to recognize in the early nineties the fact that upland, well-drained soils were liable to be even strongly acid and to respond to alkaline materials.

Alumina and Soil Acidity

The difficulty and one remedy was thus early recognized but that active alumina itself was a potent toxic factor in acid soils was not known until the discovery was published at the Rhode Island station in 1918. The deleterious effects of aluminum salts had been recognized elsewhere but not that these effects were attributable to the alumina part of the salts.

The relative toxicity of alumina to different crops was found to be similar to the relative effect of acid soils containing active alumina, and this seems to be the principal deleterious factor in such soils inasmuch as abnormally large applications of superphosphate temporarily conditioned the soil without reducing the acidity. Phosphoric acid, used liberally in addition to lime, is now recognized as a desirable second antidote to use in conditioning soil for crops which are highly sensitive to acid soil containing active alumina.

Plant chlorosis had been recognized for years when sufficient lime was used to neutralize all of the acidity; this was later found to be due to a lack of available manganese, hence the desirability of only reducing to a low point the acidity by the use of an alkaline antidote such as lime and the completion of the conditioning by a carrier of phosphorus as an additional antidote.

Under highly acid-soil conditions it was found that mangels, cabbages, rutabagas, and buckwheat exerted an outstanding deleterious effect on crops sensitive to such soil conditions; for example, in 1910, even though the onions were liberally fertilized, the yield varied from 72 bushels following mangels to 524 bushels following redtop. It was found later that the deleterious crops had a highly alkaline ash and that their removal increased soil acidity and aluminum activity. Furthermore, increasing applications of superphosphate decreased markedly the ash alkalinity.

It was shown that the addition of alkaline materials till the soil was only slightly acid, and an accompaniment of liberal applications of phosphorus carriers, so conditioned the soil that well fertilized preceding crops were no longer deleterious to even highly sensitive followers.

Only after a soil has been put in ondition in other respects, should atention be given to fertilizer for nuient purposes. The quantity of each ertilizer nutrient required has been ound to depend on the crop plant to e grown as truly as on the soil. herefore the relative response of diferent crops to each of the three ferlizer nutrients is as fundamental to ertilization as similar information oncerning response to alkaline maerials has proved fundamental to ming.

Crop plants, including pomological nes, are being divided into low, meium, and high response groups in reect to each ingredient which has een mentioned.

Owing to the scarcity of horsetable manure, attempts are being nade to maintain the necessary organic matter in market-garden relaions by the use of green manures, ompost, and peat.

Extreme differences have been maniest between early cabbage which has needed no manure and late celery vhich has not been grown successfully vith the lesser amount of organic natter from the green manure. Relatively then the cabbage appears to be in the low response group and the celery in the high response group to organic matter.

Throughout the state many cooperative field tests and considerable chemical work has been done to determine the lime and nutrient needs of different soils.

Fertilizer Studies

The availability of the fertilizer ingredients in nearly all commercial carriers, and the effect of the associated ingredients on the soil have been determined. For example, the commercial carriers of potash are used under such conditions that there is an opportunity given for the effects of not only potash but the associated sodium, magnesium, chlorine, and sulphur. Sodium has been shown to be markedly effective with many crops when there is not sufficient potash.

Weedless lawns have been maintained by taking advantage of the discovery that bent and fescue grasses compete successfully with weeds under highly acid-soil conditions. Such conditions are maintained or created

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Original offices and chemical laboratories, Rhode Island.

More Soybeans

By O. E. Ackerson

Jacksonville, Illinois

THE soybean seems destined to occupy an increasingly important place in the cropping systems of the Midwest, because of the many economic advantages in favor of its production. The acreage of soybeans has increased more rapidly than any other field crop in Illinois in recent years. In 1914 the State harvested about 2,000 acres for all purposes. In 1927 the acreage increased to 776,000, of which 419,000 acres were planted for seed and hay, and 357,000 acres were planted for pasture or silage with corn or other crops.

The increased interest in the crop has created a demand for information on the fertilizer needs of the crop, methods of application of fertilizers, the value of the soybean as a soil builder, and the effect of the soybean on other crops in the rotation.

Draws on the Soil

The soybean is rich in the plant foods commonly found in a fertilizer. One and three-fourths tons of soybean hay per acre is a conservative yield. This tonnage of hay contains 89.6 pounds of nitrogen, 23.8 pounds of phosphoric acid, and 81.4 pounds of potash, according to Henry and Morrison. It is evident that the crop uses large amounts of nitrogen and draws heavily upon potash.

Soybeans grown on the University of Illinois Experimental Field at Odin have received a basic treatment of residues, limestone, and bone meal. On adjoining plots this treatment has been supplemented with potassium sulfate. The limestone has been applied at the rate of 1,000 pounds per acre annually, the bone meal at the rate of 200 pounds per acre a nually, and the potassium sulfate the rate of 100 pounds per acre a nually. The increased yields of t combination with potash over th without are shown on replicated plo over a period of years.

Increase of Plot	1927 Seed Bu.	1926 Hay Tons	1925 Hay Tons	19 Se Bu
5 over 4	12.7	.49	.33	5.(
10 over 9	8.5	.21	.02	2.7

The soil type at Odin is a gray si loam on tight clay.

The photographs of the soybea on the Odin Field taken July 2 1928, show the height and appearan of the crop shown on the residue limestone, and bone meal treated plo compared with the crop on an ac joining plot receiving the same trea ment plus potassium sulfate.

The effect of the soybean on oth crops in the rotation has been invest gated by different stations. On th University Farm at Urbana a rotatio of corn, corn, corn and soybeans grown. The first-year corn after soy beans has averaged about 10 bushe higher than the third-year corn aft soybeans. The yield of corn on th Morrow plots at Urbana is 10 bushe higher in the corn and oats rotatio than where corn grows continuously Whether the increased yield of cor after soybeans is due simply to change of crops or to some other fac tor is not known.

In the Rotation

There has been some complair about the soybean affecting a succeed ing wheat crop unfavorably. Som

iese soybeans received only residues, limestone, and bone meal. Compare the height of growth with the man.

hio results throw light on this point. Vith the same soil treatment in 12 otations the average yield of wheat fter corn was 35.5 bushels an acre. n 6 rotations the average yield of heat after potatoes was 40.2 bushels. n 6 rotations the average yield of heat after soybeans was 33.3 bushs. In 3 rotations the average yield f wheat after oats was 37.9 bushels. n one rotation the average yield of heat after clover was 40 bushels. ll wheat yields above are 9-year avages. The soybeans were grown for rain in the above rotations.

The first crop of wheat following change from soybeans for grain to soybeans for hay resulted in 15 per cent larger yields following hay soybeans. In 1928 there were 170 per cent greater yields of wheat following hay soybeans than when following grain soybeans. This indicates that the earlier seeding of wheat made possible when the beans are harvested for hay has an influence on the yields of wheat.

The University of Illinois has found that wheat after soybeans yielded more than wheat after corn, and the same as wheat after sweet clover on land fertilized with superphosphate, while on untreated land, wheat after soybeans yielded the least.

addition to the same treatment as above, these soybeans received potash. Note that the growth reaches the man's waist.

If wheat does not yield quite as well after soybeans as after other crops, the difference may be offset by less costly seedbed preparation for wheat after soybeans. Oat stubble is usually plowed for wheat, but wheat is often drilled on soybean stubble without any preparation, or by simply disking ahead of the wheat drill.

Ohio investigations show that about nine-tenths of the soybean plant is found in the top and one-tenth in the roots. If the entire crop is removed and none of it returned as animal manure or green manure, the soybean although inoculated would not increase the nitrogen supply. Inoculated legumes secure about one-third of their nitrogen from the soil and two-thirds from the air. Hence when the entire crop is removed, clover is more valuable for soil improvement than the soybean.

Fouts Brothers of Camden, Indiana, owners and operators of Soyland Farm, report the profitable use of fertilizers on soybeans, using both row and broadcast applications. In 1928 an 0-28-12 analysis was used. They say the analysis of the plant indicates that it needs as much phosphate as the average farm crop and much more potash. They have found that soybeans are more sensitive to fertilizer in the hill than most farm crops, and suggest that heavy applications should not make direct contact with the seed.

High Feeding Value

The rapidly increasing acreage of soybeans is proof of the advantages of the crop over some of the common farm crops. The high feeding value of soybeans, both hay and grain, has caused many farmers to place them permanently in their rotations, and others to grow them whenever other legume hays fail. Soybean grain is the richest protein grain, and soybean hay is the richest protein roughage produced on the farm.

One of the chief limiting factor in the economic production of live stock on corn belt farms has bee and still is the feeding of rations to low in protein. Wise feeders hav been buying high protein feeds suc as tankage, linseed meal, cottonsee meal and other concentrates to bal ance the high-carbohydrate farn grains. They will continue to bu such feeds, as mixtures of various pro tein feeds have been demonstrated t be more profitable than single protei feeds, but the same quantity will no need to be bought by those who sup plement their rations with the single season farm grown soys.

For All Animals

Leading soybean growers includin the Meharry Farms in Illinois and In diana, and the Fouts Brothers' Farms Camden, Indiana, believe that th most profitable way to use soybean is to feed them. The horse, cow, hog sheep, and hen can use the soybean o some soybean product in their ratio to good advantage. However, ther are other promising outlets. Com mercial companies have built severa soybean processing plants for the pro duction of soybean oil and soybea cake or meal. Companies located in Bloomington and Peoria guarantee growers \$1.35 per bushel f.o.b. thei plants for the 1928 crop. Owing to the increasing acreage of beans, th seed outlet has been profitable to thos equipped to reclean and grade soy beans as demanded by the seed trade

The soybean has an advantage ove alfalfa and clover in that it will grow on soils too acid for the successfu production of the latter crops. Th soybean is adapted to a wide range o soil types, but like other crops, de velops best on fertile soils.

Soybeans fit well into the rotation of Midwest farmers and furnish a sat isfactory substitute for oats, the mar ket for which has been dwindling wit the reduction of the horse population

Jupiter Pluvius—*Thief*

By D. Scoates

Agricultural and Mechanical College of Texas

"OUR soil fertility losses are greater from erosion than om all the other causes put to- ether," is the verdict of a group of ientists who have been studying this roblem in Texas for the past several ars. Most of those interested in griculture have not as yet come to ie realization of just how great this ss is.

A typical example of how little it is ppreciated was brought out by the titude of this group of Texas agri- ultural research workers when they ere setting up an experimental proj- ct in western Texas to discover the mount of water that ran off or that as lost to the land on which it fell. his group of workers were setting up hat is possibly the largest runoff ater project in a country where the verage annual rainfall is 21½ inches, nd where moisture is the limiting fac- or in crop production.

While discussing these projects, they ecided that the question of soil ero- on, as far as this section of the coun- ry was concerned, was of minor im- ortance and it possibly was very little. ortunately, however, they decided to heck up on it in order to know ex- ctly what it was and be in position o say definitely that it was of no im- ortance.

Imagine their surprise when at the nd of the first year they found that here was loss on one piece of soil at he rate of 41 tons per acre and this vith only 27½ inches of rainfall and slope of only 2 feet in 100 feet. If uch losses occur in places with so mall a rainfall and on such flat slopes, vhat must the losses be in sections of higher rainfall and steeper slopes?

Fortunately, we have some authentic information along this line because the Missouri Agricultural Experiment Station has been checking up on their soil losses by a system of small plats which have an average slope of 3.68 feet per 100 feet. This project has been in operation for 10 years. The data for the first 6 years is all that is available and it shows that during that time the mean annual rainfall was 35.87 inches. On the plat which was uncultivated and kept clean of weeds and vegetation, the average annual loss was at the rate of 34.6 tons per acre; or putting it another way, this land would lose 7 inches of its top soil in 29 years.

There is a similar project at the North Carolina Agricultural Experiment Station, where the slope is 10 feet per 100 feet with an annual rainfall of 45 inches. I am informed that although they have not published any data on the subject, they have had an annual loss which checks very well with the results from the other stations.

Naked Land

It must be admitted that absolutely naked land is in the minority as far as acreage goes, but it must not be forgotten that there are large acreages which are void of any vegetation. Particularly is this true in the badly eroded sections where the top soil is gone, leaving only the unfertile subsoil exposed.

The slipshod methods used on thousands of farms where the rows are run up and down the slopes, the seedbed

Here a terrace is being constructed to carry water off from the adjoining fields.

is shallow, and no system of maintaining soil fertility is pursued, have resulted in almost as great a soil loss from erosion as there is from the naked land. This is borne out by the first year's results of the experiment at Spur, Texas, where land planted in cotton on a 2 per cent slope had a soil loss of almost 28 tons per acre, with a 27½-inch rainfall. The Missouri Station found that their soil loss on land continually cropped with corn, was at the rate of more than 16½ tons per acre. Comparatively speaking, a very small per cent of the land farmed throughout the South and Midwest, where soil erosion is a problem, is farmed with any attention to the reduction of soil losses.

The magnitude of our soil losses can best be shown by the large amount of silt carried by our rivers. The Mississippi River transports annually into the Gulf of Mexico over 406 million tons of silt. The Potomac River empties annually 5½ million tons of silt into the Atlantic. Blaney and Fortier are authority for the statement that the Colorado River, which runs through Colorado and down into California, and on which the much disputed Boulder Dam is to be placed, and which has a drainage basin as large a the state of Texas, is carrying awa annually over 253 million tons of silt

It is not only the loss of this sil from the watershed that is a grav economic problem, but it is the hand ling of it after it gets into the stream It brings on many serious troubles. I the stream had a constant rate of flo and a straight path, the silt would g on down to the sea and be placed o its bed. There are, however, differen slopes to the stream beds, as well a various crooks and turns, whic change the rate of flow. As the sil carrying capacity of a stream depend on its velocity, when there is a chang in velocity, it immediately changes th carrying ability, with the result tha some of the silt is dropped. Thi means the forming of bars and th filling up of the river channel, whic necessitate clearing the silt out of th channel if it is to carry the drainag that comes to it.

Loss of Soil Fertility

Most of our large rivers are no taxed to the limit, due to the fact tha drainage in all sections has been im proved. River flood plains have bee encroached upon, forcing the rivers t

y within their channels when pre-
usly they were allowed to spread
t over large areas of bottom land.

So the soil loss which is a tragedy
itself, in that it is lowering the fer-
ity of our soils and thereby reduc-
g our crop yields, which in turn
ells unprofitable farming, is not all
e story. We have lost this heritage
ven to us and it goes down through
e streams of our country only to
st us additional wealth in getting it
t of the streams in order to prevent
tastrophes to people in all walks of
e.

It has been felt for some time that
here this silt gets into irrigation
ater, instead of being a menace, it is
blessing. This is by no means al-
ays the case. The problem of the ir-
gation engineer in building his canals
d constructing his large reservoirs is
ways how to handle the silt if he is
aling with a muddy stream. For-
nately, the engineer is becoming
lept in improvising ways and
eans by which he can dispose of this
t as it accumulates in places which
ill decrease the efficiency of his irri-
tion works. But at best, these sys-
ms of handling are very costly and
many cases are only partly success-
l.

The idea that the silt when it gets on to the land through irrigation water is beneficial, in that it is continually depositing a new wealth of soil fertility, does not always hold true. A number of years ago, I was talking to the then superintendent of the State Agricultural Experiment Station in the Imperial Valley in California. We were discussing the raising of cotton, and I asked him what he did about his soil fertility and what rotation he followed. His answer was that soil fertility did not worry them because the Colorado River was giving them, through the silt in the irrigation water, more fertility each year than they could hope to exhaust. That was a number of years ago and today the Imperial Valley has awakened to the fact that there are many disadvantages in that silt which more than offset its fertility. It is ruining the mechanical condition of their soil. The result of all this is that they are now very much concerned about how they can get the silt out of the water and not put it on the land. According to Fortier and Blaney the average annual cost of silt disposal and control in its various forms in the Imperial Valley Canal is about one million dollars.

Soil fertility losses from this soil erosion cannot, of course, be estimated accurately in dollars and cents. Ben-

Showing how a well-constructed terrace will carry off the water gradually.

nett, of the U. S. Department of Agriculture, says that soil erosion takes from the farmers' pockets an annual toll of at least two hundred million dollars. He goes on with the statement that he believes he is very conservative and that this estimate is moderate. There is no doubt that the loss is tremendous and as we have said before is not fully appreciated by the rank and file of those interested in agriculture.

We are finding, however, that it is becoming a very popular subject of talk by leaders in our affairs of the world. Business men and bankers also are coming slowly to the realization that something is wrong because the production of our farms is not what it used to be. In thinking of the solution of the problem, these men do not have to be very keen observers when they go out through our agricultural section to see that the top soils of our very fertile fields have migrated to lower elevations.

The Banker's Concern

The banker usually is cautious in taking up new systems and new ways of doing things. I do not know that he is different from other folks in this respect, but because he so materially affects the business of people in all walks of life, we perhaps particularly notice his conservativeness. These men who hold the purse strings of the country are just waking up to the great economic loss which soil erosion is causing the country. They had to have this fact brought home to them in a most forceful way before they took action to prevent it as far as they could. When we realize that the yearly loss from cultivated land, when not properly treated, can be at the rate of say 16½ tons per acre, it only takes 32 years for the upper 4 inches of that soil to be gone. When that 4 inches goes, it is practically the farm because it is the productive part of the farm.

If a banker has a mortgage on the farm, and the land was worth $100 an acre when he started, and this mort gage was at the rate of $50 an acr and if the time of the mortgage is 4 years, he wakes up when this mort gage becomes due to find that he ha lost his farm. The thief is Jupite Pluvius. He can swear out a warran for this person, but the trouble with i is that the sheriff cannot serve th warrant and no jail can house th criminal. The farmer who lives o the land, of course, was negligent i allowing the crime to be committed but if he is that kind of an individua it does not do the banker any good.

At least one bank has awakened t this fact and that is the Federal Farn Loan Bank of Houston, Texas, wit the result that they have incorporate in the papers they have issued on th loan that the farmer must terrace an drain his land properly so as to kee the collateral in good shape. If at an time the bank does not think this is be ing done properly, it can call the loar

This seems to me to be one of th most outstanding developments in re cent years towards enforcing protec tion of the fertility of our soils.

What Can Be Done?

What methods can be employed t eliminate absolutely this soil erosion I do not believe we are far enoug into the study as yet to be able to dic tate a policy which will absolutel eliminate all soil erosion. However we can go a long way towards it. I we wanted to eliminate it altogethe to the extent that it would be almos inappreciable, it would be necessar to cover all our lands, which are sub ject to erosion, with grass. The Texa experiment, as well as the Missouri proved conclusively, that there is n better prevention to soil erosion tha a good sod. At Spur, Texas, last yea with the rainfall of about 16 inches on a grass plat there was no erosion with an annual rainfall of a little ove 35 inches, in Missouri, over a perio of 6 years, they annually lost soil a

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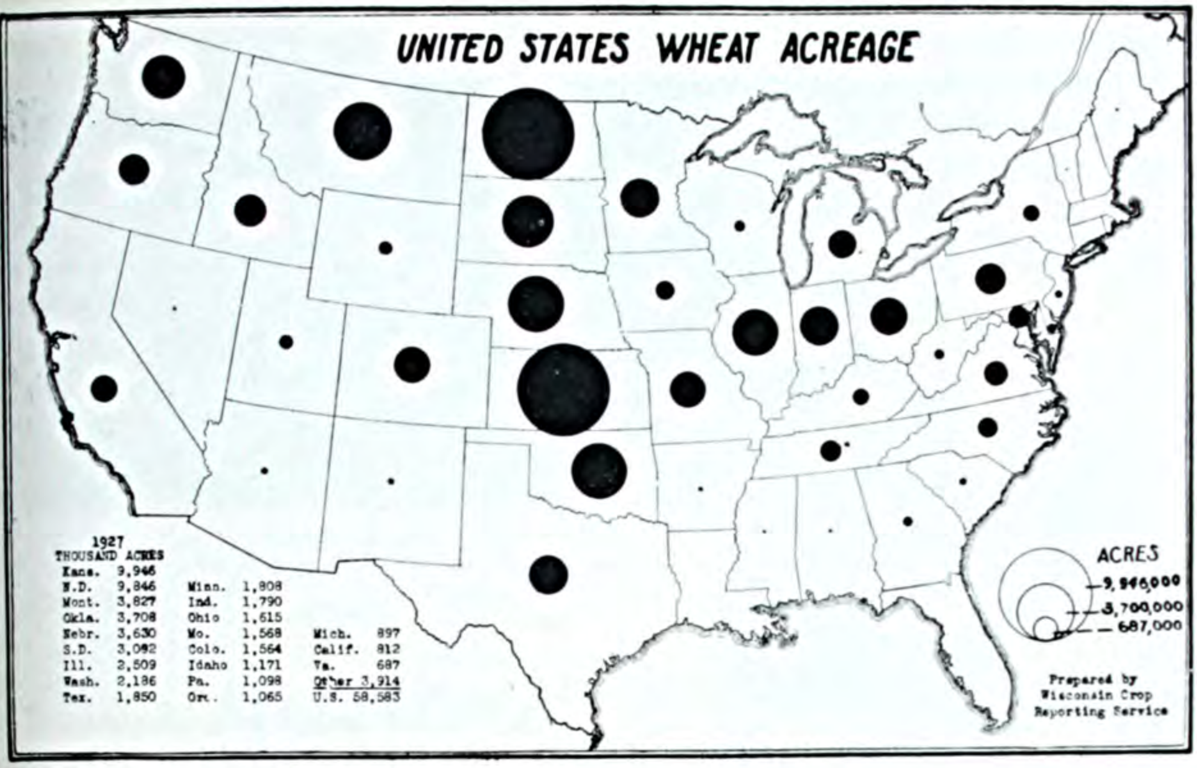


WHEAT

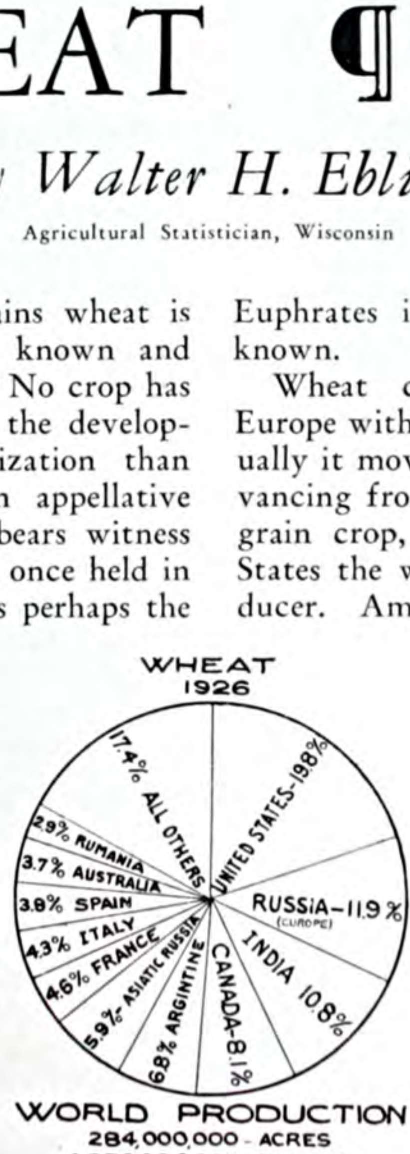
Fifth of our crop series

By Walter H. Ebling

Agricultural Statistician, Wisconsin

OF all the cereal grains wheat is probably the best known and the most widely grown. No crop has played a greater part in the development of Western civilization than wheat. Its well known appellative "the staff of life" still bears witness to the important place it once held in the lives of men. It was perhaps the first grain to be domesticated and its influence on the progress of the human race dates well back into that period of dim unknowns—before the dawn of recorded history. When man carved his earliest records into the rocks, it had already become an item of importance. Its origin, while commonly attributed to the valleys of the Tigris and Euphrates in Asia, is not definitely known.

Wheat came to America from Europe with the earliest settlers. Gradually it moved westward with the advancing frontier. Always the leading grain crop, it has made the United States the world's leading wheat producer. American leadership in wheat was associated closely with the development of the grain binder which made possible the harvesting of huge acreages on the prairies of the West, and with the advent of modern threshing and milling machinery which were needed to dispose of the large production.



In most parts of the world the word bread

(*Turn to page 55*)

¶ Here is a story of a combination plus good management which made money.

A harvesting scene where 750 crates per acre are being cut. Left: Putting the final O. K. on a crate of choice celery.

SUNSHINE SAND *and* CELERY

By J. L. Baskin

Atlanta, Georgia

WHEN Milwaukee is mentioned, we are reminded that "Schlitz made Milwaukee famous," but now that the days of Schlitz are over, Milwaukee must maintain her fame without its foam. Other cities are famous for the men they have furnished, statues they have erected, the roads they have built, the furniture they have manufactured, vineyards they have planted, or the crops they have produced.

Down in Florida there is a town of 10,000 inhabitants located on the beautiful St. Johns River that has become famous for the celery it produces. Sanford, county seat of Seminole county, produces one-third of the national supply of this golden harvest.

Along the banks of the St. Johns where once the savage Seminole fought and fished one can now hear the clutter of tractors making fields ready for celery and see giant motor trucks, loaded with crates of crisp, tender stems, speeding over paved roads to railroad terminals. During harvest the air is filled with the most delightful and appetizing fragrance which seems to keep all workers in a happy, snappy mood. Cutters, strippers, packers, craters, loaders, washers, and haulers, all seem to realize the obligation of delivering this most fragrant of vegetables to market in a way that it will please the consumer. Such organized cooperation explains why Sanford celery is demanded in increased quantities each year.

The soils of Seminole county, once the bed of the ocean, have almost perfect physical condition, but the thousands of years of tidal washing have made them almost devoid of plant food. The area devoted to celery is primarily of the Portsmouth series with a little Norfolk mixed in. After these soils were elevated, they remained as waste land for thousands of years and probably would yet be classed as such were it not for fertilizers and irrigation. Celery would never have been a success on these lands had the grower not early realized the value of an abundant and cheap water supply and furnished it. This water deficiency was adequately met by installing a complete sub-irrigation system of tiling to carry water from flowing artesian wells. Growers spend $600 per acre furnishing water to their crops, but this expense is well justified.

No sooner had the wells begun to flow through the underground passages before the growers realized that the soils were almost devoid of plant food. The problem of supplying ample plant food for a bountiful harvest was no small task. With ample water and sufficient plant food this vast wasteland has been turned into an intensively kept garden, many fields producing two carloads (1,500 crates) of choice celery per acre. Man has made a wonderful success by meeting nature's deficiencies of water and plant food. Furnishing water was primarily an engineering problem, but the supplying of plant food was chemical, nutritional, and biological. Here on these fields we find growers applying lime from Georgia, ashes from Canada, nitrogen from many countries, potash from Germany and France, and phosphate from Florida's own deposits.

First-hand Information

In order to learn what takes place on a celery farm, the writer interviewed Mr. J. E. Baker of Sanford who is an industrious farmer and a good celery grower.

"I commence my preparation early—beginning for the fall crop about September. After preparation I apply 1,000 pounds ashes and 500 pounds lime per acre broadcast. And, by the way, a celery grower can never produce maximum crops without good plants. I always try to not only have enough plants, but a surplus. I usually plant from October to December, depending on whether I want an

(Turn to page 53)

J. E. Baker in a field of young celery holding a 4-inch tile, a network of which underlies his fields.

Potato Profits

By F. C. Deitz

State Institute of Applied Agriculture, Long Island, N. Y.

THERE are two sources of information relative to improving one's practice in growing a farm crop. One source is observation of the practice of the best growers, the other is experimental evidence.

Observing the practice of good growers often discloses excellent suggestions, but it is difficult to point to some one specific thing as the factor responsible for an increase or a decrease in yield because other factors which may have contributed just as much, or more, are not controlled. In a carefully conducted experiment the variability of these other factors is reduced to a minimum.

Practice as to the amount of potash for potatoes varies on Long Island. Many growers use ten per cent potash in their potato fertilizer, some use seven per cent, and others use only five per cent. Some years, and under some growing conditions, nearly the same yields are obtained. This instance serves to illustrate the influence of the variable factors. What per cent of potash could be recommended on the basis of the practice of other farmers, under conditions as cited above?

In 1926 the writer began a three-year experiment at Farmingdale, Long Island, to study the effect of potash on the yield of potatoes, and to study the residual effect of fertilizer on soil where continuous cropping with potatoes is practiced. On Long Island continuous cropping of potatoes is practiced by many growers; therefore the residual value, if any, is important. A survey of the fertilizer practice of the growers shows that there is a wide variation as to the amount of potash used, even on similar soils. Some growers are not using enough potash. For these growers, increasing the amount of potash in their fertilizer should result in increased yields of potatoes without materially increasing their cost of production.

The soil on which this experiment was conducted is a sassafras, gravelly loam, typical of much of the potato soil on Long Island. Previous to this experiment, general farm crops had been raised on this land; the rotation including hay, corn, and grain. None of these crops had received heavy applications of commercial fertilizer. The soil was tested for acidity, and found to be acid. Upon such soil, it was believed that potatoes should respond to the application of fertilizer.

The Fertilizer Treatment

In the spring of 1926, stable manure was applied to the experimental field at the rate of 10 tons per acre. The field was not manured in the spring of the two following seasons of the experiment. Plowing was done late in March, after which, the soil was thoroughly fitted. The experimental plots were then laid out and marked permanently with iron markers, so that the exact location of each plot could be easily determined the succeeding seasons. In 1926 there were nine plots, each 200 feet long and wide enough to plant ten rows of potatoes. The following diagram shows the arrangement of the plots:

1—Check	5—Check
2—5-10-0	6—5-10-0
3—5-10-5	7—5-10-5
4—5-10-10	8—5-10-10
9—Check	

Since this work was directed to a study of potash and its effect on the yield of potatoes, potash was the only variable fertilizer in the experiment. Nitrogen and phosphorus were applied in equal amounts to all plots except the check plots. The amount of fertilizer applied to each plot was at the rate of 2,000 lbs. per acre and the foregoing table gives the analysis of the fertilizer used on each plot. In mixing the fertilizer for the plots, the nitrogen and phosphorus carriers were mixed first, using the following formula, on a ton basis:

100 lbs. Nitrate of soda
150 lbs. Ammonium sulfate
100 lbs. Dried blood
300 lbs. Tankage
1,160 lbs. 16 per cent Superphosphate

Where potash was used, is was obtained from high-grade sulfate of potash and muriate of potash; the amount varying from nothing to 200 lbs. and 400 lbs. in the 5-10-0, 5-10-5, and 5-10-10 fertilizers respectively. (The muriate plots were added to the experiment in 1927 with a 5-10-10 analysis.) Great care was taken to see that each plot received the same amount of nitrogen and phosphorus. The seed was planted about April 15 in 1926 and 1927 and about a week earlier in 1928. The seed used each year was certified Green Mountain from New York state.

Cultivation and spraying were done each year throughout the growing season in accordance with the best Long Island practice. The yields for 1926 and 1927 were normal yields for the location and the type of soil, but the 1928 yield was greatly reduced due to excessive rainfall in July, making adequate spraying impossible. This condition brought about a premature killing of the vines by blight. The reduced yield was the result of partially matured tubers. There was no late blight rot.

Considerable difference was observed during the growing seasons between the plots receiving fertilizer and the check plots. The plants in the check plots were less vigorous, had much smaller foliage, and were of a lighter green color. These differences were more pronounced each successive year of the test. In the summer of 1928 the vine growth in the check plots was very meager. The plots receiving potash made the most vigorous vine growth throughout the three years of the experiment.

Each year the potatoes were harvested during the latter part of September. After careful digging and an examination of the tubers for diseases, yields of the several plots were graded into a number grade and culls. In the table below, giving the yields of the various fertilizer treatments, the figures given for each treatment are the average for the two plots receiving the same fertilizer treatment.

POTASH PRODUCED MORE AND BETTER POTATOES

Fertilizer Treatment	Yield per acre in bushels					
	1926		1927		1928	
	No. 1	Culls	No. 1	Culls	No. 1	Culls
Checks	147	22	101	20	25	37
5-10-0 Fert.	152	40	108	22	68	45
5-10-5 "	191	30	253	23	115	39
5-10-10S* Fert.	258	14	264	18	120	36
5-10-10M† "	...	..	251	24	93	45

* Sulfate of potash.
† Muriate of potash.

Looking at the yields for 1926, it will be apparent that potash was a valuable factor in producing a better crop of potatoes. The increase in yields on marketable potatoes with the use of a 5-10-5 fertilizer as against the 5-10-0 was 39 bushels per acre. With 10 per cent potash in sulfate form, the yield of No. 1 potatoes was 67 bushels more than the 5-10-5 yield and 106 bushels more than the 5-10-0 yield. Even greater increases are found in the yields for 1927. In 1927 there is a reduction of 46 bushels in the yield of the check plots, and a reduction of 44 bushels in the yield of the plots receiving nitrogen and phosphorus, but no potash. In 1928 there are still further reductions in these plots. This indicates the danger of continuous cropping with potatoes where no fertilizer is used, or where one element as potash is omitted. The reduction in the 5-10-0 plots is undoubtedly due to potash hunger. The 1926 crop was able to get some potash from the soil of both the check and 5-10-0 plots, but the second and third crops suffered from a depleted potash supply. In the case of the no-fertilizer plots, the low yield is probably due to a deficiency of all three plant food elements.

The Next Year

Turning now to the 1927 yields of marketable potatoes on the plots receiving potash, we find an increase of 62 bushels per acre over the 1926 5-10-5 yield and a decrease for the 5-10-0 plot of 44 bushels in 1927. In the large increase of the yield of the second crop on the 5-10-5 plot, there is evidence of the residual effect of potash from the previous year's fertilizer application. The smaller increase in the 10 per cent potash yield the second year may indicate that the use of 10 per cent potash under a system of continuous cropping, is not economical on some soils. However, the 1926 yield with 10 per cent potash shows convincingly that this amount of potash is essential to a maximum yield on land which has not been heavily fertilized for previous crops.

The yield in 1928, although low on all plots, shows an increase of 5 bushels per acre for the 5-10-10S plot over the yield of the 5-10-5S plot. Due to the uncertainty of the factors involved in the low yield of 1928, this difference may not be significant, and should not be interpreted as indicating that under all conditions of continuous cropping with potatoes, a 5-10-10 fertilizer would pay after the first two years of cropping, better than a 5-10-5 fertilizer.

In 1927, a muriate of potash plot was added to the experiment in an analysis of 5-10-10. This was added for comparison with the 5-10-10S plot. For the season of 1927 there was a difference in yield of 13 bushels per acre in favor of the sulfate form. This difference was too small to be significant. In 1928 the yield of the 5-10-10M plot was 27 bushels less than the yield of the 5-10-10S plot. This may indicate that under some conditions sulfate of potash is a more desirable form to use than the muriate of potash. In a similar test made in 1927 at Hicksville, Long Island, there was a difference of 51 bushels per acre in favor of the muriate form. It is evident that what is best under one set of conditions is not necessarily the right thing under different soil conditions. The previous cropping and previous fertilizer applications, and the type of soil of a field must be considered. Then too, it is possible that the response of the plant to different forms of potash may be greatly altered by the kind of season, as to the average temperature during the early part of the season, the amount of rainfall, and the distribution of the rainfall.

It is unfortunate in some respects that the 1928 yield was reduced so far below the average for the two preceding seasons. Some of the spe-

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A round-up of cattle in the Battlement National Forest, Colorado.

Agriculture Today

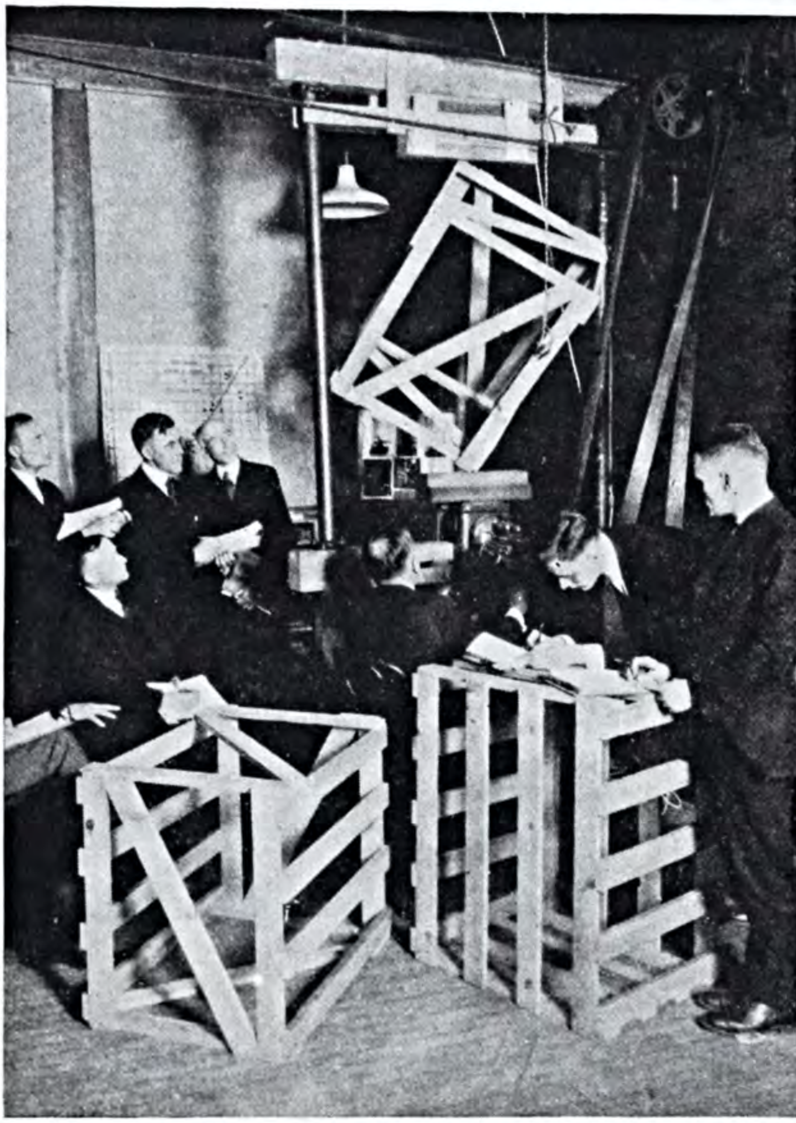
VI. Forestry

By Frank George

AMERICAN farmers own more than 140,000 acres of woodland. How to enable these owners to get the best return from this great aggregate of land, split up into scores of thousands of comparatively small parcels, is an important and complex problem. Added to this problem is that of promoting forestry practice on privately owned timberlands other than farm woodlands.

"The solution of the problem of farm woodlands may best be approached," according to R. Y. Stuart, chief of the United States Forest Service, "through better understanding of the part that a well-managed woodland can play in the whole farm enterprise. It involves guiding this action through advice and instruction based on organized research and adapted to meet a great diversity of conditions growing out of differences in area, location, character, and ownership of the woodlands."

In 1924 the enactment of the Clarke-McNary law provided means for broadening and intensifying ef-



Testing shipping crates at a Forest Products Laboratory which conducts wood utilization experiments.

and more than 30,000 acres of farm lands were planted with approximately 28,000,000 young trees supplied by State forestry departments in cooperation with the Forest Service.

"Less progress," Mr. Stuart declares, "has been made in promoting forestry practice on privately owned timberlands other than farm woodlands. Thus far, the approach to a solution of this problem has been along two lines: one, the conduct of organized research into the principles and methods of timber management and wood utilization; the other, the making of the results of such research available to private owners and forest industries."

Investigations along these lines are being made at 11 Experiment Stations, the Forest Products Laboratory at Madison, Wisconsin, and by other units of the Forest Service and regional offices. A special investigation dealing with forest taxation is now under way under the direction of Professor Fred R. Fairchild of Yale University. The scope of Forest Service investigations thus includes organized effort toward the solution of problems in timber culture, wood utilization, forest economics, and in general of all questions involved in the management of forest land and the exploitation and use of its products.

"The McSweeney-McNary law, passed at the last session of Congress," Mr. Stuart says, "authorizes a much needed expansion of this work in forest research. Although great progress has been made in the past, even larger

forts by the Forest Service and State forestry organizations for extending farm woodland management. Under the provisions of that law 32 States have employed extension foresters through whom the States, the Federal Extension Service, and the Forest Service are now cooperating in bringing to the attention of farmers the possibilities for better agricultural practices afforded by woodlands, and through practical assistance in putting into operation the best known methods of handling woods.

The provisions of this Act call also for planting stock at low cost to farmers for the establishment of windbreaks, shelter belts, and farm woods. During the past year 4,509 farmers received assistance toward the management of 222,135 acres of woods;

problems lie ahead waiting to be solved, problems caused by the great diversity of forest conditions in this country, the many kinds of timber trees, the methods of utilization that have been practiced in the past, and the immense consumption of timber in the United States—more than all the rest of the world combined."

The Forest Service is promoting the adoption of forestry practice on privately-owned timberland also through cooperation with the States and private owners in fire protection. Under the provisions of the Weeks Law and the Clarke-McNary law, $3,890,000 has been expended by the Federal Government in the last 17 years in cooperation with the States in protecting timberland from fire. As a result of this activity on State and private lands, and of the work on the National Forests, about 292,000,000 acres of forest land in the United States are now under systematic fire protection.

Increased security to forest investments as a result of better fire protection, changing economic conditions, and greater familiarity with the timber-growing idea, are regarded to have helped in recent years to bring about some forestry practice on privately owned land. There remain, however, millions of acres of forest land that are waste or only partially forested, or covered by growth that is scrubby or of inferior species. This land, the forestry experts declare, should be growing full crops of timber if the needs of the nation are to be supplied.

The handling of the National Forests is regarded as being mainly an agricultural problem of huge proportions—the growing, protecting, and harvesting of timber and forage crops on 159,000,000 acres of land. Handling the timber resources involves pro-

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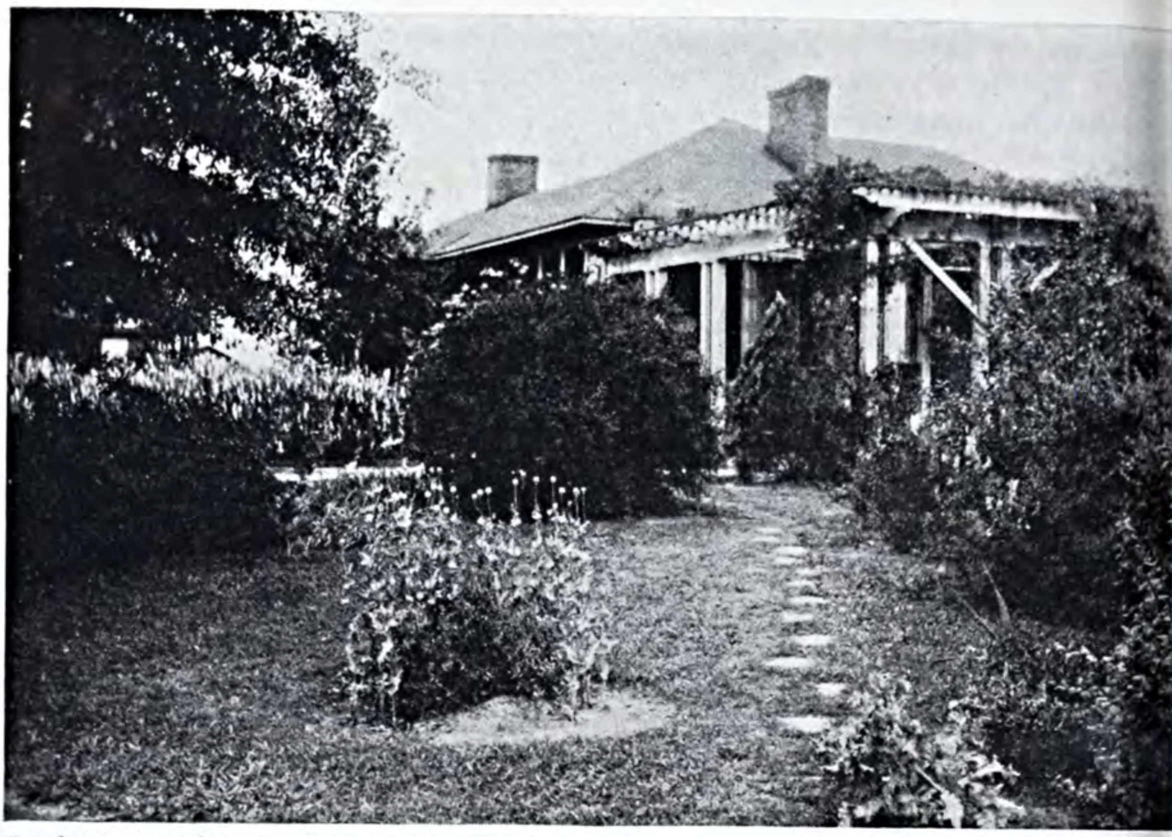
One of the meanest jobs in the world is fighting fire, but when a fire is discovered in the National Forests, it is fought until extinguished. Fire lines cleared of brush are usually used to check the spread of fires running along the ground.



In the Spring of 1927 when the flowers and shrubs were growing luxuriantly as a result of well-balanced plant food supplied by fertilizers.

Making *a* Home Out *of a* House

By Mattie R. Ferris

Jackson, Mississippi

NEVER before in the history of the South have our homemakers given so much thought to beautifying their premises. Millions of dollars are being spent annually for evergreens and smaller amounts for grasses with which to do this. Much of this money will be wasted, in fact, is being wasted because proper care is not taken to see that such grasses and shrubs are properly fertilized.

For several years I have been growing ornamentals for market, but have recently sold the nursery and moved away, so that no one need think I am trying to advertise my own wares. I had fine success in growing and marketing such ornamentals and attribute it entirely to having kept them well worked and fertilized. This applies not only to shrubs in the nursery rows but as well to the same after they had been placed in their permanent settings.

All who saw my small nursery were impressed with the beauty and symmetry of the plants and it was always possible to sell them in competition with other similar plants that were being held at lower prices. Such plants sell on their looks alone and unless healthy and symmetrical in appearance will never bring the cost of production. I was equally successful in developing in a very few years an attractive home at very small cost, starting with a house built in an abandoned cotton field.

1921, two years after the little home was built in an abandoned cotton field. The ornamentals and the lawn have a good start.

Knowing little in the beginning about the effects of fertilizers and nothing about the several plant food elements that give value to them, I applied to my nearest experiment station and was told that liberal applications of animal manures, supplemented with equally liberal amounts of commercial fertilizers, would likely be as helpful to crops of this kind as to the common farm crops of the country.

Only small amounts of manure were available and these were used on the plants permanently set in the yard, being supplemented by rather heavy applications of an 8-4-4 mixture. On the nursery proper no manure at all could be had and I depended entirely on a commercial mixture of the above composition purchased from a nearby fertilizer factory and used at the rate of 1,000 pounds or more per acre.

Some of these ornamentals were more or less subject to injury from low temperatures in winter and my experience went to show that this danger from cold might be materially lessened by the use of increased amounts of potash either in the mixtures or applied as a side-dressing. The idea of using potash to harden the wood as a protection against winter injury was obtained from the local Satsuma orange growers who had found that side-dressings of potash used in late summer rendered such trees much less subject to occasional winter freezes.

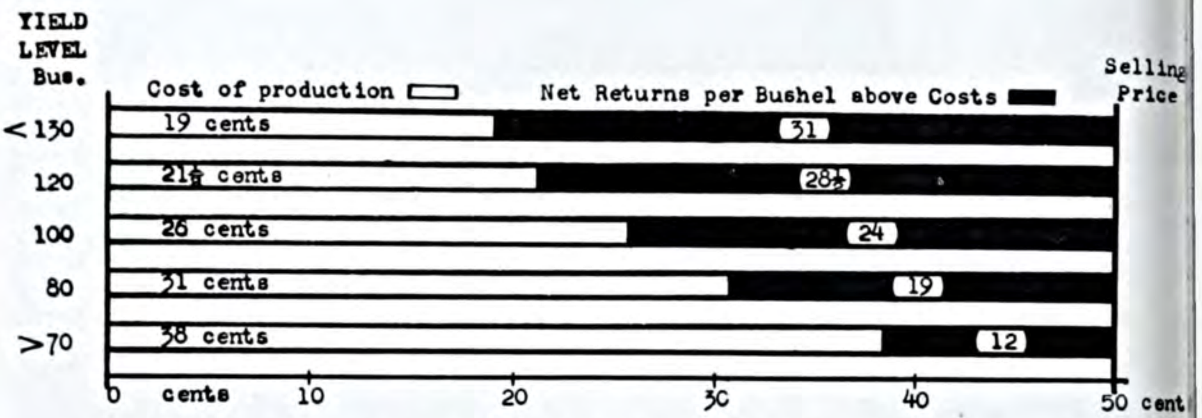
Ornamentals are used entirely to gratify a love for the beautiful and to satisfy one's aesthetic tastes. It would seem the height of folly to plant them for such a purpose and then allow them to become diseased and disfigured for the want of proper food. Like growing prize animals, those who produce prize plants must feed them liberally with well-balanced rations. Potash is said to control quality in plant growth more than any of the other plant foods and I felt one could scarcely afford to run the risk of this loss of quality by withholding this potash since it is the cheapest constituent of a fertilizer.

Several years later with the shrubbery severely pruned during winter. The home begins to take on a livable appearance.

Corn Production Costs

By H. L. Garrard

Mansfield, Ohio



THE MORE BUSHELS PER ACRE—THE MORE PROFIT PER BUSHEL.

WE sell our corn by the bushel so why not produce it on the basis of cost per bushel rather than cost per acre?

No single thing, but a combination of proper practices will enable farmers to produce maximum yields of corn per acre. These were the general conclusions from a summary of the practices of 510 farmers competing in the Ohio 100-bushel Corn Project over a period of nine years, as discussed by John A. Slipher, Soils and Crops Specialist of Ohio State University, at the recent Ohio Farmers' Week. Many of the farmers who completed the necessary records in the corn project did not succeed in producing the desired 100 bushels of corn per acre. Comparisons of the farming practices accompanying or resulting in certain yields or yield levels show some very interesting indications.

The higher the yield, the less was the average actual cost of production per bushel up to husking time. Therefore a greater profit resulted because of both more profit per bushel and more bushels per acre. The accompanying table shows that the average cost per bushel from yields below 70 bushels per acre was 38 cents,

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INCREASED YIELDS RESULTED IN LOWERING PRODUCTION COSTS AND INCREASING NET RETURNS.

Average Yields Bus.	Ave. Cost of production per bushel	Differences in cost of production per bushel	Net returns per acre above cost of production. (Corn @ 50c per bushel)
60 (Below 70)	38 cents	....	$ 7.20
80 (71-90)	31 "	— 7 cents	15.20
100 (91-110)	26 "	—12 "	24.00
120 (111-130)	21½ "	—16½ "	34.20
140 (Above 130)	19 "	—19 "	43.40

Good Asparagus

By A. E. Wilkinson

Vegetable Specialist, Connecticut Agricultural College

DO you know your asparagus? Perhaps you do when it is before you on toast on a plate. But how about it out in the field, and how would you grow it to make money?

Ernest Lamb of Pawcatuck, Connecticut, could tell you how he is making money from asparagus raising. His field is not very large; he only has about five acres. The land is entirely level, of a heavy, sandy loam nature, free from stone, and is not more than 5 ft. above water table.

In starting the crop of asparagus, Mr. Lamb used a method which is becoming more common in Connecticut and in other eastern centers. This method was one originated by the writer and is called the Wilkinson Method. It consists in planting asparagus in rows 5 ft. apart with the plants in the row 9 or 10 in. apart. The plants are spaced in depth 9 in. from the average surface level, but they are not covered more than 1 to 1½ in. As cultivation progresses, the furrows are filled and the plants are not injured by being buried too deep. Asparagus is a plant hog. It needs lots of fertilizer.

Manure was available on the Lamb farm and as soon as the plants were placed in the trench and the inch of soil covered, then 1 to 1½ in. of well-rotted manure was spread in the furrow. This manure acted as a protection against loss of moisture, also prevented crusting of the soil and aided somewhat in plant food. As

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Starting the young asparagus bed—rows 5 ft. apart—plants 9 in. apart.

Improvement Winners

By J. D. Romaine

THE best soil improvement programs of county agents in the North and South as submitted in contests of the National Fertilizer Association are noticeably broad and uniform in their general outlines. This uniformity in the methods for soil improvement is the more remarkable when it is considered that the programs come from 12 states scattered over the humid regions of the United States. This would indicate that these county agents have selected very sound and fundamental practices or these would not pertain to such a variety of soils, climates, and cropping conditions.

In nearly all the programs, the soil improvement was begun by the use of lime to correct soil acidity. This was followed by the growing of leguminous hay and green manure crops, properly fertilized. With soil acidity and humus supply taken care of, conditions were favorable to the extensive use of properly balanced high analysis fertilizers.

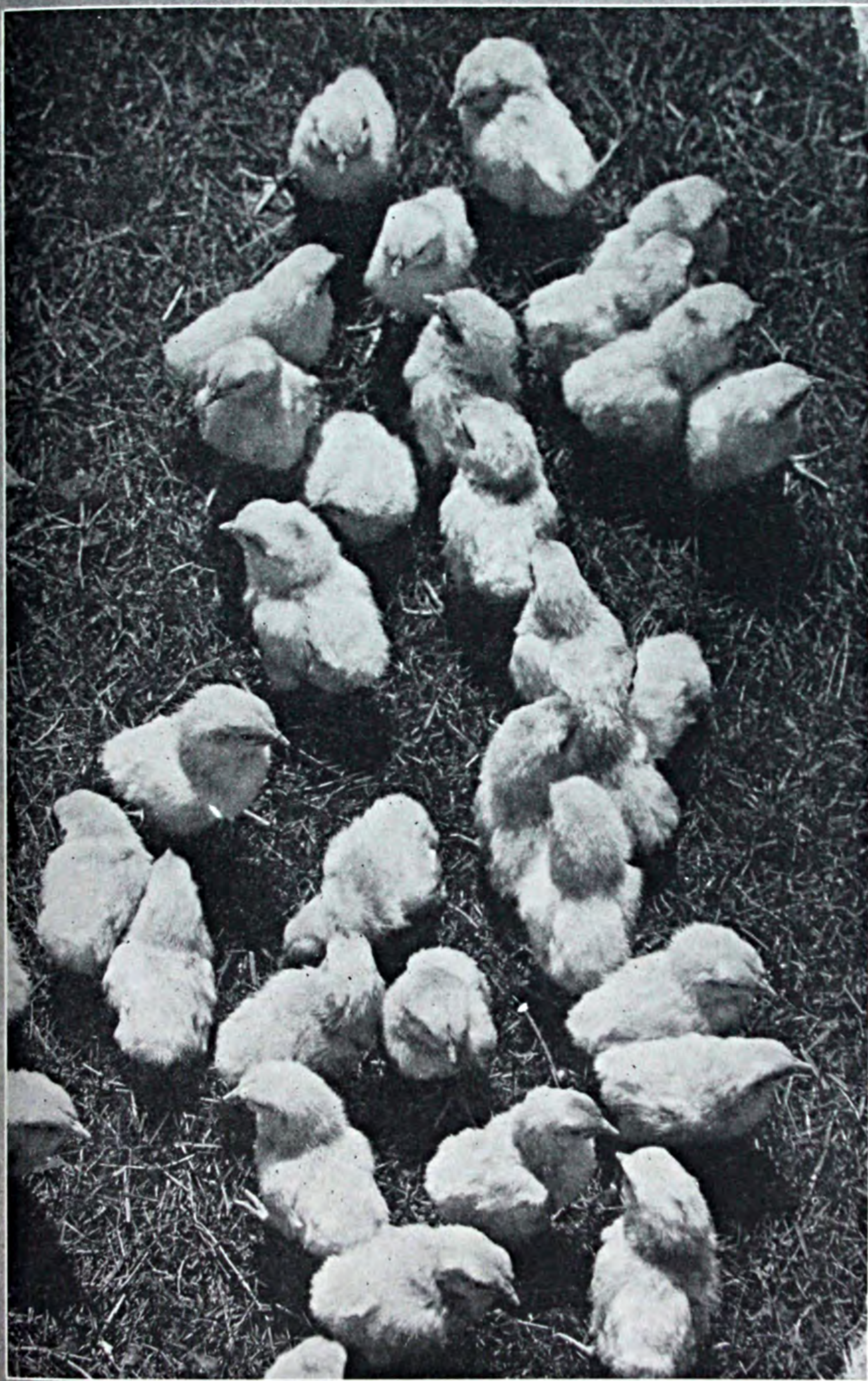
In most of the programs also are included such features as legume inoculation, control of erosion, and improvement of pastures and hayfields by fertilizer top-dressings.

The methods used to put the programs in effect necessarily vary with local conditions, service demonstrations, clubs, agricultural trains, meetings, and especially soil acidity testing—all were pressed into service.

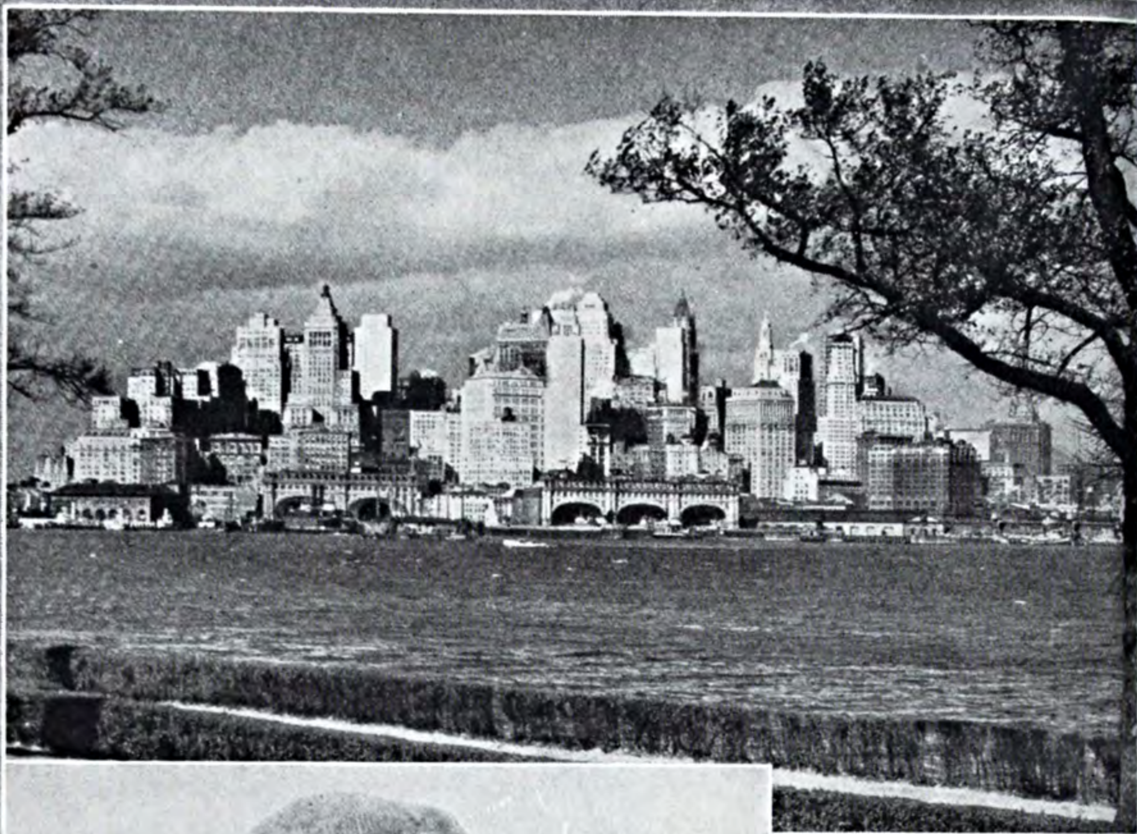
The good effects of these programs can be measured by the increased yields and quality of the crops, increased acreages of legumes grown, better systems of farming, increased tonnage of lime and properly balanced high analysis fertilizers, and in many sections, the more economical production of dairy products.

The agents who submitted the prize-winning programs are: O. E. Allen, Cass County, Mo.; T. H. Blow, Washington County, Vt.; W. G. Yeager, Rowan County, N. C.; C. D. Lewis, Hartford Co., Conn.; H. K. Sanders, Person Co., N. C.; C. L. McNeil, Madison County, Miss.; H. G. Sterm, Harrison County, W. Va.; R. Amundson, Outagamie County, Wis.; Earl W. Smith, Muskogee County, Okla.; G. R. Gilkey, Richland County, Ohio; H. C. Heath, Chambers County, Ala.; W. L. Hall, Faulkner County, Ark.; W. S. Barnhart, Muskingum County, Ohio; L. E. Thorn, Jasper County, Ind.

The competition for winning prizes was very keen this year and the judges had a difficult task to select the best programs. The judges represented an eminent group of agriculturists, and included for the North: G. I. Christie, Professor of the Ontario Agricultural College; A. J. McCall, Chief of Soil Investigations, U. S. Department of Agriculture; E. L. Worthen, Extension Soil Technologist, Cornell University; B. L. Hartwell, formerly Director of the Rhode Island Experiment Station; B. K. Bliss, Director of the Iowa Extension Service; and for the South: O. S. Fisher, Extension Agronomist, U. S. Department of Agriculture; W. B. Mercier, Director of Extension, Louisiana State University; I. O. Schaub, Dean of Agriculture and Director of Extension in North Carolina State College; T. S. Buie, Head of Department of Agronomy, Clemson College, S. C.; J. R. Ricks, Director of the Experiment Station, A. and M. College, Miss.



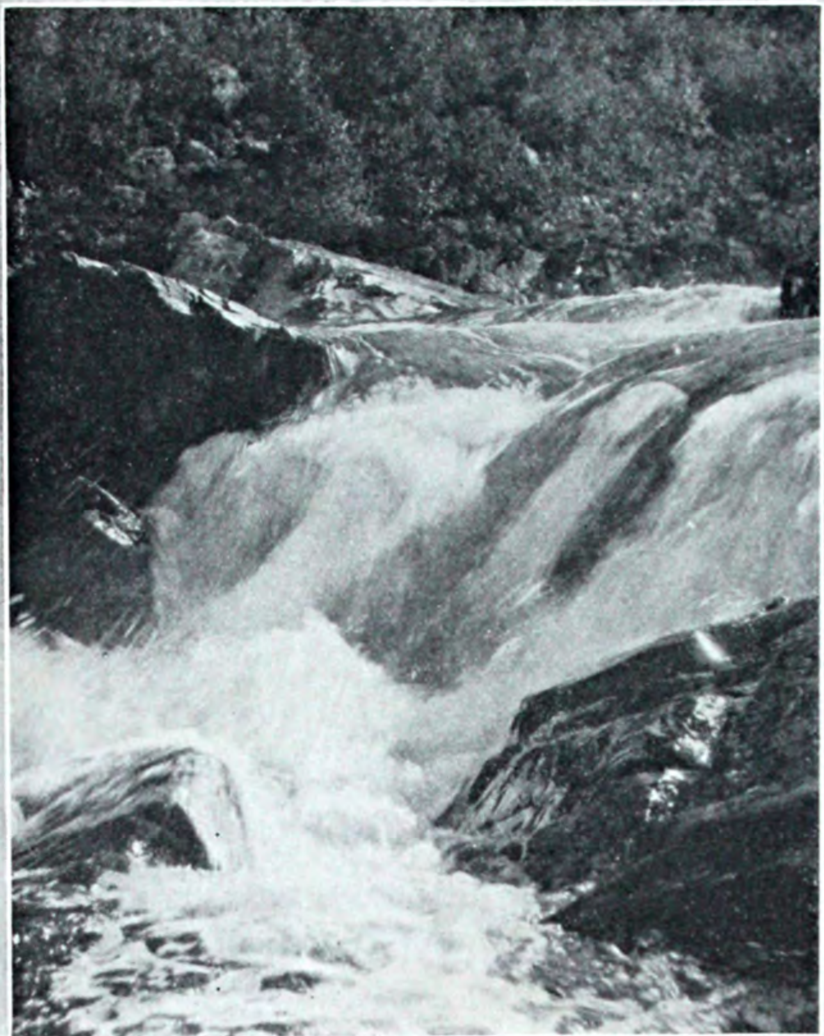
PICTORIAL



Above: The marvelous sky line of lower Manhattan New York. The view wa taken looking almost directl north from Governor Island.

Left: The Spring harvest on the horse radish farm of D. C. Marshall, near Topeka, Kansas. The product goes to condiment factories.

Right: An inspiration to fisherman. A beautiful little falls in the White River, near Iron Bridge, Ontario.



Below: The chick seems to be quite contented with its foster mother, Miss Kathryn Landy, Hollywood film star.

Left: This youngster is not worrying about the price of hogs for it has plenty of time to change before his pet pig grows up.

Right: Helping Mother, and at the same time finding an interest more absorbing than dolls.

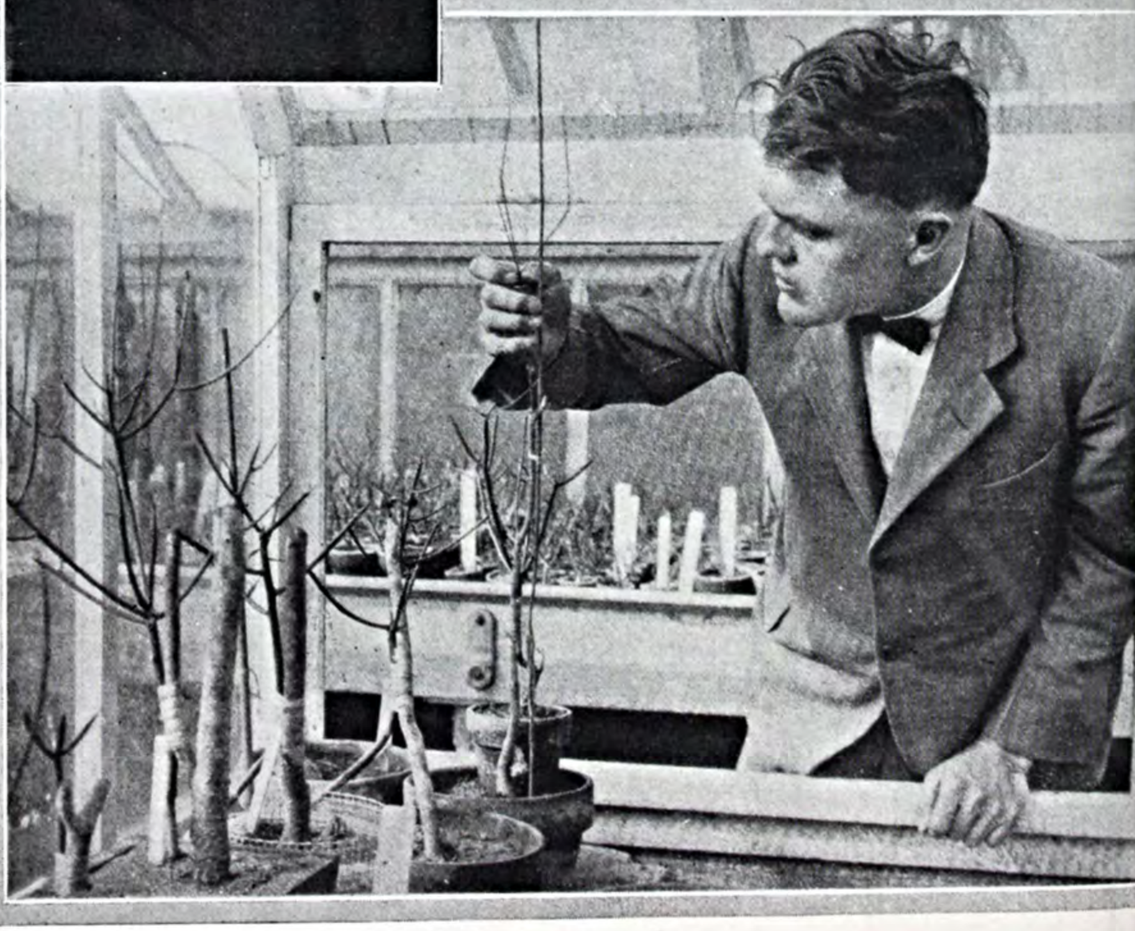
Right: Harold Stoner, son of Mr. and Mrs. Paul D. Stoner of Ladoga, Indiana, has a good friend in this pet lamb, which he hopes will never have to be sold.

Left: Trying to understand each other. It looks as though an interpreter might be necessary for successful cooperation in this family.

Right: Miss Thyra Moore, daughter of Mr. and Mrs. F. W. Moore of Otterbein, Ind., watering two of her father's good horses.

Left: Dr. Clarence L. Holmes, who recently became chief of the Division of Farm Management and Costs of the Bureau of Agricultural Economics, United States Department of Agriculture. Dr. Holmes has been head of the Department of Agricultural Economics of Ohio State College at Ames.

Below: Dr. Charles F. Swingle of the United States Department of Agriculture who recently returned to Washington from Madagascar with live plants and seeds. Many of the plants brought along and some of those represented by seeds are rubber yielders that it is hoped in the years to come will help to keep our autos properly shod.



The Editors Talk

What Will the Harvest Be?

That is the question which every farmer, consciously or unconsciously, asks himself as he plans his spring seeding. In this day of surpluses, the thinking farmer should ask himself another question, "What is the other fellow's harvest going to be?"

There can be no definite answer given to these questions. No one can tell what the weather, the greatest of all factors affecting crop production, is going to be like during the several months of the growing season. There are other variable factors upon which no workable estimate can be placed. However, there is one, and a very important one, on which some fairly definite ideas can be obtained and from which the farmer can profitably govern his preparation for yields. This is the farmers' intentions to plant, a report of which has just been released by the United States Department of Agriculture.

The Department is to be highly commended for this report. Entailing a great amount of work on the part of the Crop Reporting Board in collecting information from 50,000 producers on the probable acreage of various crops, except cotton, to be planted in 1929, the report will enable farmers to make such adjustments in their plans for 1929 plantings as may seem desirable. Every farmer should receive and carefully study in line with his own operations the information contained in the assembled data.

There will be, according to the report, about a two per cent increase in the aggregate area planted, but farmers are planning some marked shifts between crops.

"If farmers carry out their present plans," says the Bureau of Agricultural Economics in interpreting the data, "there would seem to be a reasonably favorable market outlook for all hay and feed crops in the Western States, alfalfa for market, potatoes for market after the first of July, sweet potatoes, rice, flax, large-type peanuts, and most types of tobacco."

The Bureau cautions the farmers to reconsider intended acreages in beans, spring wheat, Burley and flue-cured tobacco, and cabbage in certain areas.

"Present numbers of livestock," it is pointed out, "indicate no material change in prospects for farmers growing hay and feed crops for sale, except in some Western and Northwestern areas, where severe winter has depleted reserves.

"Spring wheat farmers," according to the Bureau, "should watch for the April winter wheat report and be guided by it in determining whether to increase the acreage of hard spring wheat. Should the intended increase in acreage of hard red spring wheat of 8.8 per cent be carried out and average yields be obtained, a production of hard red spring wheat only slightly less than in 1928 would result. Such a production with an average winter wheat crop, would be large enough to produce an exportable surplus of the lower qualities of spring wheat.

"The combined acreage of the principal feed grains, corn, oats, barley, and grain sorghums as now planned is unchanged from the acreage harvested last year and remains three per cent above that of 1927. Farmers indicate intentions to increase tame hay acreage approximately three per cent above that in 1928. Average yields on this acreage will result in sufficiently increased production to provide a surplus of market grade of hay in the North Central States as contrasted with the present shortage.

"Potato growers indicate they intend to plant 3,418,000 acres or 10.6 per cent less than that harvested last year. Allowing two per cent for usual loss of acreage from flood, drouth, blight, and other causes, this intended acreage would leave about 3,350,000 acres for harvest next fall compared with 3,825,000 acres harvested in 1928 and 3,476,000 acres in 1927. With average weather conditions, this acreage would produce somewhere around 390,000,000 bushels, a production which would furnish about the usual supply of potatoes after the heavy holdings from the 1928 crop are off the market."

For more detailed information, especially on intentions to plant in different regions, we heartily recommend securing a copy of this important report direct from the United States Department of Agriculture.

Common Sense

The primary object of all human effort, especially as related to industry, is gain. Whatever the units of measurement employed to determine gain, mathematics, the science of figures, plays an important role.

In this country, it is the dollar that we use as a unit for measuring gain. One hundred, the basis of the dollar, is also the basis of percentage. The relation between dollars gain to the farmer and percentage gain, is very close indeed.

Some of us have thought in terms of percentages, for instance as applied to fertilizer analyses, for so long that our entire viewpoint in feeding crops with relation to percentage of gain in dollars has been clouded.

Let us still think in terms of percentages, but never for one moment lose sight of the total pounds of plant food per acre, cost in dollars and cents, and profit. For example, as we approach the maximum use of phosphoric acid for a crop, the relative increases for each increment become smaller and our phosphoric acid curve flattens out. It is doubtful if we will ever be able accurately to determine for all conditions the percentage of phosphoric acid required. Especially is this true of small applications of fertilizer per acre.

Suppose we apply 400 pounds of 4-8-4 per acre to a crop and find indications of a deficiency of phosphoric acid. Why not apply a 4-12-4 fertilizer? If we believe that more than 8 per cent phosphoric acid is needed, it is sound economics to make it 12 per cent in actual farm practice. Phosphoric acid is cheap. The cost of the additional 4 per cent phosphoric acid in the mixture is less than 80 cents per acre. The 4-point increase in percentage of phosphoric acid may considerably increase the return in dollars.

What has been said of phosphoric acid applies also to potash. With small applications of fertilizer per acre, some crops show but a slight response when only 4 per cent potash is used. Increasing the potash from 4 to 12 per cent, however, may give outstanding results. Potash is cheap. Therefore, it is sound economics to apply enough potash in your fertilizer to provide for maximum yields.

With increments of nitrogen one has to be more careful than with either phosphoric acid or potash, for nitrogen costs more. We must be sure of the need for extra nitrogen and of the possibility of large returns before it is a good economic practice to greatly increase the amount used.

On account of differential in costs of the three fertilizer elements, common sense dictates that in the feeding of any crop we safely may have a surplus of phosphoric acid and potash, but not a surplus of nitrogen. The fertilizer used should contain adequate quantities of all three elements, for we seek to supply soil deficiencies in feeding our crops. Only in this way are we assured of the largest return on our fertilizer investment.

Sulphur and Molasses

It is not so many years ago that Spring meant sulphur and molasses. Noses were held while great spoonfuls of the odious mixture were poked down the throats of protesting youngsters. Elders took the "spring tonic" to tone up sluggish systems after a winter of overeating and inactivity. Of course it worked; the recovery from a good dose of sulphur and molasses was enough to make any one feel better.

Modern health rules keep us toned up the year round. Some of these are quite simple and can be followed with litte inconvenience. Now along comes Miss Mary Leonard of the University of Illinois with ten commandments of health. "Eat less; chew more," she says. "Ride less; walk more. Clothe less; bathe more. Worry less; work more. Idle less; play more. Talk less; think more. Go less; sleep more. Waste less; give more. Scold less; laugh more. Preach less; practice more."

Practical and simple, aren't they? Let's be commanded.

The County Agent and Soil Improvement

Too often the county agent is taken as a matter of course without being given recognition for the great efforts he may be putting forth to help the farmers and other groups in his county. Called early and late from one end of the county to the other on matters pertaining to any of the subjects listed from A to Z in the encyclopedia, he is supposed to know something about all of them. Sometimes he finds a simple problem that with a little thought the farmer himself could have satisfactorily solved. Other times he saves the farmer large amounts of money by recommendations made or decisions rendered. In either case, the county agent does his best striving to serve all fully and impartially.

One would think that all of this would keep a man occupied, and it would most men, but county agents are in a class by themselves. After answering the many enquiries and tending the multitude of details of his office, he goes out and makes himself more work by organizing meetings to discuss dairy herd improvement, marketing problems, poultry management, cropping systems, pasture improvement, fertilizer and lime usage, and a host of other projects. Then to fill out the rest of his time, he holds demonstrations on tree pruning, use of lime and fertilizers, legume inoculation, poultry culling, seed treatment, in fact demonstrable problems too numerous to mention.

These busy county agents have a very thorough knowledge of those branches of agriculture most pertaining to their counties. It seems almost inconceivable that a man having to cover such a wide field of knowledge could have much detailed information about any one subject. Yet we find many agents fully informed on fundamental facts connected with the most important problems in their counties. We have a good example of this in the soil improvement programs submitted by county agents to the National Fertilizer Association which are summarized elsewhere in this issue.

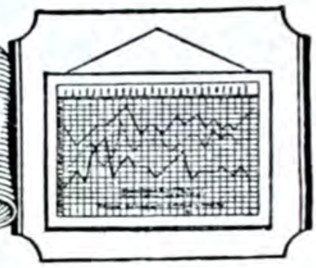
All of these men selected very basic practices as the starting points for increasing the fertility of the soils in their counties. These programs necessarily vary slightly to fit local conditions, but the underlying principles are the same in all of them. It is by no mere chance that these programs are so similar. The agents have carefully studied the fundamental factors in the conservation of the soil, the very foundation upon which all agriculture rests. Through their own experiences and that of countless others, they have learned that the correction of soil acidity, maintenance of organic matter, control of erosion, proper drainage, crop rotation, and the use of properly balanced fertilizers are of primary importance in soil management.

This is but one instance of the splendid work county agents are doing all over the country. They are attacking many other important problems in their counties, just as thoroughly and intelligently. It obviously is impossible for any one of them to handle all the phases of agriculture so completely. But we can rest assured that they are doing their best and are striving to accomplish more and more as time goes on.

Our appreciation and admiration go out to all county agents for the great services they are rendering, and our congratulations go to the authors of the winning soil improvement programs for the fine work they are doing.

HEARTY COOPERATION IN THE SPRING DRIVE FOR BETTER CROPS

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

PEA ROOT ROT REDUCED BY FERTILIZER

Liberal use of commercial fertilizer, applied carefully so as to prevent seed injury, is effective in reducing root rot of peas, according to results obtained by Dr. C. M. Haenseler of the New Jersey Agricultural Experiment Station, who calls it the best insurance for a good crop. Fertilizer doesn't prevent the disease, but it retards the spread of the fungus so that good yields can be obtained on heavily infested soils. On a field which was not used the year before on account of the prevalence of the rot, Dr. Haenseler last year demonstrated that by proper fertilization such fields can grow peas profitably. The best results were obtained when a superphosphate-potash fertilizer was placed in the row and the nitrogen, most injurious to seed, was given as a side application after the plants were up. The yield was 135.5 bushels of high-quality peas to the acre.

SEED TIME AND HARVEST

Wheat is ready to harvest at approximately the same date year after year regardless of the date of seeding, according to results obtained at the North Dakota Agricultural Experiment Station over a period of 36 years. In the years 1896, 1901, 1908, 1920, and 1924 the date of harvest was August 10, but the seeding dates those years were May 6, May 4, April 18, April 26, and April 22. In some instances there was a variation of a month from one extreme to the other in date of seeding yet harvest time came on the same date in both cases. However, late seeding is not recommended by the station as it usually results in the production of short straw and a light crop.

FIELD TESTS NEEDED TO TELL TRUTH ABOUT SOILS

Farmers will always have their own particular soil improvement problems, says Dr. L. H. Smith of the University of Illinois in summing up the results of the most recent crop rotation period on the 26 soil experiment fields of the State maintained by the agronomy department of the College of Agriculture. His summary showed that no single system of soil treatment proved best on all fields. The farmers' problems will be made easier, however, by the working out of fundamental principles on these State fields. "As a matter of fact," says Dr. Smith, "most soil fertility problems are so exceedingly complex that it is doubtful whether any simple laboratory tests will ever be devised that will take the place of the well-ordered soil experiment field. Aside from showing the way to improved farm practices, results from these fields bring out clearly some of the general principles in soil investigations. For example, the great variation in natural productiveness of Illinois soils is brought out strikingly by comparing the value of crops produced on untreated land. This value ranges from less than $4 an acre on one field to nearly $40 an acre annually on another field. On one field the land is naturally so good that a yearly return of eight cents an acre is the highest profit from soil treatment. In contrast, on another field the best treatment gave a profit of more than $20 an acre a year. As might be expected, the poorer land in general produced more profit from soil treatment than the richer land."

CENTRIFUGE TO TEST SEED

The principle of the centrifuge has long been in use on the farm in the Babcock milk tester and in the cream separator. Now it is being used in North Dakota to test samples of seed wheat for farmers to determine if there are smut spores present. By this method only three minutes is required to make the determination. This year the county agents in Cass, Richland, Burleigh, Towner, Benson, and Ramsey counties are prepared to make this seed test for farmers in that State. It is the first time farmers anywhere have had such a service offered them to determine in advance whether or not it is necessary to treat seed for smut.

TELL YOUR TREATY MAKER

The International Agricultural Congress is to meet at Bucharest this coming June. Dr. Charles L. Stewart, in charge of agricultural economics at the University of Illinois, has a suggestion for this conference to sink its international teeth into. He says the farmers of the world need a new form of treaty under which the acreage devoted to crops that have international markets can be held down to prevent the production of ruinous surpluses.

PRICKLY PEAR STORES ITSELF

The Department of Agriculture has issued a bulletin in which the prickly pear is described as a silage crop that keeps without a silo. It grows in the four States bordering Mexico and h proved valuable as a stock feed times of drouth on the range. The cactus plants are growing in fav with stockmen as a substitute for si age. In Texas some varieties of th prickly pear will produce without cu tivation, but cultivation is likely t prove profitable. Because of the bul of these cactus cuttings needed i starting the crop, and the consequen cost of starting a large acreage, it desirable to start on a small scale an expand with the rapidly multiplyin plants.

PROGRAM FOR WOOL PRO DUCERS

A program for wool producers wa outlined recently before the annua convention of the National Woo Growers' Association at Phoenix, Ari zona, by J. F. Walker, specialist i wool marketing in the U. S. Depart ment of Agriculture. He made fou recommendations: 1. Establishment o wool classing and sheep breedin courses, to be taught from the wool producing standpoint in agricultura colleges. 2. Carrying to the wool pro ducer, through the Extension Service a better knowledge of sheep classin and sorting. 3. Adaptation of th classing system, provided a sufficien quantity of wool is available, to b worked out through central store rather than on the farm or range ("There is no doubt that the classin of wool has not only increased com petition for Australian wool but ha enhanced its value as well.") 4. Improvement in methods of sellin through cooperative associations. H added that "there is also the problem of cooperation among cooperatives that there is no doubt that a combined central service organization can better serve producers and consumers of the United States by strengthening the bargaining power of the various cooperative organizations."

Foreign and International Agriculture

Hunting Grasses

By U. V. Wilcox

Washington, D. C.

G RASS is the basic food for all animal life. All flesh is grass, y the Scriptures. The continent of ·ass is Africa. For untold centuries ıe antelopes, the gnu, the cattle, and ıe savages have lived because of the rength and nutriment of the grass f the veldt.

"It seems logical to assume that nce Africa supports such a wealth f animal life that the basic food, the rasses of Africa, must have unusual utrient value. With this thought in ind the Federal Government sent ıere an expedition to collect the seeds f these unknown grasses so as to as- ertain if they can be utilized in merican agriculture." So said Pieters ephart, plant scientist of the United tates Department of Agriculture, ho has just returned from a 10- ıonths' trip through equatorial frica gathering grass seeds.

Many bags of varied grass seeds ere brought back to America. These ill be planted, cultivated, and if pos- ble adapted to conditions in this ountry.

"Africa is a continent of grass," Ir. Kephart explained. "There are ractically no forests in Africa as we now the term. The tree growth here is useless for timber. There are o pines, oaks, spruce, or such trees. African timber is commercially value- ss. The trees are gnarled, crooked, twisted and if cut will check, split, and crack. Most of the trees are small.

"The great vegetable growth is the grass. For thousands of miles the grass grows tall and luxuriant. Lions, tigers, and other beasts of prey hide in it. Antelope and cattle feed upon it. The natives use the grass for huts and for food and drink. African grass is essential to life."

Mr. Kephart explained that the grasses of this great continent are mostly unknown in America. It is hoped that they may prove useful in supporting grazing cattle in the western states. This will have to be proved and with the seeds now in America the experiment is under way and only time will ultimately tell.

"Beer" Grass

One of the closest relatives to African grass known to America is a type found in public parks. "Many of the baseball parks," Mr. Kephart declared, "use a type of African grass, hardy and long-lived. This is probably the only grass similar to the African variety known in this land.

"The odd thing about this type of grass is that the natives of Africa make a beer from it. The grass so used is in reality rotted and the beverage is horribly repulsive to a white man, tastes exceedingly bitter and sour, but delivers a degree of intoxication that is amazing."

There is no desire on the part of government plant scientists to encourage such a use of our baseball grass and there is no danger of its being so used due to its taste, but to the scientific mind there is thus illustrated the unfortunate use that is made of a worthy vegetation.

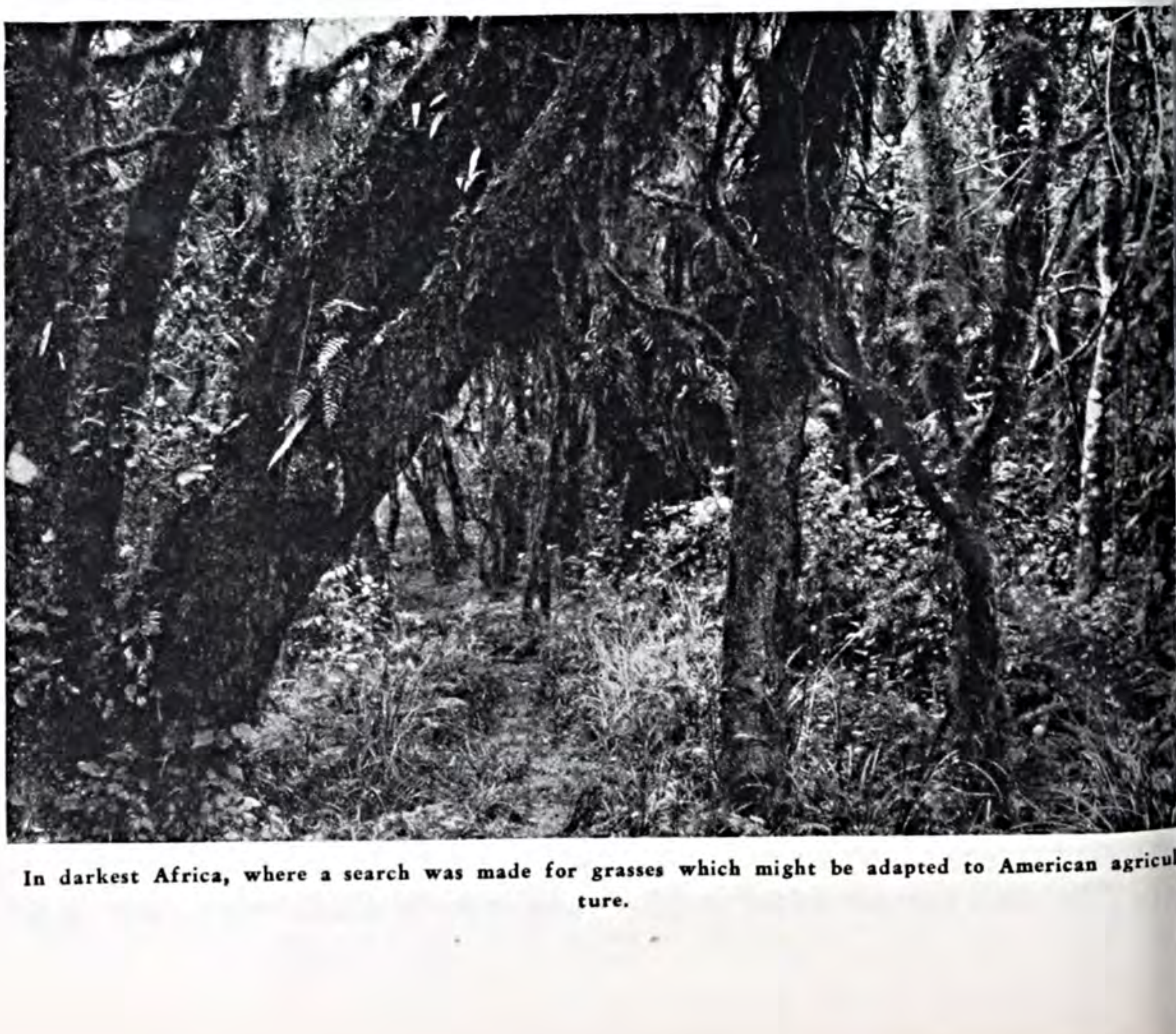
Mr. Kephart and his associates had many thrilling experiences in their hunt for the strange and useful grass seeds of the African veldt. Lions roared; torrential rains impeded their progress. Traveling along the equator the extremes of heat and cold were experienced. In one instance the nights would be dangerously cold and the days oppressively hot. At one place there was found within 35 miles a skating pond with glaciers when a few hours' descent would bring all the oppressiveness of debilitating heat. This was the case in a region located on the equator.

Hunting grasses meant long treks across plains devoid of roads and trails. An American motor truck plus th help of husky African natives carrie the baggage.

"One of the chief problems whic faced us," Mr. Kephart explaine "was that of water. We had to bo all water. The trips frequently mad were from water-hole to water-hol No matter how thirsty we were, w had to wait until the water was boilec This water was frequently taken fror great mud holes, or sinks. Here th game from miles about would wallov at night hiding about in the long gras and quenching their thirst. Huma beings from other lands could hardl endure the germs thus supplied to th water in such liberal quantities, con sequently the need of boiling.

"The African, could, howeve brush all the scum, the insects, an the visible dirt aside and drink witl apparent immunity. Centuries of th survival of the fittest have given thei bodies a resistance but the white ma had to guard against malaria and th germs that produced dysentery."

(*Turn to page* 47)



In darkest Africa, where a search was made for grasses which might be adapted to American agriculture.

REVIEWS

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

:rtilizers

Much practicable information on ie purchasing and use of fertilizers contained in Professor A. T. 'iancko's circular "Fertilizers for Inana Soils and Crops," Agr. Exp. a., Lafayette, Ind., Cir. 162, Oct.)28. Fertilizer recommendations for ırious crops on different soils under veral systems of farming are given a table, and some erroneous ideas ncerning fertilizer materials are exained. All this is carefully presented condensed form well repaying the ader for the few minutes needed to gest this publication.

"State Laboratory Fertilizer Report—Seed :port," Quar. Bul., Vol. 18, No. 4, State ard of Agriculture, Dover, Del.

"Inspection of Commercial Fertilizers" Agr. :p. Sta., Amherst, Mass., Control Ser., Bul. , Dec., 1928, H. D. Haskins, H. R. DeRose, d M. W. Goodwin.

"Nitrate of Soda Experiments—1928," Agr. :p. Sta., Clemson College, S. C., Cir. 36, Feb., 29, W. B. Rogers.

oils

"Drainage in the Sacramento Valley Rice :lds," Agr. Exp. Sta., Berkeley, Cal., Bul. 4, Jan., 1929, Walter W. Weir.

rops

The authors of a new bulletin on Approved Practices for Sweet Poto Growers," Bul. 263, of the North arolina Agricultural Experiment Staon, briefly attack the reasons why e quality of sweet potatoes is not hat it should be. H. B. Mann, R. . Poole, and Robert Schmidt, the ıthors, attribute poor quality to: 1, nsuitable soil types; 2, fertilizers ontaining excessive nitrates and insufficient amounts of potash; 3, varieties and strains not best suited for all conditions; and 4, diseases. The recommendations are tabulated in such form as to make this valuable 8-page bulletin an exceedingly ready reference for the problems of the sweet potato grower.

"Thinning Sugar Beets," Agr. Ext. Service, Berkeley, Cal., Cir. 22, Dec., 1928, W. W. Robbins.

"Strawberry Culture in California," Agr. Ext. Service, Berkeley, Cal., Cir. 23, Dec., 1928, A. H. Hendrickson.

"Bush Fruit Culture in California," Agr. Ext. Service, Berkeley, Cal., Cir. 25, Jan., 1929, A. H. Hendrickson.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Cal., Vol. XVIII, No. 1, Jan., 1929.

"The Climate of Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 200, Nov., 1928, A. J. Mitchell and M. R. Ensign.

"Variety Tests of White Potatoes," Agr. Exp. Sta., Gainesville, Fla., Bul. 201, Nov., 1928, L. O. Gratz.

"Peach Pruning in Maryland," Agr. Exp. Sta., College Park, Md., Bul. 299, July, 1928, A. L. Schrader and E. C. Auchter.

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol. XI, No. 3, Feb., 1929.

"American Potato Journal," The Potato Association of America, East Lansing, Mich., Vol. VI, No. 2, Feb., 1929.

"Building Permanent Pastures," Agr. Ext. Service, Raleigh, N. C., Ext. Folder 28, Jan., 1929, S. J. Kirby.

"The Normal Multiple Sprouting of Seed Potatoes," Agr. Exp. Sta., Wooster, O., Bul. 430, Jan., 1929, John Bushnell.

"Director's Biennial Report—1926/28," Agr. Exp. Sta., Corvallis, Ore., Sept., 1928.

"Cotton Variety Tests—1928," Agr. Exp. Sta., Clemson College, S. C., Cir. 35, Feb., 1929, T. S. Buie.

"The Utah Agricultural Experiment Station," Logan, Utah, Cir. 76, Feb., 1929, P. V. Cardon.

"Biennial Report of Director, July 1, 1926-June 30, 1928," Agr. Exp. Sta., Logan, Utah, Bul. 209, Feb., 1929.

"White Biennial Sweet Clover as a Cover Crop," Ext. Service, State College of Washington, Pullman, Wash., No. 151, Feb., 1929, A. E. Lovett.

"Reliable Relief for Agriculture," Col. of Agr., Madison, Wis., Cir. 226, Feb., 1929, H. L. Russell and K. L. Hatch.

Economics

The California College of Agriculture's new circular 24, "Enterprise Efficiency Studies on California Farms," by L. W. Fluharty and F. R. Wilcox, gives a summary of cost account records. Since 1925, farmers of California have been keeping efficiency and cost records on various farm enterprises in cooperation with the Agricultural Extension Service of the University of California. Records have been kept for citrus fruits, nut crops, field crops, dairying, and poultry raising. The summary contained in this circular is a valuable insight to production costs.

Bulletin 462 of the California College of Agriculture, by S. W. Shear, is a comprehensive treatise of the prune supply and price situation. California produces approximately two-thirds of the commercial prune crop. The world production of dried prunes during recent years has been about 70 per cent larger than during the period 1909-1913. As a result of the increasing production, the California prune industry is faced with the probability that on the average prune prices will be unprofitably low, unless improvements, notably in lowering market costs and increasing demand for prunes, are made.

"The 1929 Agricultural Outlook for California," Agr. Ext. Serv., Berkeley, Cal., Cir. 27, Feb., 1929, H. R. Wellman.

"A Survey of the 1928 North Dakota Wheat Crop," Agr. Exp. Sta., Fargo, N. D., Bul. 222, Nov., 1928, C. E. Mangels, T. E. Stoa, and R. C. Dynes.

"Illinois Crop and Livestock Reporter," Bureau of Agricultural Economics, U. S. D. A., Washington, D. C., and Illinois Dept. of Agr., Cir. 386, Feb. 1, 1929.

Diseases

"Coconut Bud Rot in Florida," Agr. E Sta., Gainesville, Fla., Bul. 199, Sept., 19 James L. Seal.

"The Damp-Off Disease of Boston Fern Agr. Exp. Sta., Gainesville, Fla., Press B 410, Mch., 1929, Erdman West.

"Ammoniacal Copper Carbonate and Ot Stainless Fungicides," Agr. Exp. Sta., Gain ville, Fla., Press Bul. 411, Mch., 1929, E man West.

"Bordeaux Paste Treatment for Stem-e Decay of Watermelons," Agr. Exp. S Gainesville, Fla., Press Bul. 412, Mch., 19 George F. Weber.

Insects

"The Southern Corn Rootworm," Agr. E Sta., Fayetteville, Ark., Bul. 232, Jan., 19 Dwight Isely.

"The Chinch Bug on St. Augustine Gr Lawns," Agr. Exp. Sta., Gainesville, Fla., Bul. 409, Mch., 1929, J. R. Watson and E. Bratley.

"Insect Investigations," Agr. Exp. Sta., C lege Park, Md., Bul. 298, July, 1928.

"The Fruit Bark-Beetle," Ext. Div., Mi State College, East Lansing, Mich., Ext. B 74, Feb., 1929, R. H. Pettit.

"The Oriental Peach Worm," Ext. Di Mich. State College, East Lansing, Mich., E Bul. 75, Feb., 1929, R. H. Pettit.

"The Fruit Tree Leaf Roller," Ext. Di Mich. State College, East Lansing, Mich., E Bul. 78, Mch., 1929, R. H. Pettit.

"Apple Maggot," Ext. Div., Mich. St College, East Lansing, Mich., Ext. Bul. 7 Mch., 1929, R. H. Pettit.

"Grape Root-Worm," Ext. Div., Mi State College, East Lansing, Mich., Ext. B 80, Mch., 1929, R. H. Pettit.

"The European Corn Borer and Its E vironment," Agr. Exp. Sta., Wooster, O., B 429, Dec., 1928, L. L. Huber, C. R. Ne wander, and R. M. Salter.

TRUOG TELLS HOW TO FERTI LIZE CORN

Four principles on corn fertiliza tion developed in recent years wer emphasized recently by Professor Em Truog of the University of Wiscon sin before the Agricultural Confer ence at Purdue University. No. 1— The smaller the rate of fertilizer appl cation, the more localized or nearer t the seed or plant should the applica tion be. No. 2—The nearer fertilize can be placed to the seed withou sing serious injury to germination, more effective the fertilizer will in promoting early growth and, ally, final yield. No. 3—Broadcast lications of phosphate and potash uld be worked into the soil to a th of at least four inches. No. 4 Heavy additions of readily available rogen should not be made in one lication.

CKING UP THE PRINCIPLES

Professor Truog backs up the first nciple by saying that the soil has ertain fixing power for phosphate l potash, and that the more soil se fertilizers are mixed with the nter they are held by the soil and more difficult it is for the plants get them out. Another reason for cing the fertilizer close is that osphates move very slowly in the and potash is not much faster, refore the plant food must be in region of early root development. e fertilizer needs to be close to the ts also because the corn will grow idly from the start and it will be sible to cultivate to advantage at early date giving the corn a good d over weeds. But if too much tilizer is placed in contact with the d it can not germinate for the fer-zer keeps the seed from absorbing isture. When making hill appli-ions, says Truog, apply the fer-zer directly over and about one-f inch above the seed in a band out four inches wide and eight inches long. In row applications the difference is there is a continuous flow of fertilizer. Row application is best when corn is drilled, and hill application when it is check-rowed. It is recommended that broadcast applications of phosphate and potash be worked to a depth of four inches because appreciable amounts of phosphate do not move down more than half an inch during the growing season, and potash moves on a little faster. Nitrogen fertilizers, on the other hand, soon go over into forms that move about too rapidly, which accounts for applying this plant food in driblets.

DO IT THIS WAY

The ideal method, laid out by the Wisconsin professor: When a heavy application of complete fertilizer is to be made to corn, apply broadcast most of the phosphate and potash after plowing and work to a depth of at least four inches by discing; at time of planting add a complete fertilizer in hill or row; and during cultivation apply nitrogen as needed. When corn is grown in rotation with small grain and clover, make a broadcast application of phosphate and potash when the soil is prepared for the grain seeding. If a heavy application is made at this time, it may not be necessary to repeat it for corn, but it may be desirable to make the hill or row application.

Hunting Grasses

(*From page* 44)

Of the dangers incident to such a entific expedition, Mr. Kephart uld say but little. Terrible heat, nching rains amounting to cloud-rsts, and wild animals were but in-ents. From out of the long grass great rhinoceros would charge. With vered head and horn pointing for-rd, the three-ton battering ram would lumber forward.

"The thing to do under the circumstances," Mr. Kephart explained, "was to stand still while the stupid beast came charging and then sidestep the last minute and let the great hulk spend its fury running for a half mile or so. This is the only way to safely outwit the rhino since it has but very poor eyesight yet very acute hearing. Of course if there is no place to step out of the way, well, you are just out of luck, that's all."

Scaling the approaches of the Mt. Kenya region hunting for grasses where progress had to be made painfully and slowly, fighting for each step in the tall tangled growth of vegetation of equatorial Africa, there suddenly appeared a few yards just ahead of the party a huge elephant. Bamboos were on every side at that point, but the elephant tore them down as if they were but wheat stalks, the meanwhile curiously advancing on the scientists.

It was impossible to retreat rapidly, the progress had been made too slowly. To turn and run would not bring escape since the elephant was all-powerful. Had it been possible, these scientists would hardly choose to relinquish the territory gained for a mere elephant.

With the elephant coming, the men stood their ground and waited. The great beast eyed them curiously and continued toward them, a great mountain of flesh, bone, and muscle. When within a few feet and with the scientists' lives and equipment in the balance, the great beast stopped, swung his trunk about disgustedly, and with the skill of a trained private of the army turned and disappeared in the grass and bamboo. Having bluffed out elephants, rhinos, lions, tigers, and other animals the party stuck to its job of gathering grass seeds.

Such venturesome explorers of the office of Foreign Seed and Plant Introduction of the Bureau of Plant Industry of the United States Department of Agriculture scour the world. The value of hundreds of crops that have been introduced or improved upon has been estimated conservatively at $100,000,000 annually. Included in the list are the hardy wheat called durum; Peruvian alfalfa, now the most important variety in California; Pima cotton, the great crop of the Salt River Valley of Arizona; the d palm, now grown as an established dustry in the Southwest; Sudan g an important forage crop in m States; and others too numerous mention.

Dr. David Fairchild, chief of Foreign Seed and Plant Introduct Office, states that there are easily times as many undiscovered plants the tropics as are to be found in colder parts of the globe. This plains why the plant hunter conc trates his attention on the worl sunniest regions. By means of highly technical art, he is striving select the hardiest growths of the and adapt them for cultivation as North as they will grow.

What happens to the many hu dreds of test plants and the bags seeds? First of all, the plants a seeds must pass a rigorous custo inspection to determine their freed from disease and insect pests. The after as an additional safeguard, th are grown for a time in detention.

The next process is to spread th among Government research work in Washington as well as among t State plant experiment stations. H efforts are made to determine th adaptability as breeding agencies. case new growths are found usef the final step is to distribute th among the thousands of plant bree ers, farmers, and amateurs throug out the land.

These plant immigrants are ve much like human immigrants in c tain respects. Most of them requ a long period of acclimatization and good many have to be bred with o domestic varieties before their r worth is known. Like all livi things, the cultivated plants on whi we subsist are changing continua through Nature's unconscious b nevertheless definite process of sele tion, while plant breeder's lore brin quicker and sometimes equally wid spread variations.

Rhode Island

(From page 9)

by the use of non-alkaline material in combination with sulphate of ammonia. This makes the soil more acid; furthermore, by using only a small proportion of phosphoric acid, the activity of the alumina is not depressed and its toxic effect on weeds is retained. Putting greens have been surveyed and the weedless-lawn principle demonstrated successfully on them.

The poultry investigations have followed three general lines of endeavor. The most important of these has been concerned with diseases of chickens and turkeys. Contributions to a knowledge of the organisms involved and in some cases means of control have been made with fowl paralysis, bacillary white diarrhea, blackhead in turkeys, and bacterial infection of eggs. The rotation method of control of blackhead in turkeys has been demonstrated to be of use in controlling the disease.

In connection with poultry management the Rhode Island station has studied the efficiency of protein concentrates for promotion of the rapid growth of winter chicks and the availability of nitrogen in cottonseed meal and beef scrap for chicks.

Inheritance problems have furnished a fertile field for research. The inheritance of body-weight has been studied in connection with the Cornish-Hamburg cross and the Leghorn-Brahma cross. The inheritance of egg-weight has also been a major problem of the station.

Since 1925, three new lines of work have been initiated and already progress has been made.

Studies with small fruit are in progress. The varietal adaptation of grapes, raspberries, blackberries and blueberries to coastal conditions and the inheritance of undesirable characteristics in blackberries are being studied.

In home economics the use of time by rural homemakers, the frequency of paid work by homemakers and the culinary qualities of potatoes as affected by fertilization are in the course of investigation.

Studies concerned with marketing conditions in Rhode Island, and in particular in the Providence area, have been made since 1925. In this connection methods of handling fresh produce, wholesale market preferences for fruits and vegetables, economic phases of the fruit industry, and sources of carload receipts of food in Providence have been described in station publications. A statistical description of Rhode Island agriculture has also been published. Investigations along similar lines are being conducted with poultry and dairy products. Farm management studies are also being made.

Good Asparagus

(From page 29)

soon as the plants come above ground, a heavy application of fertilizer was given. At first a 5-8-7 type was used at the rate of one ton per acre, and before the season was over two applications of nitrate of soda and muriate of potash were applied as an additional dressing, 200 lbs. of each of these materials in each application. Asparagus is a plant food loving plant, particularly a potash loving plant, therefore, enough was given to feed its needs.

Mr. Lamb felt that some of his land was not just right for the best asparagus raising, and he applied one ton of hydrated lime to practically all the land in order to bring it in condition where asparagus would grow best. Every third or fourth year another application of lime is given, thus maintaining the desired condition. At the end of the first year his asparagus had made a growth of top as large as many growers obtain in three years.

Part of this, and a large part, is due to the abundance of plant food, but also a large share must be given to Mr. Lamb's working of his bed. In the six or eight years that I have known Mr. Lamb, I have never seen a fully developed weed on his farm. Where most people realize that weeds are fertilizer robbers, moisture robbers, sunlight robbers, and destroyers of prolific plant growth, I wonder how many realize this as much as Mr. Lamb.

This new method of asparagus raising calls for cutting the asparagus after one year's growth. Mr. Lamb cut the bed only two weeks and his bed was strong enough to cut three or three and a half weeks. He took an average of $45 per acre after one year's growth. The second year he cut the bed five weeks and secured $150 per acre. The third year he cut the bed until the middle of June and received $350 per acre.

On other systems of raising asparagus, the third year is the first year when the asparagus is cut and generally speaking $50 to $60 per acre is about all that is received. This newer method with its intensive planting in the row, but still allowing sufficient space for each plant, and plenty of plant food, have certainly paid Mr. Lamb.

In marketing the grass he is very painstaking. He is ably assisted by Mrs. Lamb in this work and they are very careful to see that the bunches that are sold are very much worth while, not only as to size of stalk in the bunch, the length, the color, but the quality. To say that he has an increasing demand for the crop is only half stating it as buyers pester him to death coming to his farm to buy. He has men who would like to take the entire crop and, therefore, solve all of his marketing problems. In fact, for the last several years the bulk of his crop has gone to one marketing agency with great satisfaction to both parties. This has permitted Mr. Lamb to give more time and attention to the growing end of asparagus raising.

24 Tons of Tomatoes

(*From page 6*)

This ripening difference continued right through the harvest season. The plot which ripened first was the first one to reach the end of its normal bearing season. When the frost came that fall there were tons of green fruits still on the vines, but very few fruits could be found on the high potash plots. That part of the field not in the demonstration was fertilized with a 2-12-6 at the rate of 500 pounds per acre. The bulk of the green fruits were found on this part of the field.

So in the canning factory tomato game the grower can often get the bulk of the crop before frost kills the vines by the use of potash under conditions like those on the Harper place. The black loams and black sands and mucks might be equally benefitted by

(*Turn to page 55*)

Pages From A Field Note Book

Fewer Acres—More Cotton

By Lynn L. Smith

County Agent, Hope, Arkansas

FEWER acres of cotton—but more cotton per acre, agriculturists agree is the big need in the South. The difficulty comes in persuading the average cotton farmer that he will earn a bigger profit by using every known method to increase the yield per acre instead of scattering his efforts over more acres. While many factors enter into the problem of making two bolls of cotton grow where only one grew before, in this article we shall confine ourselves to a discussion of a more intelligent use of commercial fertilizers.

The desire to plant cotton strikes the cotton farmer like a fever epidemic, with the result that he plants more cotton than he can adequately cultivate. Not only does the increased acreage keep him from planting and cultivating essential feed crops, but in addition, it causes him to scatter his limited amount of commercial fertilizer over too big an area. The result is a smaller yield of cotton on the increased acreage with a greater expenditure of labor and money producing it.

Evidence is accumulating which unquestionably shows the value of liberal applications of high analysis fer-

The plant in the right hand had 20 bolls and was from an acre fertilized with 600 lbs. of an 8-6-8 and which yielded 972 lbs. The plant in the left hand had only 5 bolls, was unfertilized, and the yield per acre was only 365 lbs.

Plot	Fertilizer per acre		Yield		Returns
1	Check Plot	No Fertilizer	325 lbs. Seed		$22.75
2	225 lbs.	10-4-4	240 lbs. "	(Av. 34 A.)	16.80
3	600 lbs.	8-6-4	912 lbs. "		63.84
4	600 lbs.	8-6-0	831 lbs. "		58.17
5	600 lbs.	8-6-8	972 lbs. "		68.04

tilizer. In 1928, the season just closed, a demonstration conducted on the farm of J. G. Collier near Hope, Arkansas, by J. E. Jones, supports the above conclusion. The fertilizer applied, the weight of the crop per acre, and the actual cash received, are shown in the table above. Numbers 1, 3, 4, 5 were one-third acres; 2 the average for 34 acres.

It is obvious that a heavier application than 225 lbs. per acre would have been far more profitable. It is also evident that on the Orangeberg fine Sandy Loam more potash gave an increase both in yield and gross profit.

If Mr. Jones had used the 8,000 lbs. of 10-4-4 fertilizer on 12 or 15 acres, he would have made far more profit and in addition could have raised on the remaining 20 acres enough legume roughage to feed 10 dairy cows through the winter. It is more profitable to grow 5 bales of cotton on 10 acres than to grow 10 bales on fifty acres.

POTASH ON FRENCH SOILS

RESULTS of numerous trials of potash fertilizers conducted since 1926 by the French Office of Agriculture have been reported by the French Director of Agriculture. Considering the results as a whole, they show very favorable and profitable returns from the judicious use of potash fertilizers, although definite conclusions are not yet drawn. These tests have proven the necessity for potash on all crops, and if not on all soils, at least on the very great majority of them. On some soils all crops responded favorably, while on other soils, some crops responded to potash, while others did not.

Studying the rate of application on these French soils, 500 lbs. per acre of muriate of potash were found to be more profitable than 250 lbs. On heavy soils, 500 lbs. of muriate appeared to give the best results. On light soils subject to drought, kainit at 1,200 lbs. per acre was found to be superior to muriate at 500 lbs. Early applications of the potash salts gave better results than later applications. The efficiency of potash decreased with the later applications, being of no value to the crop if applied too late in the season.

All the tests showed the importance of having the soil well supplied with lime if the best results are to be secured from the potash. The lime should be applied well ahead of the potash application (sometimes a year), rather than along with the potash. Le Phosphate et Les Engrais Chimiques, Paris, Nov. 1, 1928.

FRENCH PASTURES

RECENTLY a farmer in France had a pasture of more than 25 acres which at the beginning of spring was completely grown over with mosses. At the middle of February this farmer broadcast 937 pounds per acre of potash manure salts on a dewy morning. Two days after the mosses were completely dried up and upon inspection in the month of March, the large yellow spots corresponding to the burnt moss areas were very noticeable.—M. Fleury, Agronomist, La Potasse, Nov. 1928.

Plowing by Electricity

ANOTHER use has been found for electricity on the farm. This ime it plays the role of a lubricant. t is not a case of the proverbial greased lightning," however. Rather, 'lightning" does the "greasing." 3riefly, a process has been devised vhereby an electric current reduces he friction in plowing.

The apparatus was invented by Dr. 3. A. Keen, an authority on the development of the plow, and Dr. W. 3. Haines, at the Rothamsted Experimental Station in England. Dr. Keen lescribed the process at the International Soil Science Congress, held at Washington two years ago, and exhibited an apparatus for recording the resistance of the soil to the plow.

The process is based upon the folowing elementary facts: slightly moist soil conducts electricity; when a current passes through the soil between two pieces of metal, acting as poles, additional moisture is deposited on the negative pole and the plow passes more readily through a moist soil.

A small electric generator is attached to an ordinary plow. A metallic electrode in the form of a cutting coulter, rigidly suspended a short distance in front of the plowshare, acts as the positive pole. The steel plowshare is made the negative pole, and an electric circuit between the two deposits a film of moisture upon the share. This acts as a lubricant to reduce the friction between the blade of the plowshare and the soil and makes the soil slide over the moldboard more easily.

Such a process is simple, and the generator does not greatly increase the weight of the plow.

Dr. Keen reports that the old English system of mole drainage for compact and poorly drained subsoils may also be facilitated in this way. The shell-shaped borer which pushes the soil away from a circular drainage way 18 to 30 inches below the surface of the soil is made the negative pole and accumulates the friction-reducing moisture. This method of making an underground drain is much cheaper than tile drainage, and the circular drainage ways are said to remain open in the earth for 10 to 12 years.—*Carl R. Woodward, New Jersey College of Agriculture.*

Sunshine, Sand, and Celery

(*From page* 19)

early or a late crop. I grow the Golden Bloom variety which is a vigorous, heavy yielder and makes good quality.

"A celery grower can produce 750 crates of celery per acre almost every year provided he applies enough fertilizer and keeps his spraying up. On my crop I have been using a brand known as Celery Special, analyzing 5-6-10, at the rate of 6,000 pounds (3 tons) per acre. A part of this fertilizer is applied every two weeks because with sub-irrigation leaching is taking place all the time. But in a broad sense, leaching is plant food in solution, which is a necessary condition to the production of high yields.

"In addition to my regular fertilizer I apply 200 pounds of muriate of potash per acre in two side applications. This year I have four acres with 400 pounds muriate per acre and it is the best celery I have. We growers don't use enough potash to secure either the largest yields or best quality. Celery, you know, is a heavy feeder on potash and its quality is greatly influenced by liberal applications of this material. Potash keeps my celery glistening, green, and smooth, producing crisp, tender bunches that bleach readily.

"Of course it would be foolish to spend money to grow a crop of celery and not protect it against blight and insects. I spray my celery often, and when the weather is hot, I keep a sharp lookout for outbreaks of blight. I use 4-4-50 Bordeaux into which I pour three quarts of concentrated lime sulphur.

"Last year was a most trying year for the celery growers on account of low prices. However, in spite of the low prices I sold my celery readily at a profit because of its extra quality. Since I have been using potash liberally, I have practically no blackheart, a disease that used to be very troublesome, and pithy stems are almost a thing of the past."

Potato Profits

(*From page* 22)

cific things which it had been hoped to learn from this three-year experiment are obscured because of the other unavoidable factors entering into the 1928 test. Because of these factors, small differences must not be interpreted as being significant.

However, all potato farmers meet with occasional bad years, and it is interesting to note what effect the different amounts of potash have on the yield of potatoes in a season when growth is checked prematurely. The largest yield under such conditions will probably be due largely to a condition causing early growth and development of the tubers. Looking at the 1928 results, it is evident that even in an extremely poor potato growing season those growers who use a high potash fertilizer, at least 5 per cent potash, will be more than repaid for the use of such a fertilizer. In this experiment, in the 1928 test, a 5-10-5S fertilizer gave a yield of 47 bushels per acre more than the plot receiving nitrogen and phosphorus but no potash. The 5-10-10S plot gave an increase of 52 bushels per acre over the 5-10-0 plot, and the 5-10-10M plot, an increase of 25 bushels per acre over the 5-10-0 plot.

Reviewing and evaluating the results for the three years, one may fairly make the following conclusions: 1, the use of at least 5 per cent potash is justified under all conditions; 2, the use of 10 per cent potash is to be recommended where potatoes are planted on land which has not been heavily fertilized with potash the preceding seasons; 3, under a system of continuous cropping, with potatoes on Long Island soils, at least 5 per cent potash should be used each year; 4, there are some lands on which 10 per cent potash would pay even under a system of continuous cropping.

The grower will do well to test the truth of this last conclusion on his own soil and under his own conditions. Ten per cent of potash will undoubtedly pay on many farms, and where it will pay, economical production demands that it be used. The role of potash in increasing the yield of potatoes cannot be ignored in this day of high labor costs and keen competition. The form of potash is probably not as important as the amount of potash. The form to be used must be determined by the relative results obtained under any given conditions and the cost of potash in each form.

Wheat

(*From page* 17)

neans wheat bread, for wheat is the eading bread cereal of the moderately lry temperate climates. Because of liseases, it has never been grown xtensively in humid regions. More han four billion bushels of wheat ire annually grown and consumed in he world. The United States as the eading wheat country produces about one-fifth of the total acreage, which is a production somewhat in excess of domestic needs, and more than two hundred million bushels are usually exported each year.

American wheat production is of two kinds, spring and fall sown, the fall sown acreage being much the larger. The United States spring wheat belt centers largely in the region of North Dakota and states surrounding North Dakota, and extends northward into the Canadian Provinces of Manitoba, Saskatchewan, and Alberta. North Dakota is the leading spring wheat state, producing over three times the acreage of its nearest competitor, Montana. Another important spring wheat belt is found in Europe. It lies largely in Southern Russia and extends in a northeasterly direction from the Black Sea nearly to the Ural Mountains.

Winter wheat in the United States is grown in a larger number of states than is spring wheat. There are two types of winter wheat, the hard and semi-hard, the former centering in Kansas, the leading winter wheat state, and the latter in the corn belt largely east of the Mississippi River.

Over one-half of the world wheat is produced in Europe, the leading regions being southern Russia, the Danube Valley, northwestern Europe, and the countries bordering on the Mediterranean Sea. Australia and northwestern India are also important producers.

In the United States, Kansas, a winter wheat state, leads in wheat acreage, but is followed closely by North Dakota, the leading spring wheat state. The tier of states beginning with North Dakota and ending with Texas occupies America's leading wheat belt.

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24 Tons of Tomatoes

(*From page* 50)

a similar treatment. It has often been reported that no one could tell a farmer just exactly what and exactly how much fertilizer he should use on any particular crop and in any particular field. It is a matter of experimentation. Harper used the method which in the end might prove profitable on nearly any farm.

When the season's records were completed, the yield on the 2-12-8 plot was 16 tons per acre. The 2-12-12 plot produced 20 tons per acre. The 2-12-16 plot made 24 tons per acre. The fractions of a ton in each case are omitted as they were near enough alike to make little difference in the comparison.

A yield of 24 tons of red ripe tomatoes per acre looks large indeed to the average grower of tomatoes for the canning factory. The official report that year gave 3½ per acre as the average yield for Indiana.

It only goes to show that given the right conditions, the tomato plant is capable of producing enormous tonnage. Twenty-four tons per acre is not by any means the limit as to yield. Records have been made which far surpass that. Thirty and even thirty-five tons per acre are possible and have been reported.

Good plants, placed in fertile, well-drained soil and cultivated by a man who knows tomatoes and their rooting habits will usually prove to be producers of "Apples of Gold" as toma toes were called by the people of year ago. The amount and the analysis c the fertilizer used are but two of th problems confronting the producer o tomatoes. Even when the grower ha taken every precaution known, ther is a possibility of failure from unfore seen cause. Yet, year after year, th men who produce the raw material fo the canned tomato continue to gambl with the crop and in the end thos who study the business and attemp to improve on their practices eac year will usually be found on the righ side of the ledger.

Agriculture Today

(*From page 25*)

tection from fire and the harvesting of mature timber in such ways as to provide for continuous production. Watershed protection, proper use of recreational resources, and the stabilization of agricultural and other industries in and adjacent to the forests are a part of the task.

In some parts of the West, thousands of irrigated farms depend for their water supply upon the protected watersheds of the National Forests. Without the forests these farms could not exist. In other areas, hydro-electric power developments and municipal water supplies owe their security to the National Forests. On watersheds which supply water for irrigation, municipal use, and hydro-electric power, the cutting of timber and the management of grazing and other uses of the forests are conducted for the paramount purpose of safeguarding the water supply.

Where established communities and industries are dependent on the manufacture of National Forest timber, plans for harvesting the timber are made with due regard for these needs. Where the successful operation o stock raising enterprises and the use o winter pasture and feed on privat lands adjacent to the forests are dependent on the availability of summe range in the forests, allotments o range under Forest permit take int consideration the desirability of stabilizing the stock raising industry of th region.

As a grazing ground, the livestock industry finds the National Forest ranges indispensable in many parts of the West. Last year, 6,394,844 sheep and goats, and 1,459,823 cattle, horses and swine were grazed under permit on the forests. When these western ranges were first included in the National Forests, many of them were in bad condition, overgrazed, and rapidly losing their capacity to supply feed for the stock.

Through research to discover what kind of stock each range is best suited for, how many animals can be grazed without injury to the forage on a particular range, and other principles of range management and administration of range resources, most of the ranges e been restored in large measure, the carrying capacity of many of m has been increased. Many probs remain to be solved, however, h in the management of the ranges, in the proper correlation of graz-, timber growing, and other uses the forests.

'The National Forests," Mr. Stuart lares, "may be considered as a up of great timber farms with ny and varied resources besides the ber. The greater portion of their ,000,000 acres of land is in the st, but they have an important and wing representation in the eastern untain chains, the Lake States and South, and outlying units in Porto o and Alaska. Their products, ir protection of important waterds, their recreational resources, and ir value as demonstrations of how odland and range can be handled a permanently productive basis ke the problem of their administran a problem of first importance to nation.

"As a result of its 20 years' experie in handling the National Forests, Forest Service has worked out, ted, and put into practice many nciples of management that have lded gratifying results. The chief ases of the National Forest problem ich require further study involve earch in fire prevention and supession organization, methods and uipment, in timber culture and utilition, and in range and forage utilition. In a certain sense, the promon of farm forestry and of industrial forestry, and the handling of the National Forests are so closely linked as to be essentially a single problem. This is the problem of getting from the forest land of the nation the largest possible contribution to the welfare of the people."

The Mississippi River flood disaster has raised the question as to the adequacy of the Nation's program of forestry. To control such floods solely through reforestation, however, is patently impossible in the view of forestry experts. Serious floods occurred in the Mississippi before the natural forest cover of its drainage basin had been disturbed by settlement or lumbering. The flood of 1927 was caused primarily by very heavy rains in the lower valleys, and engineering works alone can restrain the vast quantities of water poured into the channel of the river under such circumstances.

However, it is considered that forests aid in the regulation of streams, because they hold the soil in place and hold back rain and snow water more effectively than any other form of vegetative cover. Forests have a place in the plan for dealing with the Mississippi River, but one which can not be defined in sweeping or general terms. It can be determined only by study of the facts to ascertain where in the Mississippi Basin the improvement or extension of forest cover will be of tangible help in supplementing the engineering works upon which the main reliance for the control of destructive floods must be placed.

Corn Production Costs

(*From page* 28)

hile costs decreased with increasing elds until with production above 130 ishels per acre, the cost per bushel as reduced to one-half (Graph). hus it is important for corn grows to realize that expenditures for better seed, more fertilizers, or better cultural methods may be very profitable investments.

The average percentage of shelled corn was also greater at the higher yield levels, as shown in the follow-

HIGHER YIELDS INCREASED SHELLING RATIO.

Average Yields	Shelling Ratio	Per cent Mois at Harvest
Below 70 bus.	80.8 per cent	23.8 per cei
71-90	81.7 " "	25.0 " "
91-110	82.6 " "	23.7 " "
111-130	82.8 " "	23.2 " "

ing table. An increase of 2 per cent in the shelling ratio makes quite a difference in the actual yield and value of a corn crop. The percentages of moisture in the corn at harvest time did not seem to have any definite relation to the size of yields.

The combined effects of present and past soil treatments and management were stressed by Mr. Slipher as determining factors in making high or low yields. That factor of human judgment, for which there is no measurement, is probably most important. No single thing in any one year is likely to produce a phenomenal change in yields. In the past there have been waves of single practices, but soon each reached its limit of increased productiveness, because other limiting factors appeared. At certain times we particularly stressed cultivation, the use of bone dust, lime, better seed, then superphosphate, and now more nitrogen and potash. But it will be the well-balanced combination of these things over a period of years which will really do the trick of increasing yields to the maximum.

The average methods of culture and soil fertility maintenance of the corn project farmers were cited, not as exact recommendations, but merely to show what some of the best farmers have done to produce larger yield corn.

The farmers who produced larger yields plowed slightly dee cultivated a few more times, planted earlier. The average pla ing date of all those fields produc from 111 to 130 bushels per acre about May 15, while those produc less than 70 bushels planted an av age of eight days later.

The fields with the highest prod tivity had apparently been built in fertility by the use of more clo sods, green manures, and more f tilizers. The accompanying table sho that 80 per cent of the highest yie ing corn crops were preceded clover crops, and 30 per cent by gr manures. It was also stated by M Slipher that these farms in the co contest grew one acre of legumes each five acres of crops, while the a erage for Ohio is one acre of legun for each ten acres of crop land.

More fertilizers per acre, both the row and broadcast, were appl by the men growing the larg yields. Of course the average app cations shown here are low becau some used no fertilizer on corn. T general tendency is to use more co plete fertilizer in the hill or row, a a phosphate-potash mixture broa

EARLY PLANTING HELPS YIELDS

Average Yields	Depth of Plowing	Number of Cultivations Harrow	Plow	Date of Planti before or afte May 15
Below 70 bus	6.88 in.	1.12	2.92	8 days later
71-90 bus.	7.03	.90	2.96	3 days later
91-110 bus.	7.18	1.03	3.01	1 day earlier
111-130 bus.	7.61	1.06	3.06	0 ———

st. The manure applications are riable because some did not use inure for the corn.

Adjusting the number of stalks per re to the yielding capacity of the l is one secret of getting maximum oduction of good quality corn. Too w stalks per acre may be the limit-g factor of yields in many cases. r instance the highest yield of corn r Ohio was made with about 20,000 ilks per acre. A common practice Ohio is to plant corn 42 inches ch way, or 3,556 hills per acre. ith an average stand of 2 stalks per ll this would be only 7,112 stalks, with an average of three stalks per ll only 10,668 stalks per acre. De easing the spacing to 38 inches each ay increases the number of hills to 4,343, and with an average stand of three stalks per hill would allow 13,-029 stalks per acre. The general tendency is to plant smaller varieties of corn, with more hills and stalks per acre, and consequently get more ears per acre. However, the supply of available plant foods and moisture must be sufficient to nourish the increased numbers of plants.

Since PROFIT = (SELLING PRICE — COST OF PRODUCTION) × UNITS OF PRODUCTION, each farmer should plan a 10-year fertility program to increase production per acre and reduce cost per unit. He has little control over selling price, but higher fertility of the soil gives a better fighting chance with the Weatherman.

GOOD SOIL MANAGEMENT IS REWARDED BY INCREASED YIELDS

verage elds	Clover sod plowed	Green Manured	Ave. Tons Manure per acre	Fertilizers Applied Row	Broadcast
low 70 bus.	64%	22%	4.04 T.	50 lbs	158 lbs.
-90	86	22	3.65	49 lbs.	145 lbs.
-110	72	22	2.70	55 lbs.	148 lbs.
1-130	80	30	3.80	61 lbs.	184 lbs.

Jupiter Pluvius—Thief

(*From page* 16)

e rate of 566 pounds per acre.

Of course, it is impossible to sod our ricultural districts, so we must do e next best thing. This quesin of sodding and its cutting down r soil erosion points out that the rm lands during the time they are e in the fall and winter, if possible, ould be in a cover crop. If this cant be done, then the land should be t in a rough state in order that the oisture which falls on it will be held soak in. Where the rainfall is so avy that the soil has not sufficient pacity to take it all in, the rough ate is only a help and not a final cure.

Another important thing too frequently overlooked is the direction of cultivation. Too many of our farms have the rows running up and down hill and are cultivated in that direction. This means that each row becomes a drainage channel in which the water will run at high speed taking soil with it. In other words, it is almost an ideal condition for the maximum soil erosion. The proper method to pursue in placing the rows in order to minimize soil erosion and the loss of soil moisture is to run the rows with the contour of the land, that is, the rows should be run practically without any fall along them.

The soil fertility should be built up as fast as possible because rich soil which is full of humus erodes more slowly. The Missouri work clearly demonstrated this, for by crop rotation only, yearly soil losses were reduced from over 17 tons per acre to less than 3. This fact has resulted in the axiom which most terracing experts give that you should terrace your best land first. It is not only easier to hold the water on it, but it naturally follows that you want to hang on to what you have while you have it.

All the above methods to prevent soil erosion are supplementary to the one outstanding method which we are universally advocating, which is to lock the door against the thief, Jupiter Pluvius, by terracing. We are learning considerable about terracing. Up until a few years ago we thought that terraces were constructed only to get the surplus water off the land but to get it off slowly. We are finding today in sections where soil moisture is the limiting factor to our crop production, and there are many such sections in this country where that is true at least sometime during the y that terraces conserve moisture. are going to learn more about tha time goes on. There is no doubt up to the present time terraces are best known device for the handlin soil erosion. They at best are none good and I feel in the future we going to learn much about them.

It is remarkable that terraces h come up through these many y with as little research attention as t have had. The result of it is that t have just grown like Topsy. The race, its construction, its location, sign, and method of handling is a s ject of many State Agricultural C lege bulletins.

A broad base so-called magnum race with or without fall along it spaced according to slope and type soil is the one which is advocated agricultural workers for use toc The use of this terrace with supp mentary methods discussed above cut down very materially the losses which we are undergoing at present time. By so doing we will i prove our agricultural conditions a do much to aid the so-called farm lief.

One of the several large concrete weirs and gauging stations on the Spur, Texas, Experiment Stati run-off water project.

Ennui

(From Page 4)

ne of ball. Consider two kinds of ple present—one being a hard ssed player who welcomes a little e out, and the other being a bored ctator who doesn't know the rules care for the sport.

There you have one clear illustration the two opposite brands of ennui. e lively player is fatigued and wants ttle rest and change of position, a nce to relax and recuperate. To n a brief rest is that much restora- n so he may *renew* the heated strife.

The indifferent spectator has no ie at stake, has made no prepara- n, is perhaps only half awake—just ting idly for the finish. Thus like- e do we all sometimes experience lethargy that men call ennui for nt of a better term. Which kind e you? The refreshing or the dead- ng variety? The kind that has ne from sacrifice or the kind en- dered by selfishness? I hope that ir answer is that you are more often ntally or physically lazy than stag- nt, morbid, or steeped in dull de- ir.

TOO much introspection or faulty digestion brings on the state best to music by the "blues." Ultra ishness is a frequent product of ra modernity. Such folks are dis- sfied, bored, and unhappy and they ow not why. They have drifted o the doldrums of dull irrational- , swept by no breeze of enthusiasm fanned by no zephyr of zest.

Remember Maeterlinck's dream ldren who sought the elusive blue- d of happiness? The end of their est is just as true outside of fairy es. It is this:

We find pure happiness in things ich depend upon ourselves, and we l to find happiness when we depend entirely upon things which are at the mercy of circumstances.

When I went to school Psyche was a pictured goddess, or something, found in the pages of a musty mythology text-book. Nobody paid much attention to her except to notice her lack of stays and a bustle.

But today I cannot scan a paper or go down the street without reading the professional card of some nerve specialist—a psychoanalyst who has a long-time treatment on tap for the myriads of the self-inflicted sufferers.

As I am very much interested in other folks and cannot keep my mind completely self-centered, it may be that I shall never see the inside of those consulting rooms. I shall no doubt continue to have ordinary plebeian ailments, like toothache and ingrowing toe-nails, rather than indulge in those modish maladies in a class with neurasthenia, dementia praecox, and hypochondria.

BE that as it may, I can partly sympathize with those patients, for their inertia is as real to them as my indefatigable energy is to me. The only difference is that I get a rest sometimes, and they don't. The nerve expert knows better than to let them!

This sort of disposes of the listless-spectator form of inertia, and brings us full steam ahead to the kind that gets most of us sooner or later.

The widening distance between the centers where decisions are taken and the places where the main work of the world is done has undermined the discipline of public opinion. In our grandfathers' time the model of popular government was the self-sufficing township in which the voter's opinions were formed and corrected between himself and his neighbors.

But now, as Walter Lipmann says,

we are "absentee rulers," or a kind of phantom public, who are expected to be on the inside of things, while we are really on the outside. The "public" consists of you and me and all the others who pay taxes but hold no office. Executive action is not for us; the real merits of a public question cannot reach us; we lack the time or opportunity for analysis or solution of the problems; and so all we can do is to spit on the stub pencils they give us on election day, and take another chance!

THIS brings me at last to Jim Yancey's Dixie mule, addressed by his forlorn, debt-ridden driver in this fashion:

"Bill, you are a mule, the son of a jackass, and I am a man, made in the image of God. Yet here we work hitched together! Do you work for me, or I for you? Perhaps it's only a mule and a fool, after all. You work on four legs and I on two, so mathematically speaking, I do twice as much work as you. When the corn is harvested I give one-third to the landlord, the other third goes to you, and what's left is my share. But while you eat all your share except the cobs, I divide mine among one wife, seven kids, three cows, sixteen hens, and a banker! Bill, you *are* getting the best of me. About the only time when I'm better than you is on election day, for I can vote and you can't. But if I get any more out of politics than you do, I fail to see it yet!"

Jim Yancey's power as an atom of the phantom public is about like yours and mine. But he is happy in his ennui, while we on the contrary, strive to be "up on" everything, and consequently get the "low down" on nothing.

Trying thus to keep our place in the sun of public opinion and aiming hard at every mark—this is the settled job of every self-respecting citizen who wishes to be counted among the intelligentsia, otherwise known as the cognoscenti.

I therefore offer some of my m recent attempts to escape inertia a ennui by "widening my horizon." you are also a well-read man, it will no hardship to get my drift and fl along with me.

The tariff should be lowered blackstrap molasses, circular saws, a saxophones, and we ought to prot the infant industries by higher dut on teething rings and toys. Af cogitation over several littered dige I am ready to toast Mr. Kellogg being well posted. That means I for multilateral treaties, not too bad mutilated.

I have delved rigorously into so correspondence on the construction cruisers which sets forth some of t conflicts (not at sea) between the st tistical claims of the National Coun for the Prevention of War and the of cials of the U. S. Navy. Added ther unto and duly subscribed are remar by the Honorable David I. Walsh Massachusetts in the Senate assembl on January 30, 1929. Append thereunder are more remarks in "fi point solid" by Honorable Gerald Nye of North Dakota, entitled "W don't need fifteen more cruisers Fargo or Bismarck."

WITH a trace of eclat and sor little unction thrown in, I sc the list of capital ships, airplane ca riers, destroyers, submarines, mine la ers and monitors—and find a horr discrepancy between the figures su mitted by the lady associate secreta of the anti-cruiser crusaders and tho so deftly presented by the rear a miral's ensign extraordinary. T whom should this be reported, and so, what for?

Looking at my thermostat I deci to keep cool in memory of Coolidg and not rock the boat. (This is m first remote hint of the oncoming, in siduous ennui.) If everybody's tryin as hard as I am to be patriotic, w shan't need Borah to protect the con stitution.

ext I am sought by the literature he People's Hobnobbing Lobby, I am showered with pamphlets h seek to arouse me and make me med of my country and its crass dity. I get eighty-five questions their correct answers printed on a al looking sheet, and it also is of my duties as a citizen to peruse n.

learn that thirty-nine people own control one-sixtieth of the total th of the country and that they at last prevailed upon America dopt the slogan "milk from coned cows" as the safe and sane um under which to perpetuate income.

n top of this comes more revelas of the public utility propaganda, I am obliged to compare Ontario er rates with those in my home in order to get a shock over the e of volts. If this keeps up I may de it is cheaper for us to do our ing out in the sedan with the e light turned on.

or a moment now I dip into histo fortify myself as to the methof serious crusaders, and I am tly overjoyed to detect that these et-crowned knights were not all ured or inspired, and that half of n were adventurers while the other didn't know what it was all it! Yet have some modern reform es produced much better material?

LMOST in despair at escaping the grip of ennui, I turn to educafor relief, and find it a jungle of ons, with no interpreter. Furthere, as fast as they print books ething occurs to make them obsoand every scientist is trying to rove what the other one has pubd.

et haven't they told me for years the only way to take the mass of the morass would be to give proletariat more pedagogues?

Neither do I acquire more confidence from the moralist, for I often find him perturbed over the thermal units in Hades. And again, what profit lies here to strengthen my industry, for what is a capital crime in my neighborhood is only a postponed case in Chicago.

If erudition and morality combined cannot keep me mentally awake, then surely my last resort rests on competition.

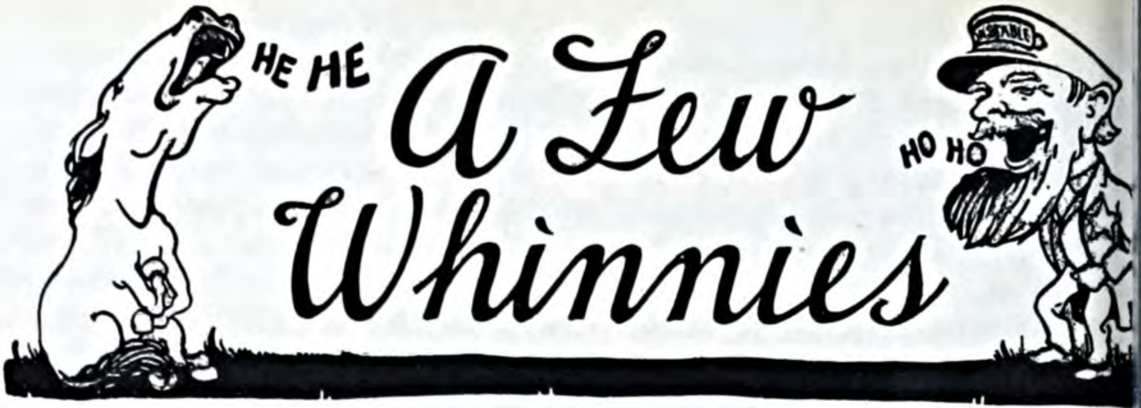
If and when I do some work, however unimportant, that somebody else may be doing a trifle better; if and when I resolve to excel that other laborer at his own game without malice or trickery; then I am apt to find the force that is latent within me to ward off deadening decadence.

So it is that I am able to shun the ennui that injures and enjoy the occasional kind that soothes and restores. I must get used to being ignorant on many things and wise to a few. I don't want anybody to call me a specialist or an expert—except in hard work and happiness.

THE recipe for the utmost happiness must include a dose of reverie and restful idleness. Most folk wait until midsummer to take that part of the recipe, only to find resort rates too high. If you are like me, however, you cannot escape it in April. After a long season of steam-heated, high-pressure, indoor production, how I welcome a chance to lie back and *quit thinking!* In the midst of this confinement and grind, how delicious it is to cease using my brain!

And so in reading this you have had to take the consequences. If, peradventure, I have convinced you that spring fever is as much a sanitary thing as spring house-cleaning, and that it does as much for the so-called human race as the entire brigade of scrub women, then my spell of word wrestling has been effective.

Call it April, spring fever, or ennui—what you will! But do not call me back to work until it's over.



THE FORD THRILL

Her lips quivered as they approached mine. My whole frame trembled as I looked in her eyes. Her body shook with intensity as our lips met, and I could feel my chest heaving, my chin vibrating, and my body shuddering as I held her to me.

The moral of all this is: Never kiss them in a Ford with the motor going.

"Hello, Jake," said the farm hand. "Why aint you comin' to the weekly dances down at the range hall?"

"Ho, ho, dances!" said Jake. "I could never learn to dance."

"You could, too. It's dead easy," replied the farm hand. "All you got to do is to keep turnin' around and wipin' yer feet."

"I want to get a good novel to read on the train—something pathetic," said the woman to a book salesman.

"Let me see, how would 'The Last Days of Pompeii' do?" asked the salesman.

"Pompeii? I never heard of him. What did he die of?"

"I'm not quite sure, ma'am," replied the salesman, "some kind of eruption, I believe."

'STAT SO?

Teacher: "How did Staten Island get its name?"

Wise Pupil: "A German was coming to America, and when he saw land, he said, 'Staten Island?' "—*Exchange.*

ONE THING AT A TIME

A friend dashed up to the cabin say: "Oh, Mrs. Jones, your man d got in a fight and got hisself kille Mrs. Jones was busy eating a ju piece of pig's feet and kept on ch ing. "Lawsy, Mrs. Jones, that's ribble. Ain't you going to take about it?"

"Just wait till I finish this h pig's trotter and you'll hear some h lerin' as is hollerin'."

One day when Mr. Gladdis golfing, he discovered an old l calmly seated on the grass in the m dle of the fairway. "Don't you kn it is dangerous for you to sit th Madam?" he reminded her. The lady smilingly replied, "It's all rig I'm sitting on a newspaper."

LOAN DELAYED

"Hello! Hello! Is this you Mac

"Aye."

"Is this Mac MacPherson I'm ta ing to?"

"Aye; spekin'."

"Well, Mac, it's like this: I wa to borrow $50—"

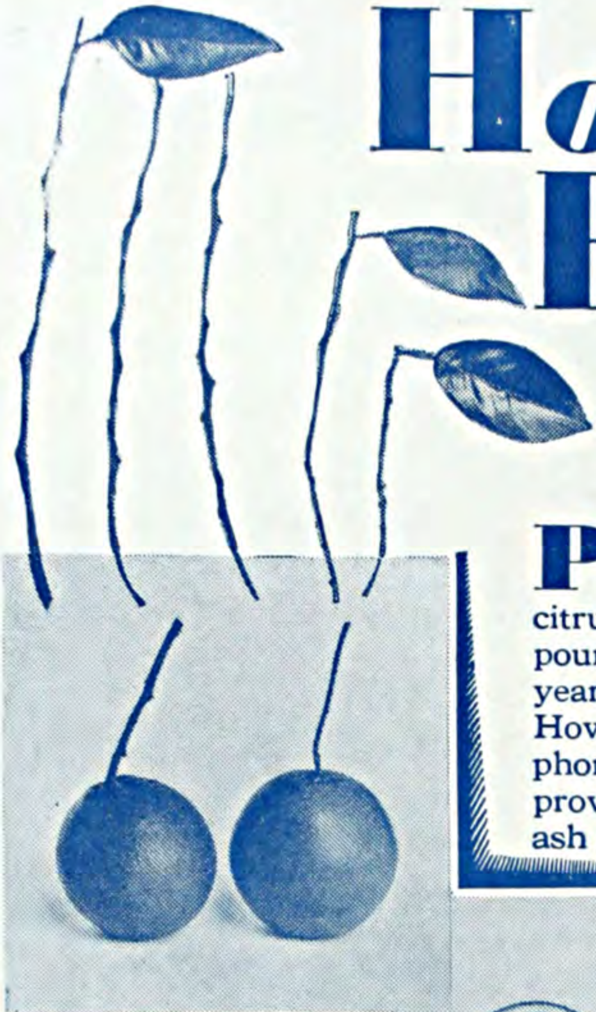
"All right. I'll tell him as soon he comes in."

METER NEVER STOPPED

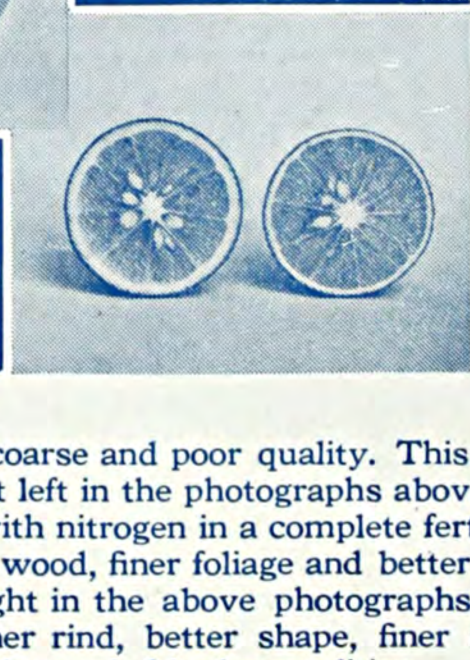
Professor: "Go your fastest, man! I am in a desperate rush."

Taxi Driver (after speeding alo for thirty minutes): "Say, you forg to tell me where we are going!"

How Potash Helps



POTASH pays in extra yields and extra quality. Bearing citrus trees should receive 2 to 3 pounds of actual potash (K_2O) per year, preferably in a mixed fertilizer. However when nitrogen and phosphoric acid are otherwise amply provided, straight Sulphate of Potash can be applied at the rate of 4 to 6 pounds per tree. This may be divided into two applications—the first in early spring, the second in late summer or early fall.



THE long continued use of nitrogen alone frequently results in too much leaf and wood growth and a poor set of fruit of a coarse and poor quality. This is illustrated in the wood and fruit at left in the photographs above. Phosphoric acid and potash used with nitrogen in a complete fertilizer produce well-developed fruiting wood, finer foliage and better quality fruit. This is illustrated at right in the above photographs. Potash produces fruit with a thinner rind, better shape, finer flavor, firmer texture, and better keeping and shipping qualities.

Agricultural and Scientific Bureau

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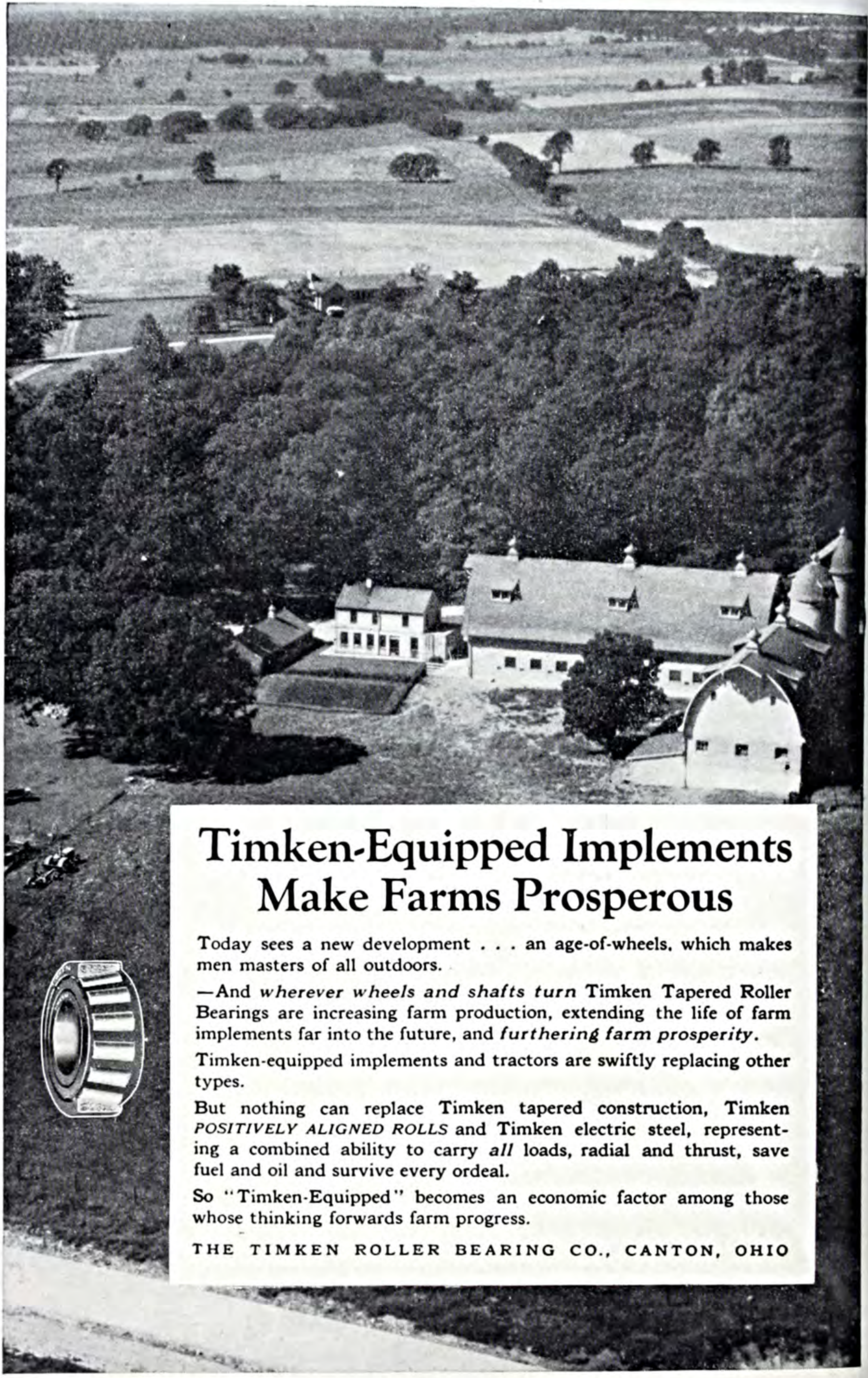

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VOLUME XII   NUMBER FIVE

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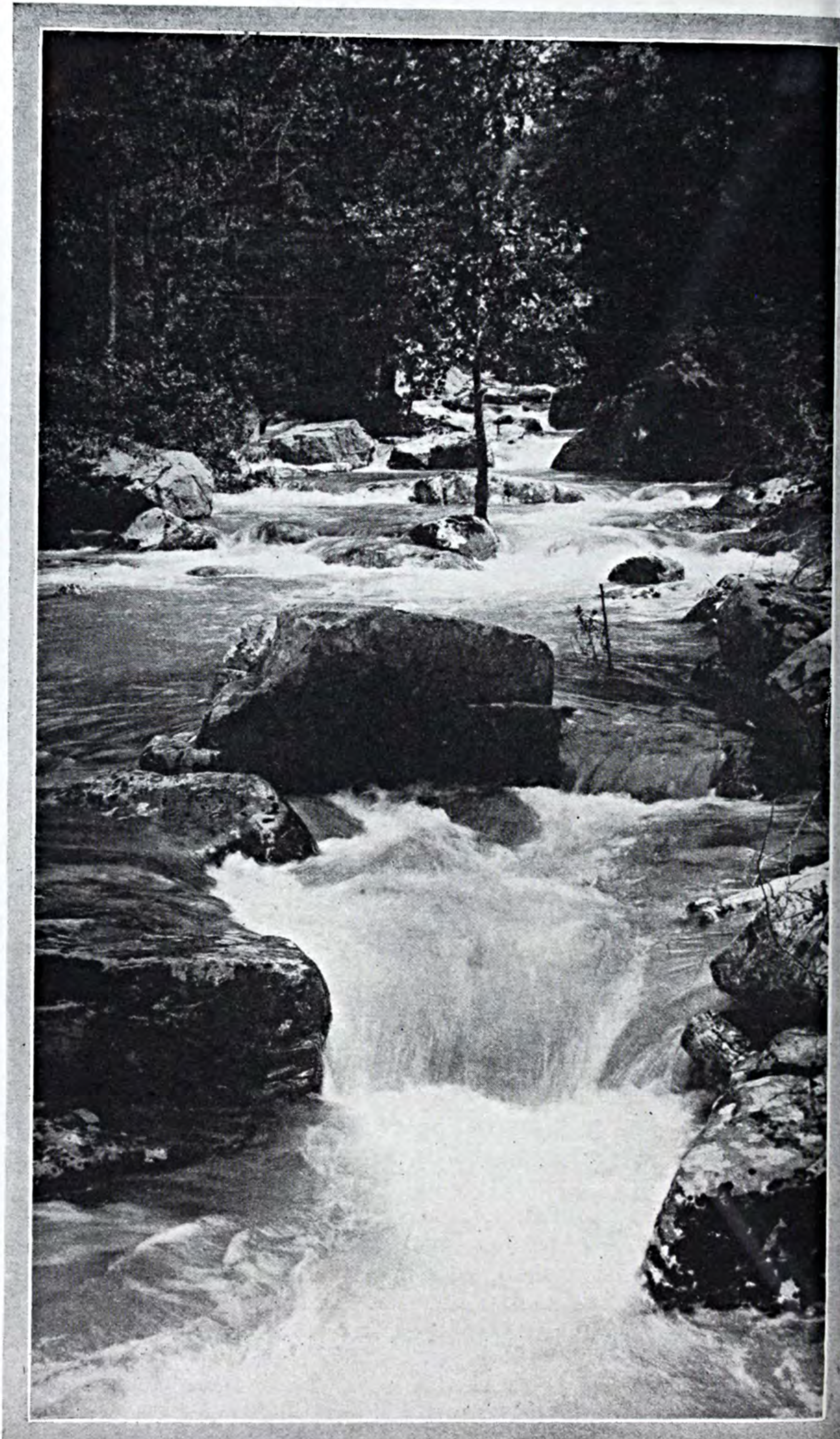

Better Crops with PLANT FOOD

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Vol. XII NEW YORK, MAY, 1929 No. 5

Jeff pays a timely tribute to—

Mothers

By Jeff McDermid

MOST mothers would forego floral offerings and mushy tributes and take their reward in raising a family not too full of original sin and Dad's peculiarities. After exterminating the former and enduring the latter for half a century, the average mother prefers peace and quiet to a place in the spotlight. She knows she is a heroine, but she prefers to be somebody's model than to wear a medal.

If there were published a Who's Who for Mothers the Congressional Library could hold only the index!

When I wear my white carnation to commemorate Maternity Day, I think of a patient little woman who saw few carnations. Her garden or what was left of it after the small boys and their dogs passed the first ecstasy of summer madness—was the haven of marigolds, verbenas, and hollyhocks.

Sometimes I get absorbed in the grind of routine and forget to buy the emblematic boutonniere on that significant morning. Yet when I discover this shortcoming, it does not upset me or spoil my day, for have I not been stumbling along immersed in those self-same homely tasks that caused Mother to be sometimes inconsiderate of her personal adornment? Perhaps it's better to forget the florist and make every day a silent, though perhaps unconscious, tribute to the one who "fetched you up by hand."

Wreaths and encomiums, paeans and memorials, glory and ritual—what part have these in making any honest heart beat more truly toward an object of natural veneration? The need of cleansing visions and death-bed repentances are not to be included in the present discussion. I address myself, as always, to normal humanity, who are neither carrying lilies nor sawed-off shotguns, and whose business is to provide a square meal rather than a round of drinks. The Mothers of Main Street, as I know them, enjoy *being* poems rather than reading them.

MOTHERS have been treated like farmers. By this I mean that mothers have been both praised and pitied, designated as indispensable and inefficient and made the subject of complete college courses written around their age-old vocations.

The bibliography of agriculture is only equalled by the bibliography of motherhood. Each has its journalists, its lecturers, its demonstrators, and its saviors. Laboratories have come to the aid of babies and barley, science has found remedies for child colic and calf scours, and savants have done almost as much for cross-eyed infants as they have for cross-bred chickens.

What makes bookish theory and actual practice so divergent and irritating on both of these subjects is that teachers do not have to live with the children and the crops. They are not obliged to castigate the one and cultivate the other. By the time a mother has finished her task and is capable of posing as an authority, she wears specs and false teeth and is anxious to change the subject.

Hence I am not looking for help from the city library or correspondence school to get posted on motherhood. Most of the best-looking books are written by maiden aunts or devoted professors who scribble feverishly for an excuse to stay away from home until the kids are asleep. The books are indeed very well boun thank you, but as someone has sai "You can't always tell by *de luxe*."

From a plain, practical standpoi these tomes are too abstruse for th flickering powers of concentration o a dame who has been slightly perturbe by what Thomas Hardy calls "th muck and muddle of rearing family."

Yet to be absolutely fair, I have observed that many fine young mother get along very nicely with Holt i one hand and Hoyle in the other, an they know when *clubs* are trump with either! And after all, both authors deal in hearts and a reader ma *say* "whist" and *play* it, too!

Relations between parents and thei offspring have undergone a chang even in my generation. Modern movements in child study, applied psychology, and child conservation, together with the disquieting complexities of latter day society, are obviou reasons for the transformation.

Soothing syrups, sugar teats, and red flannels; ear-muffs, wristlets, and nailed-down casements; copy-books family prayers, and a slap with th slipper—these have vanished with th saints of yesteryear. The sinners o the present age require more syntheti discipline and diversion.

"AS the twig is bent" has changed until the parent is broke. Yet without some care, the little saplings may grow into old saps. Personally, I have little faith in the liberalist vogue of child rearing which makes the parent only a provider but seldom a persuader. Our mothers did not know much about the word "ego," but they knew a lie when they heard it and they halted a lot of cussedness by a trip to the woodshed.

Old-fashioned mothers made the error of putting too much trimming on infant bonnets and petticoats, while the modern ones are apt to insist

(*Turn to page 60*)

Potash Turns *the* Trick

By James J. Lacey

Former County Agent, Green Lake County, Wisconsin

WHEN Henry Traugott of Berlin township in the northern art of Green Lake county, Wisconsin, rows potatoes, he has a definite maret in view. This market is the neary cities of Oshkosh and Fond du Lac. urthermore, when Henry Traugott rows potatoes, in planning his crop he eeps definitely in mind the demands f his market with respect to quality nd number of bushels, and the soil ertility necessary to profitably meet hose demands.

Normally, this progressive farmer lants about 10 acres of potatoes, an mount considered as a mere sideline o the other activities on the farm, ut an acreage that in a good season ets a handy cash income. Mr. Traugott finds the lowly spud a crop that its nicely into his other general farm practices. He is a firm believer in oil fertility maintenance, and he finds the potato a crop that reponds readily to the ertility supply in his vell-kept Miami fine andy loam.

His regular farm crop rotation is built around legumes, and 'A Legume on Every Acre Every Year," has become a slogan and an established practice with him. He uses alfalfa and medium red clover as his hay crops. His pasture acres are growing sweet clover. His fields of corn for ensilage purposes carry an abundance of Manchu soybeans. Even the portion of his cornfield that is "hogged down" is sown to sweet clover at the time of the last cultivation. Every acre of his small grain is seeded to alfalfa, medium red, or sweet clover. In other words, he works the legumes for all they're worth.

The Traugott herd of 15 dairy cows return a goodly amount of barnyard manure to the cropped fields. But in spite of this general good care in the up-keep of the soil fertility, last year Mr. Traugott began to wonder if after all he was not dissipating his supply of fertility. He had read and heard much about commercial plant food and about its results even on well-kept farms. He wondered whether the time had come when he, too, should be us-

Left: Mr. Traugott and two rows fertilized with 3-8-16. Right: Mr. Lacey and two unfertilized rows.

ing the commercial supplement to his barnyard manure. He felt that perhaps in spite of his vigilance he was removing plant food from his soil to an extent that was not compensated for in the returns from his legumes and his barnyard supply.

Therefore, last spring he was very willing to cooperate when approached on putting on a fertilizer demonstration on his potato crop. He was not at all certain that fertilizers would make any wonderful showing, but he wanted to know, and the desire for knowledge is the cornerstone of unreserved cooperation.

The field selected for the demonstration had been growing a mixture of timothy, medium red, and sweet clover in 1927. This had been turned under in the fall, and since the field was more than a mile away from the farm buildings, no manure was applied for the 1928 potato crop.

Details were discussed and readily settled. The fertilizer was to be applied, drilled in the row, at or below seed level, and at the rate of 600 lbs. per acre. Four different analyses would be used, 3-8-0, 3-8-6, 3-8-12, and 3-8-16.

The potatoes would be planted checked both ways, at three-foot intervals, to allow cross cultivation because of the presence of some quack-grass. Four areas of one-third acre each would be fertilized on a uniform strip of soil, with one-third acre throug the center left as a control or chec plot.

A very efficient fertilizer sower w made from an old discarded corn sulk cultivator. The shovels were all r moved, and one large shovel from a old-style shovel plow was fastene rigidly between the shovel beams. fertilizer supply box was mounted o the frame of the sulky cultivator, an a rubber hose led from a hole in th bottom of the box to a point directl back of the large shovel. Then thre spring teeth of an old spring-toot harrow were secured between the tw shovel beams, behind the large shove

In brief, this was the plan: The larg shovel, when lowered, would dig trench about seven or eight inches dee and of about the same width. The fer tilizer would be fed down into thi trench through the rubber hose tha led from the supply box. The sprin teeth, lowered, would follow behin the fertilizer stream and mi thoroughly the fertilizer with the soi in the bottom of the trench. The po tatoes would be planted at three-foo intervals in the trenches or rows tha would still be visible where the fertili zer had been applied. Selected Rura New Yorker seed that had been treate with hot formaldehyde for scab an scurf control were to be used in th demonstration.

When planting time arrived, th plans worked out perfectly. Twelve row across the field, eac about 25 rods long made each one-thir acre. The fertilize sower worked true to form. The fertilize was applied on May 30, and the planting was done one day later.

Forty-two unfertilized rows were left on the south side of the field to avoid any possibility of having the

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Mr. Traugott made this fertilizer sower from an old discarded sulky cultivator.

Gassing Groundhogs

¶ *War on these pests has been declared.*

By James Silver

United States Biological Survey

DURING April and May is the open season for gassing groundhogs, and there are three good reasons for confining gassing activities to this time of year.

First, groundhogs should be destroyed early before they get a chance to damage the year's crops and before the season's young can grow up and make double the amount of gassing necessary. Second, the groundhog burrows should be fumigated while the vegetation is short so that they can be found more readily and fewer of them missed. Third, in order to avoid destroying valuable wild life, groundhog burrows should be gassed at a season when they are most easily identified and when they harbor no other animal.

April and May are the only months that will fulfil these three conditions. Much has been said and written in opposition to the gassing of groundhogs at any season, because of the contention that other burrow - inhabiting and valuable wild life —including foxes, skunks, and rabbits— are destroyed in large numbers. Federal specialists have shown this contention to be false, however, by fumigating a large number of groundhog burrows and then excavating them to note results. In no case was any dead animal found other than the groundhog—where gassing was done during April and May.

The groundhog is also called a woodchuck.

Most farmers are well acquainted with the location of all the active burrows on their lands, and because they see them almost every day they know which are being used by the groundhogs.

The Method

Farmers may occasionally have to destroy a fox or a skunk to protect their poultry, or to war on rabbits to save their crops, but on the whole farmers are as ardent conservationists as other folks. In addition to recognizing the importance of these animals for their fur or food, farmers know that most of them are inveterate foes of the small rodents that prey incessantly on their crops.

About two ounces of carbon disulphide or one ounce of calcium cyanide placed well down into the groundhog burrow, and the burrow tightly closed with an inverted sod, will do the trick. Arrange to do a thorough job on the area to be protected, and start early enough in the season to allow time before the last of May to go over the ground a second time, if necessary.

Maryland Experiment Station

By Melville D. Bowers

Editor, University of Maryland Extension Service

BETWEEN the year 1847, when the Maryland Agricultural Experiment Station may be said to have had its origin, and the present year of 1929, there is a span of no more than 82 years. Yet in that interval of time the world has moved fast and far. So fast and so far, indeed, that it is likely to forget that American agriculture in 1847 was like an ungainly stripling, racing through its adolescence to the mature and seasoned growth it so speedily attained.

Today, in the minds of most people, American agriculture resides west of the Mississippi river. How strange it seems that this selfsame agriculture was once cradled in what is now regarded as the effete and highly conservative East. And yet it must be true, for in 1847 Conestoga wagons were still toiling along rude trails into the Northwest. The gold rush to California was history still one year away from the making. New York was giving promise of becoming a great metropolis, but if it had stopped to number its population it likely would not have discovered more than half a million souls. There were probably not 50 towns in the entire United States that could muster in excess of 8,000 inhabitants. Railroads were building, and the first telegraph lines were being constructed. Industry was expanding, but was playing a minor role to agriculture as a source of wealth and occupation. New varieties of seeds and plants were being distributed from the Patent Office, but there was no United States Department of Agriculture.

During this period, Maryland, like many other eastern states, was contributing largely to the agricultural development of the nation. A few years earlier, a Maryland man had secured the first patent on a reaper and had demonstrated it successfully on the farm of General Tench Tilghman in Talbot county. An established agricultural paper had been spreading its influence over Maryland and adjoining states for years. The State had adopted the infant canning industry and was struggling with the intricate problems of its growth. Commercial fertilizers were just coming into use, and Maryland was laying the foundation for its subsequent place of leadership in this particular industry.

Out of this pioneering period in Maryland agriculture, grew the State Agricultural Experiment Station. In

1847, to be exact, the legislature passed an act providing for the establishment of an agricultural laboratory for the study of soils and fertilizers. It was the first thing of its kind in America, and from this source possibly might be traced the later preeminence of the state in its efforts to study and classify the various types of agricultural soils.

This early law provided for a chemist who was required to visit each county annually and give a course of lectures on the results of his investigations. The county commissioners, moreover, were authorized to publish these lectures and to distribute them to the farmers of their counties. Thus, in 1847 did Maryland have in effect both an experiment station and an extension service.

In 1856, or nine years later, the Maryland Agricultural College was chartered. It was the second agricultural college in the western hemisphere. It was entirely under private ownership and management, but the charter not only empowered the trustees to do educational work but set forth a requirement that agricultural investigations be undertaken. In 1859, accordingly, the first year of the college's operation, tests were inaugurated on fertilizers then on sale in Maryland. These tests were conducted with hay, grain crops, and potatoes and were continued until interrupted by the Civil War.

The First Director

Apparently little systematic experimental work was done in Maryland following the Civil War until the enactment of the Hatch Act in 1888. The passage of this bill seemed to inject new life into the trustees of the Maryland Agricultural College, and they immediately set out to find a man suited to the task of directing the investigational work and serving as president of the college. Their choice was a credit to their serious purpose and to the high aims which they had for the school. They undertook to secure and did secure Major Henry E. Alvord, professor of agriculture at the Massachusetts Agricultural College and previously director of the Hough-

Founders' Gateway at the University of Maryland bears tablets with the names of the early patrons of the Maryland Agricultural College.

Dr. Raymond A. Pearson, President of the University of Maryland.

chairman of the Associ tion of American Agr cultural Colleges and E perimental Stations to s cure the appropriatio of the Hatch bill and this committee was ass ciated with the pres dents of the Pennsylvan State College, Michiga Agricultural College, th Kentucky Agricultur and Mechanical Colleg the University of Ten nessee, and the Cornel University."

One of Major Alvord' first acts on assuming hi new duties was to draw warrant on the Stat treasury for $30. Thi sum constituted a six years' appropriation from the State for the Mary land Agricultural Col lege. It had not been collected. The bill au thorizing the appropria tion, it seems, was orig inally drawn to pro vide for $5,000 annually. But legislatures then as now had the trick of at taching surprising amendments, and this particular bill was enacted with an amendment to strike out the three naughts after the figure five and insert the words "and no more."

The finances of the institution were at a low ebb. There was a debt of approximately $20,000 and the only income came from the interest on the land fund which was below what it should have been. Major Alvord received his salary from the Experiment Station and contributed his services as president of the College.

To make matters more difficult, there was apparently a strong feeling in the State that the prime purpose of the college farm was to demonstrate that farming was a profitable occupation. In the Maryland *Farmer* of

ton Experiment Farm in New York. Speaking of the probable appointment of Major Alvord, the Maryland *Farmer* of April, 1888, said:

"In case of Major Alvord's acceptance, his term of office will begin March 20 of this year. He is about 55 years of age and is now in charge of the Massachusetts Agricultural College at Amherst, to which position he was called after three years' management of the Houghton Experimental Farm in New York State and where he was very successful. He has been recommended as a man of great executive ability and in every way eminently fitted for such a position. He is a member of the executive committee of the Jersey Cattle Club and has a national reputation. He was

March, 1892, there is a statement showing that the expenses of the college farm the previous year were $1,450.87. Receipts from products of the farm were but $1,126.73, an apparent loss for the year of $324.14. Editorial comment on this condition was long and acid, concluding with these words: "We know that farming in Maryland can be made as grand a success as anywhere in the world, and no better home for enterprising farmers and their growing families can be found in our country. It should be —it must be demonstrated in a model farm at our Agricultural College."

It can well be understood that Major Alvord's four-year tenure of office as director of the Experiment Station and president of the Agricultural College was not all clear sailing. Under the regime then in vogue, the position of each and every member of the faculty and staff was automatically vacated each year. If the incumbent was not fortunate enough to be reelected, he instituted search for a position elsewhere. Major Alvord was not excepted from this rule.

Major Alvord remained, however, until 1892. He left behind him a very substantial record of achievement. He had reduced the college debt to approximately $3,000, had rallied to the service of the institution some most capable men, and had brought about many other noteworthy improvements.

Dr. Harry J. Patterson, Dean of the College of Agriculture and Director of the Maryland Experiment Station.

Dr. H. J. Patterson, now director of the Maryland Experiment Station and dean of the College of Agriculture, was among those whom Major Alvord brought to the Maryland Agricultural College during his term of office. Dr. Patterson had been assistant chemist at the Pennsylvania Experiment Station. His father was superintendent of the farm there.

On one of Major Alvord's visits to the Pennsylvania station, he had encountered young Patterson carrying in from the fields a half bushel of weeds. His father asked him in the presence of Major Alvord if those were all the weeds he had been able to find. His reply was in the affirmative. Major Alvord was so impressed by this careful farming of a 400-acre tract, that in his first year of office he offered young Patterson the position of chemist at the Maryland institution.

It was during Major Alvord's incumbency, too, that Milton Whitney came to Maryland as soils physicist. He was a graduate of Johns Hopkins University, and his Alma Mater provided him with a laboratory and instruments at Clifton, the old Johns Hopkins manor, in Baltimore. His expenses and salary were paid jointly by the trustees of the Maryland Agricultural College and the United States Department of Agriculture.

Dr. Whitney's work, of course, is widely known. The first soil survey work in the United States was begun in Maryland under his direction. The Division of Soils which finally became the Bureau of Soils in the United States Department of Agriculture was inaugurated as a result of his outstanding achievements in Maryland, and he was the man who organized it and headed it until just a few months prior to his death last November.

It is rather interesting to note in this connection that there have been but two men at the head of the soils work in the United States Department of Agriculture and both of them came from the Maryland Experiment Station. The one was Dr. Whitney and the other is Dr. A. G. McCall, who gave up his position at the Maryland Station last summer to become chief of the Division of Soils in the newly created Bureau of Chemistry and Soils.

In 1892, Robert H. Miller, of Spencerville, Montgomery county, was chosen to succeed Major Alvord as Director of the Maryland Experiment Station, although there was a gap of three months before his appointment during which Dr. Patterson served as acting director.

There was considerable progress of a constructive character during the six years that Mr. Miller directed the activities of the Maryland station. The San Jose scale came into prominence during this period and resulted in the inauguration of research in entomology and plant pathology. A serious outbreak of spinal meningitis in horses also occurred in the State about this time and opened up the way for investigational work in livestock diseases.

Progress Was Steady

From this point on, the work of the Maryland Agricultural Experiment Station progressed steadily under the wise and able direction of Dr. Patterson, who this year rounds out 40 years of service with the college, part of the time as its president, and 30 years as director of the Maryland Experiment Station.

The various lines of experimental work, necessarily elementary in the early stages of the Station's history, have been broadened notably. Reference has already been made to some of these, which in the main consisted of

(*Turn to page* 58)

The short course for rural women is an annual feature at the University of Maryland

Industry Presses Onward

¶ Bringing to colleges of agriculture and to industries that serve agriculture special problems and opportunities.

By G. J. Callister

THE march of industry is compelling individual and group adjustments in thinking and in doing the day's work, which few of us can escape. Indeed our whole social fabric and structure are being modified under this growing power. Industry is more and more being regarded as fundamental in the life of the community rather than incidental to it.

The force of this movement is inducing us to change our outlook and ideas in all directions. In our practical every-day affairs, it is encouraging us to want more of this world's goods and yet to have more leisure; to do less manual labor and yet to receive more in return for the labor we do. It is enticing us to cultivate new methods of spending and investing; to develop new ideas of thrift and bolder plans of corporate action—thus are growing greater outlets for the courageous instincts of mankind in industrial ventures that circle the globe.

Probably never before have a people benefited so fully from the labors of industry as have the people in America today. According to Herbert Hoover:[1] "Today the vast totals of production and consumption as set forth in the columns of daily statistics indicate for each group whether it be common labor, professional men, farmers, artisans and others, the highest standard of living and the greatest degree of material comfort for each of them in any country at any time in the history of the entire world. Not all of these groups have marched parallel with each other. For instance, agriculture has fallen behind the march of industry in latter years."

In a more abstract way, this growing influence of industry is a power that is teaching many of us to be less isolated mentally, to seek broader interests, and to be tolerant of unity in larger spheres of activity. Today the notes that ring out above all others are a new vigor and a new enthusiasm born in the deeper concept of the more fundamental character of industry in the life of the community.

The Other Side

But in all pictures there are shadows. Sheldon[2] interprets the chief danger of industry as a lack of a plan—a goal. He says, "As the barque of industry grows daily more heavily freighted, and ploughs through seas of increasing storminess and danger, the task of steering that barque is proportionately increased in complexity and responsibility. . . . The danger for management is a lack not of activity but of a plan of action." The great need, as he points out, is for "some definite goal."

In its broadest sense, this lack of a plan of action, a definite goal, seems to be the common danger especially to

1—Hoover, Herbert. Foreword in A Century of Industrial Progress.
2—Sheldon, Oliver. Philosophy of Management.

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A good barbecue, like this one at a corn demonstration in Craven county, North Carolina, would help any demonstration.

A Viable Agriculture

By F. H. Jeter

Agricultural Editor, North Carolina State College

DOWN here in the Old North State, one hears a lot now about soil improvement and soil fertility. The public press carries much interesting material about it. Occasionally there will be a burst of local enthusiasm over some fine pasture campaign conducted successfully, and photographs of a vigorous citizenship engrossed in consuming huge quantities of well-cooked pig, prepared in open-air barbecue style, will adorn the columns of our favorite papers. County boards of agriculture and their county farm agents announce with pride that carload after carload of valuable legume seed have been ordered cooperatively and distributed. Plans for rotations of crops are made public, and the premeditated growth of forage crops to supply an expanding livestock industry is commented upon in friendly gatherings of those who hold North Carolina's farming industry to be the supreme concern of the State.

Where so much of this occurs day after day, there must be an embryo of accomplishment. I, personally, would not like to be considered a rah, rah boy, ready to do or die for dear old Yalvard, because the fact is that I put much of this in the papers myself. But this I do know — North Carolina farmers are thinking in terms of acre yields, profit per worker, cost of production, and similar phrases meaning little in the past but now very real and, as the seedmen say, viable.

The North Carolina Experiment Station knows its fertilizers. Its agronomy workers have accumulated probably as much valuable and definite data about the response of soils and crops to plant food ingredients and mixtures as any station. The farmers of the State believe in fertilizers and know that the use of such aids to crop production is profitable. Now they are learning that a combination of fertilizers with manures, with legumes, with crop residues, in crop rotations, with pastures, livestock, and forage supplies will balance farming and will increase acre yields.

As stated, the agronomy folks and the farmers believe in fertilizers. Professor C. B. Williams, head of the department of agronomy at State College, has been in his present job for a long time and he has more valuable data about fertilizer materials than he will ever publish. In a recent study he found that the 34 counties, which coincide closely with the area where cotton is grown, constitute about 53 per cent of all the land in the State devoted to the growth of crops each year. This same area has 49 per cent of the total value of the farm lands; it has 47 per cent of the value of farm buildings and 47 per cent of the total value of all implements and machinery used in the State. This same area produces 61 per cent of the total value of all farm crops and uses 73 per cent of all the fertilizer purchased.

Mr. Williams goes into other and more tedious analyses in this study using smaller groups of counties in the area and finds, for instance, that nine counties spend more than a million dollars for fertilizers; that Wilson county which spends the highest amount for fertilizers per acre for all land in crops also has the highest total value of crops ($12.12 is spent for fertilizers and $81.18 returned in crop value); two counties which spend the least for fertilizer ($2.96 and $2.99) get the least back in crop value ($32.70 and $28.75); and as to the type of citizenship in these counties, he says that in the past 50 years, 60 per cent of Carolina's great Governors came from the better areas.

So while North Carolina spends money for fertilizers, the money is wisely invested and the returns are commensurate with the amount used.

Demonstrations Convince

Looking into the future, one could perhaps say with certainty that because of the new kind of farming being done in the State, fertilizers will pay still better in the future. Demonstrations seem to confirm this forecast. E. C. Blair, extension agronomist, has charge of the soil fertility demon-

Fertilizer made this difference in cotton in Hertford county, North Carolina.

strations and when he studied the reports of county agents last fall, he found that these field men conducted 284 definite fertilizer demonstrations. Most of these proved the value of good fertilizer mixtures and they proved also that building up the soil fertility by the use of legumes permitted a more economical use of the commercial materials. Then, Mr. Blair found that nearly every county agent was called upon, time after time, to make fertilizer recommendations. It may be, as some say, that the farmer heard the recommendations with care and then took what his dealer happened to have on hand at the time. That may be true, but it would appear reasonable to suppose that many of these farmers asked for the kind of fertilizer recommended and thus probably caused a slight change at least in the dealer's buying habits.

Why do I think this? Because the county agent of one county reports that 75 per cent of the farmers in his county have improved their fertilizer practices with cotton since 1924.

See how Tom Broom, county agent of Union county, and beloved by us all in Tarheelia, brings about these changes:

"The outstanding achievement in soil management this year," says Mr. Broom, "is the elimination of rust in cotton and frenching in corn. This was accomplished through the more liberal use of potash in the fertilizers. Previous tests had shown us that we were not using enough potash, so early in the year, we began a campaign for a more liberal application of the material. For special soil types, we recommend 5 per cent, 7½ per cent, and even as high as 10 per cent of potash in the fertilizer. We had calls from many farmers to visit their farms and advise for their crops on different fields. This we did as far as time permitted. Otherwise, we consulted a soil map, located their farm, determined the soil type, and advised accordingly. We called upon the fertilizer dealers and secured their cooperation in putting into the hands of farmers the quality of fertilizers recommended by us. A large percentage of the farmers did their own mixing and they used 200, 300, and 400 pounds of muriate of potash to the ton, as the soil type demanded."

Those who follow "trends" and "weight" their figures according to mathematical formula, will have a hard time laughing this off for it is

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C. V. Elliott of Columbus, North Carolina, believes in diversified farming. On this piece of land in 1928 he grew oats, corn, and cow-peas. He keeps his land growing something the year round and is sure to include two or three legumes in his rotations.

Glancing Ahead *at the* Markets

By Arthur P. Chew

PROBABLY half a million farmers in the United States grew potatoes for sale in 1928, and most of them lost money on the crop. Potatoes at the farm averaged only 56 cents a bushel on November 15, compared with 95 cents on November 15, 1927, and $1.41 on Nov. 15, 1926. The price slump was caused by overproduction, but what caused the overproduction?

It would be easy to answer in terms of acreage and yield. Our 1928 potato acreage was increased about 10 per cent beyond normal requirements; the yields averaged 121 bushels an acre, against 115 bushels the previous year. It is estimated by the U. S. Department of Agriculture that two-thirds of the excess supply resulted from overplanting, and the remainder from exceptionally favorable weather conditions.

This explanation, however, does not carry the chain of causation far enough back. It does not suffice to show that our farmers lost money on potatoes last year chiefly because they planted too many. It is equally necessary to explain why they made this mistake, for acreage is the controllable factor in farm production and its rational control is the indispensable condition of profitable farming. What applies to potatoes in this regard applies to practically all farm crops. Overproduction, in so far as it results from wrong planning, is destined to remain with us until we understand why farmers misjudge the consumer's requirements.

The Department of Agriculture offers a simple if none the less startling explanation. It attributes the over-expansion of acreage and the overproduction of livestock to the tendency of farmers to plan their acreage and their livestock breeding on the basis of *past* instead of *future* prices. This doctrine obviously involves the assumption that future prices can be approximately known, and the purpose of this article is to examine some of the evidence in favor of that assumption. Farmers are inclined to scout the possibility of price-forecasting chiefly on the ground that unpredictable speculative influences and also the exactions of middlemen have much to do with prices. But this view is not supported by statistical research.

Skepticism Is Natural

Another view widely held among the farmers, the fallacy of which will appear in a moment, is that government economists and statisticians who could forecast prices would use their knowledge to enrich themselves, rather than to help farmers plan their work. The error here is there is something esoteric about price-forecasting, which must afford a great advantage to the initiated insiders. As a matter of fact, the process far from being based on secret information necessitates the world-wide collection and dissemination of market news. It is not magic, voodoo, or any sort of hocus-pocus whatever, but science.

Skepticism about price-forecasting is natural and indeed praiseworthy, for the technic is still in an early stage. Excessive faith in market predictions, at least for the present, might do harm. But ignorant skepticism is as bad as ignorant credulity. Skeptics who investigate the matter will find that the Department of Agriculture, in its annual outlook reports and in other official publications, has anticipated important price movements for several years with only a small percentage of error. This function, though publicly done and widely known, has been vigorously criticised, and some of its practitioners have accordingly advised cloaking it under some fancy name. It has been suggested, for example, that the government economists should talk about predicting supply-and-demand prospects, rather than about price forecasting. One suggestion is that the phrase "statistical inference" or "inductive inference" should be substituted for the plainer term "forecasting." Dr. O. C. Stine, head of the Department's statistical and historical research division, has no use for such suggestions. Academic highbrow labels for common things, he says, may avert criticism but will not promote the popular understanding necessary to further progress in the work.

Better to Look Forward

It has been demonstrated by the Department's outlook reports that estimates of future prices are a safer guide than knowledge of past prices in the adjustment of farm enterprises. The 1928 potato situation is a typical case. Had the farmers looked forward instead of backward in planning their potato acreage, they could have averted a disaster. Under average weather conditions, 3,500,000 acres planted to potatoes will produce about 400,000,000 bushels, or as large a quantity as can usually be marketed. The growers planted 3,825,000 acres. They did so because three successive years of high potato prices had made them over-optimistic. The Department of Agriculture issued warnings in January and March and again in May against the over-expansion of the potato acreage, but these warnings had no effect.

Agricultural price forecasters do not pretend to measure supply and demand with absolute accuracy. They allow for a margin of error, both in the statistical record and in their interpretation of the statistical material. Price forecasting is based essentially on the assumption that the various price-making influences will act in the future about as they have done in the past. This may not always work out. It is therefore well not to be too cocksure in making predictions. It is certainly possible, nevertheless, to anticipate price trends in the main, and in the case of some products to be fairly specific. Economics is thus beginning to rank with the other sciences in power to make predictions based on quantitative measurements.

Its progress in this direction is based of course on the growth of statistical data. Anyone knowing the conditions under which such growth takes place will immediately recognize the absurdity of the assertion that if government economists had the power to predict prices they would use it for their personal advantage rather than for the benefit of agriculture. That idea comes from a mistake akin to the one people made in talking about the weather man. There is of course no individual weather man. Weather forecasting is a cooperative job, requiring the services of a virtually world-wide meteorological reporting system. World data must be assembled before a scientific 36-hour forecast can be issued in a single locality.

It is the same with price forecasts. Four hundred thousand voluntary crop reporters in the United States and a host of government officials at home and abroad aid in gathering the data necessary in forecasting market trends. The information obtained is never kept secret, but is published immediately. Even the final interpretation of the information after it has been condensed requires the co-operation of a large corps of economists and statisticians.

In the preparation of the annual outlook reports, committees representing not only the Department of Agriculture but state agencies and colleges of agriculture are appointed to deal with each crop. The whole outlook report is finally gone over at general meetings attended by all those who have had a hand in the earlier stages of the work. In short it is impossible for an isolated individual to make a worth-while agricultural price forecast. The task is really an unusual example of the effective subdivision of labor, with the final result representing the consensus of many experts.

The hobby of this little lady of the circus is poultry. She probably doesn't have to worry much about marketing chickens like these.

Economics, it is sometimes declared, is not a science, but merely a collection of disputed opinions. Modern statistical methods are removing this alleged inferiority. The economist can not control his material as the chemist or physicist does, since he must draw it from the living, changing world. He therefore still is obliged to mix hypothesis with his facts in a rather large proportion, in which respect his fault, if it is a fault, differs only in degree from that of scientific workers in other fields. But the relative position of theories and facts in economics is changing. Statistical research is accumulating a vast body of measured, established facts, from which the economist may draw inductive generalizations. In this field it has ceased to be arguable that one opinion is as good as another.

The familiar law of supply and demand has been the subject of the most extensive effort to supplant hypothesis with verified knowledge. No longer is the economist content to say that prices will go up or down under certain conditions; he undertakes to say in many cases how much they will go up or down. This is made possible by accumulation of data showing how the commodity markets have reacted to supply-and-demand changes in the past. Separate measurement of the different factors in the supply-and-demand relationship has been carried to a surprising degree of refinement. It may never be possible to develop a method of forecasting that will leave no room whatever for differences of opinion, and consequently, for speculation as to the probable course of prices. But knowledge can supplant uncertainty.

Lay critics of the Department's price analysis work sometimes aver

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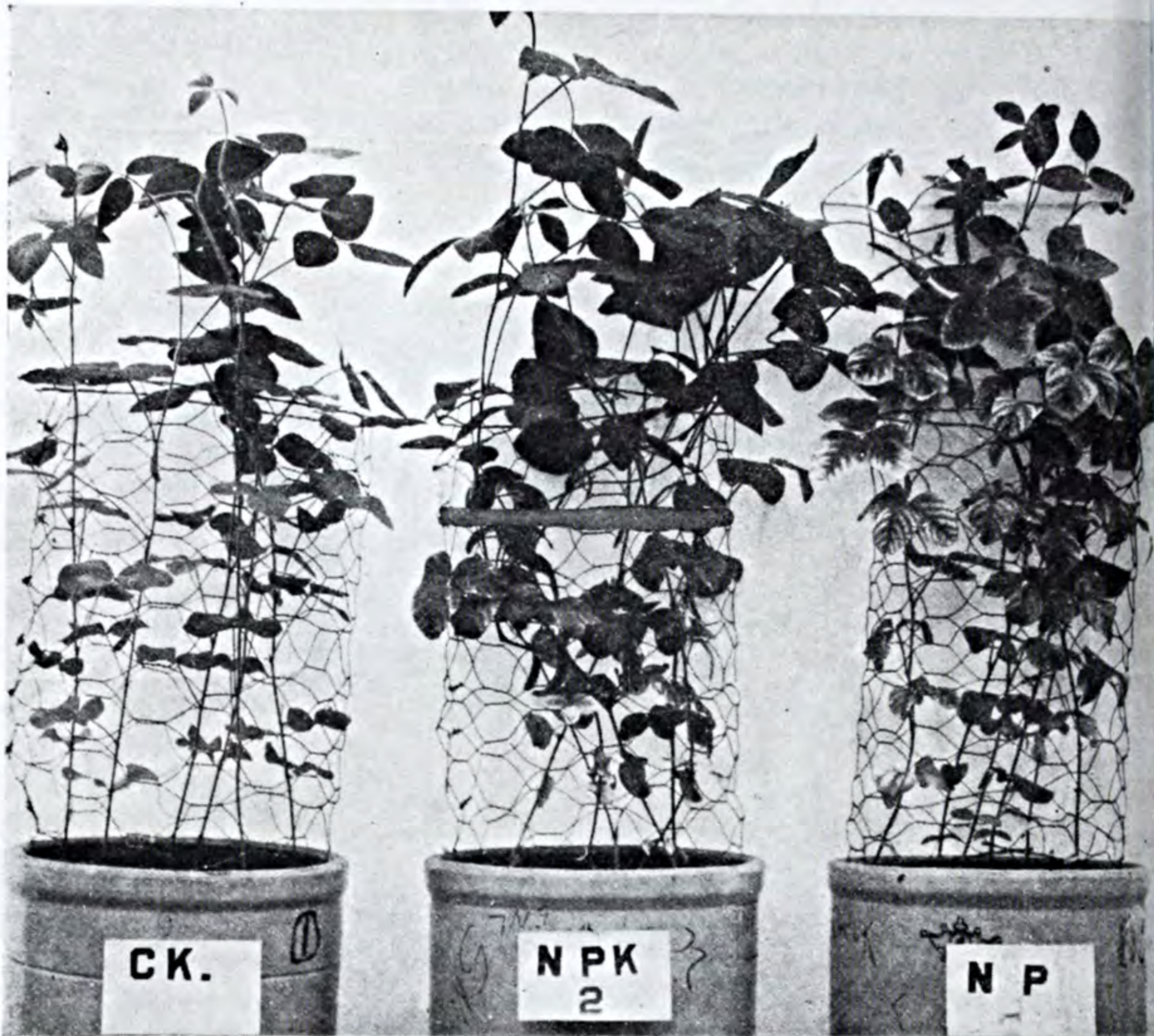

The untreated soils (ck) produced slender plants with small, slightly chlorotic leaves. The nitrogen and phosphorus in combination (NP) produced greater growth and larger leaves but the leaves were badly affected by chlorosis. A complete fertilizer (NPK) applied after chlorosis appeared prevented its further development. The line drawn on the photograph shows the development before and after application of fertilizers. Note the lighter areas of the leaves are chlorotic symptoms.

CHLOROSIS

By G. L. Schuster

Agronomist, University of Delaware

OCCASIONALLY farm crops turn yellow and ripen early with a resulting low yield of inferior quality. This condition is not anything new. Agricultural research workers have been concerned about it for some time. In order to distinguish between this early pseudo-ripening period and the normal ripening period the term chlorosis has been applied to the first condition.

The general symptoms of chlorotic plants are as follows:—A general lightening of the green color, turning to yellow, in the leaf areas farthest from the major veins, and becoming more extensive as the condition advances. As it advances, the veins remain green, thus giving a characteris-

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Plants fertilized with nitrogen and phosphorus made greater growth than the untreated plants, but were chlorotic.

Plants fertilized with nitrogen, phosphorus, and potash showed greater growth than any of the others, and no chlorosis.

Beardless Barleys

By E. N. Bressman

Plant Breeder, Oregon Agricultural College

THERE are at least six new smooth-bearded barleys. One of the newest is known as Comfort, and was originated by the Nebraska Experiment Station, at Lincoln. The Nebraska Experiment Station has found this new barley to be high in yield, as well as free from the objectionable barb.

The Wisconsin Experiment Station has a smooth-bearded barley, known as White Barbless. It is not only high yielding and barbless, but also resistant to the disease known as stripe.

The Minnesota Station has developed a new barbless variety, known as Velvet. This variety is now being grown rather widely in both Minnesota and Iowa, where it has given good results. The Minnesota Station has another barley with smooth awns known as Glabron. In addition to smooth awns and high yields, it has a stiff straw.

The Michigan Station will distribute in 1929 a new smooth awned, two-rowed barley known as Spartan. Another smooth-bearded barley which has been grown to a very limited extent in some of the western states is known as Flynn.

The trend in barley breeding work is to develop new varieties that have smooth beards. There have been some attempts to develop barleys with no beards, or at most a small projection at the top of the kernel known as a hood. Most of these hooded developments, however, were either low in yield or shattered very badly.

The relation of the barley beard to the yielding ability of the variety is of interest. Work done at the Minnesota Station nearly a decade ago showed that there was some connection between the beard of the barley and its yield, particularly under humid conditions. Additional work has shown that there is a relation between the beard and the giving off of water from the kernel. Still other work has shown that there is some relation between the beard and the ash content of the kernel.

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Beardless barley does well in the West, but not under humid conditions.

More *and* Better Melons

By E. R. Lancashire

Extension Specialist, Ohio College of Agriculture

ONE rainy day last spring a group of melon growers met in a barn near Wilmington, Ohio. County Agent Hall had called them together to see what could be done about putting up a melon of better quality.

The extension service of Ohio State University was called on to explain why melons lost that fine flavor which makes them so tasty. These men knew that one good first-class melon sold several more. They knew, too, that melon troubles were multiplying in Clinton county.

The specialist talked their problems over with them, and one man in particular had the courage to follow up the system outlined. He, as a neighbor put it, is spending his winter in Florida.

So successful was this man in capturing the elusive quality factor that people would collect about his delivery truck whenever it stopped in a town or city within the radius of his melon field. This may have been partially due to a large sign which he had placed on the truck. A well-worded sign will attract a buyer, but only quality in the melon will cause an epidemic of repeat orders. To corner the market, one need only produce a better quality melon than can be secured elsewhere.

This particular grower had 14 acres of melons last year. It was a pleasure to look at the field. His methods were those which will work for nearly any farmer who wants to grow melons. He learned how to keep the vines healthy, at least enough vines remained that way to secure the desired results.

More than good seed and cultural care are included in his system. Two items of real merit were added to his usual thorough program. These were insect and disease control methods.

The cucumber beetle is the chief insect attacking the melon here in Ohio. The melon vines were kept well covered with a calcium arsenate-gypsum dust from the time the vines first appeared until blight was noticed on the leaves.

This dust was applied in very liberal amounts to the ground about the young plants as well as to the plants. The early protection of foliage with this dust was especially necessary because the cucumber beetle is the winter home of the bacterial wilt disease which attacks muskmelons. This disease is often the cause of the vines dying about the time the melons are nearing maturity. Control of the cucumber beetle results usually in a control of the bacterial wilt.

Home-made Dust

This gypsum-arsenate dust is made by mixing calcium arsenate and gypsum together at the rate of one part of the arsenate to twenty parts of the gypsum. Hydrated lime is not a substitute for gypsum chiefly because there is less danger of foliage injury with the use of gypsum.

This dust is mixed by placing the two ingredients in a lard can or in a churn and rolling it back and forth for from five to ten minutes. The well-mixed dust applied with a dust gun or by shaking the dust over the vines through a gunny-sack at the right time and in sufficient amount will usually solve the cucumber beetle problem.

Leaf blights and other foliage troubles are often controlled by the use of a copper lime dust. As soon as the first signs of such trouble appear, the use of the gypsum arsenate dust is discontinued, and a new dust is mixed and used.

The new dust is a mixture of 20 parts of monohydrated copper sulfate and 80 parts of a hydrated lime. In case 100 pounds were to be mixed, one would use 20 pounds of the copper dust to 80 pounds of the lime. If the beetles were still active, the grower could replace five pounds of the lime with five pounds of the calcium arsenate, and the resulting dust would be a control for both beetles and blights. Those who are not sure when the disease factor is likely to appear can begin using the copper-lime-arsenate dust before the symptoms are seen and thus prevent foliage injury.

The copper lime dust is applied to the under side of the leaves, because it is there that these diseases enter the plant. Apply the copper-lime-arsenate dust when there is no wind blowing and while the vines are damp with dew or just after a rain.

A thin layer of this dust will usually give control if applied every five days and after every rain from the first appearance of blight until after the crop is almost finished. From 20 to 40 pounds of the dust are needed for each application.

There are two or three types of dust guns which the grower can operate by hand. The more expensive ones are either of the bellows or the crank type. Each has its advocates. Some prefer the crank type because it is said to be easier on the back. The bellows type can be operated at will, whereas the crank type usually is cranking out a continuous stream of dust. Then there are power and traction-row crop dusters for those who do not choose to use the hand machine.

The remedy sounds like work. The sound is not deceptive. Real work and expense are involved in the production of a super-quality melon.

Dust alone will hardly turn the trick. Good seed and well-grown plants, properly fertilized and otherwise cared for are always first requirements. Dust, intelligently applied, is but a kind of insurance which the grower takes out to protect his investment in seed, fertilizer, labor, and other charges such as rent for fields and all other items which make melons so expensive to produce.

Fertilizers Next in Importance

The grower of such an intensive crop as muskmelons can protect the vines against insect and disease injury if he is equipped and willing to do the amount of work required. Bringing these vines to the blooming stage at just the right rate and type of growth is another matter. The proper fertilization of the melon field is the next item in importance to that of keeping the foliage healthy until the crop is matured.

A quick start is desirable for the germinating melon seedlings. This speeding up of the growth rate is best brought about in such a way that there will be little if any available free nitrogen remaining at blooming time.

A quick start followed by a well-balanced vine growth secured through the liberal use of a high-analysis, balanced fertilizer will usually prove most profitable. Where fertilizer is placed in the row, it is suggested that 500 pounds per acre of a 4-12-4 be used. The more favored way, however, is to use from 1,000 to 1,500 pounds of a 4-12-4 applied broadcast just before the seeds are planted. In

Proper insect and disease control, together with the right fertilization, will insure the quality of melons.

addition to this the use of 200 pounds of ammonium sulfate or nitrate of soda per acre is favored. This additional fertilizer is best worked into the soil around the hills about three weeks after the seed are planted. The theory is that the nitrogen in the 4-12-4 will carry the seedlings very well for the first three weeks of their growth. The top-dressing of available nitrogen can be given as soon as the grower thinks the original supply is exhausted, about three weeks usually.

Thirty to fifty pounds of available nitrogen expressed in terms of nitrate of soda means from 200 to 330 pounds of this chemical. Where sulfate of ammonia is used, the equivalent of the same amount of available nitrogen is 150 to 250 pounds. From thirty to fifty pounds per acre of available nitrogen is often advised for top-dressing melon plantings. A fine opportunity awaits the melon grower who will try out the use of nitrogen in connection with the melon crop in the way described.

No one can tell a grower just exactly what fertilizer or how much of it should be used for any particular crop or on any particular soil. Experimental work on the part of the grower is needed. The information presented here is given in the way of a basic fertilizer treatment, a sort of starting point for the grower who is desirous of trying out some experimental work with this particular crop.

For any soil containing an abundance of organic matter only commercial fertilizer is needed. Too much nitrogen will produce a rank vine and usually a poor set of under-developed melons. To guard against this condition the grower can use enough mineral elements to balance the nitrogen. Superphosphate and potash are needed in liberal amounts. From 8 to 12 per

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Worth While Fertilizers

By Lee Van Derlinden

WORTH while crops in regions even of moderate rainfall need fertilizers. No matter how good the crop grown, it would have been better if the right combination of plant food had been applied.

I can see the county agents in Iowa, Wisconsin, and in other states all over the United States smile at this statement. What is a worth while crop? If it is wheat, it should be the maximum number of bushels that can be produced on the acre. It should weigh over 60 lbs. per bushel, and the kernels should be plump. There is no particular reason why our farmers should be content with less than 30 bushels, and the figure really should be larger. Yields of 50 bushels per acre in Indiana are not exactly common, yet it frequently happens that a Hoosier farmer gets such a yield.

Farmers have six per cent interest to pay on their investment, the same as the business man. Then why not emulate the business man and try to get the very most out of the investment. The farmer doesn't, partly because he has come to regard wheat sown in the Fall not as a crop itself but as a necessary evil—a nurse crop for clover or grass crops. He has his mind on the clover, not on the wheat crop; he thinks the wheat crop is a gamble anyway. Isn't the clover crop a gamble also? But clover must be grown, and so he throws in a wheat crop to help the clover along; it is clover insurance.

The writer has discussed this matter with thousands of farmers in the Midwest during the past six years, and in most cases farmers say they would not grow wheat if it were not for the purpose of "catching" the grass crops.

Wheat is an important crop in the Midwest. It should receive individual attention, the same as any other crop does. It needs a great deal more plant food than it gets. Suppose the farmer uses 200 lbs. of a 2-12-6 per acre. This is 4 lbs. nitrogen, 24 lbs. phosphate, and 12 lbs. potash—40 lbs. in all on a whole acre.

Wheat is sown in the Fall following corn or some other crop, seldom on land that has not produced a crop the same year. It needs more than 40 lbs. of plant food. If it needs nitrogen at all, it needs more than 4 lbs., and the same is true of potash and phosphate. The wheat crop must divide the fertilizer with a new growing clover crop and some of the plant food is bound to leach away.

Enough for Results

How many farmers in the wheat growing states use 200 lbs. of a 2-12-6 per acre? The average application is more like 125 lbs. If 125 lbs. per acre are used this means that but 2½ lbs. nitrogen, 15 lbs. phosphate, and 7½ lbs. potash are used, a total of 25 lbs. of plant food per acre supplied for the wheat and clover crops. This is not enough to insure worth while results. It would be better if it were a 6-32-12.

Potash and phosphate are comparatively cheap elements of plant food. Nitrogen must be used in many cases, but it can be grown on the farm much more reasonably than it can be

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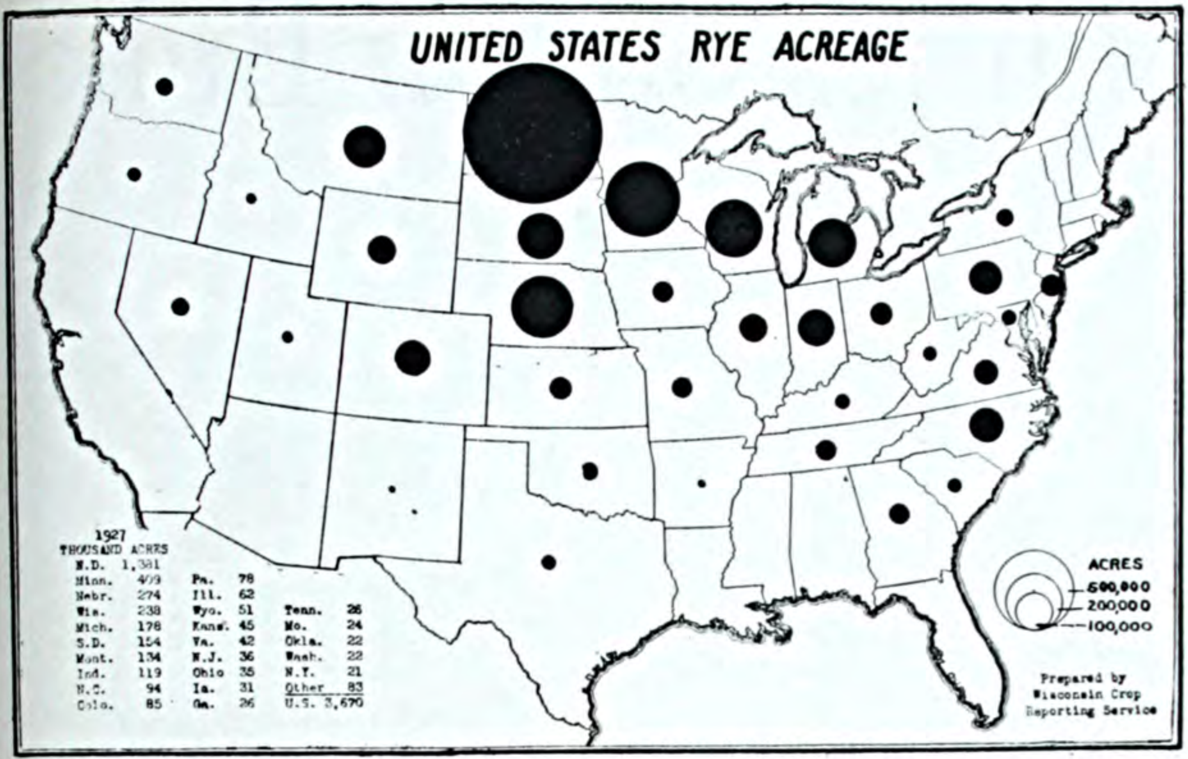

RYE

Sixth of our crop series

By Walter H. Ebling

Agricultural Statistician, Wisconsin

AS a small boy, I had to assist in harvesting grain on my father's dairy farm. Because of its stiff straw and great size, the rye crop was always objectionable. The bundles were often bigger than I was, and the handling of them was trying indeed.

The bulk of the world's rye is produced and consumed in Europe, Russia, Poland, Germany, and France being the leading growers. The United States grows only about 3 per cent of the world's acreage. In Europe it is mostly a bread grain, but in the United States it is grown largely as a feed crop. Even in Europe, however, the use of rye as a bread grain is reported to be declining gradually since the war as more wheat is used in its place. Nearly all of the rye produced is of the fall-sown type.

RYE

WORLD PRODUCTION
45,500,000-ACRES

In the United States the acreage, though widespread, is quite largely confined to the northern states, North Dakota leading both in acreage and production. In recent years there has been a westward shift of the rye acreage and since yields per acre tend to be higher in the eastern and corn-belt

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Limestone *in* Bulk

By J. Robert Hall

County Agent, Linneus, Linn County, Missouri

IF you want to supply a whole county with lime, get your railroads, bankers, farmers' cooperatives, clubs, and exchanges, commercial clubs, and Farm Bureau to help you. This is the way to do a big job well. We have tried it here in Linn county where every acre of upland needs lime, and it has worked to the advantage and profit of farmer and all.

It pays well for one farmer to cooperate with another. It pays for many farmers to cooperate, and it pays still better for these to cooperate with all business interests.

At one time we had a grave fertilizer problem. It has been solved by our clubs, exchanges, and cooperatives buying by the car. Most of our soils need some fertilizer. They all need some lime—that is to grow legumes successfully—about two tons per acre.

No one wants to lime his whole farm in a couple of days, so no one could lime at all unless he went in with his neighbors, and they were not always ready to unload a car the day it came. Damage and loss of valuable time in a busy season often resulted from liming under this antiquated system. For three years it has been different here.

At one of Missouri's famous Clover and Prosperity meetings, when all Linn county turned out to discuss our soil fertility problems, this plan resulted. It grew out of a universal need for legumes. Necessity was, is, and always will be the brooder of success. It was legumes or no soil. It was lime or no legumes. So all needed agencies agreed to cooperate to put the big job of supplying lime by the pound or by the car at the minimum cost to every station in the county. Now a farmer taking hogs or wheat to town can take back a load of lime, he can haul it in his leisure, or spread that alfalfa field white whenever he wants to sow.

Nearly everyone can afford a little time each year for his sour soil's sake, and even if he needs a large amount,

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This is one of the poorer bins, which nevertheless is very practical.

County Agricultural Agent Jesse Wood of Martin county, Indiana, with his eight gold medal winners in the Indiana Five-Acre Corn Contest. There were eleven contestants entered in this county, all of whom won medals and eight of whom made the 100 bushel corn club. From left to right they are Jesse Wood, County Agent; C. C. Vanhoy, Loogootee, 101.8 bu.; John F. Larkin, Loogootee, 102.45 bu.; Harry Tedrow, Shoals, 113.28 bu.; Elvis Jones, Shoals, 117.92 bu.; Walter Jones, Shoals, 120.68 bu.; Wilson Chenoweth, Shoals, 101.71 bu.; seated in front D. K. Williams, Huron, 127.10 bu.; and Wm. G. Nikam, Shoals, 107.84 bu.

Winners *of* Gold

By Chester P. Allen

West Lafayette, Indiana

DRIVING through Martin county, Indiana, up one hill and down another, one sees bright prospects for a bumper crop of hoop-poles, blackberries, and rabbits, but little hope for large yields of worth while crops such as corn, on these farms which seem to be standing on edge.

However a check of records turned in by the 845 entrants in the Indiana Five-Acre Corn Club contest, which was conducted under the auspices of the Indiana Corn Growers' Association in cooperation with Purdue University, shows that of the eleven contestants from Martin county eight of them were gold medal winners, meaning they produced more than 100 bushels per acre. Not only did more than 75 per cent of the county entrants win gold medals but these men captured second, fourth, fifth, and seventh places in the battle for highest yield honors. This is the second time during the past three years that Martin county has taken second place and year before last it took first honors.

Donald K. Williams, whose farm is nestled in a little valley cut through the hills by the east fork of White

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Profit *in* Late Cabbage

By A. E. Wilkinson

Vegetable Specialist, Connecticut Agricultural College

MY good friend, Mr. John T. McKnight, of Ellington, Connecticut, has learned to grow approximately 20 tons of Danish bald-head cabbage on an acre. Mr. McKnight is a dairyman in a tobacco-vegetable section. Whether he was contaminated by the vegetable growers more than by the tobacco raisers is unknown, anyway he has been raising late cabbage very successfully.

Having an excellent dairy, he has been fortunate in having stable manures to apply on his land. Approximately 15 tons per acre have been used broadcast. In addition 1,000 pounds of a high-grade fertilizer have been used; the 5-8-7, the common fertilizer in Connecticut, being the one selected.

All of this good farmer's land is in systematic rotation and in a high state of cultivation. Any added fertilizers must force a crop to produce. This, of course, then is one of the principal foundations on which his success in late cabbage raising rests.

Mr. McKnight obtains the best strain of late cabbage that is known, one that has produced elsewhere 20 tons or more per acre and one that he has tested enough to know that it will give him approximately that same yield on his farm.

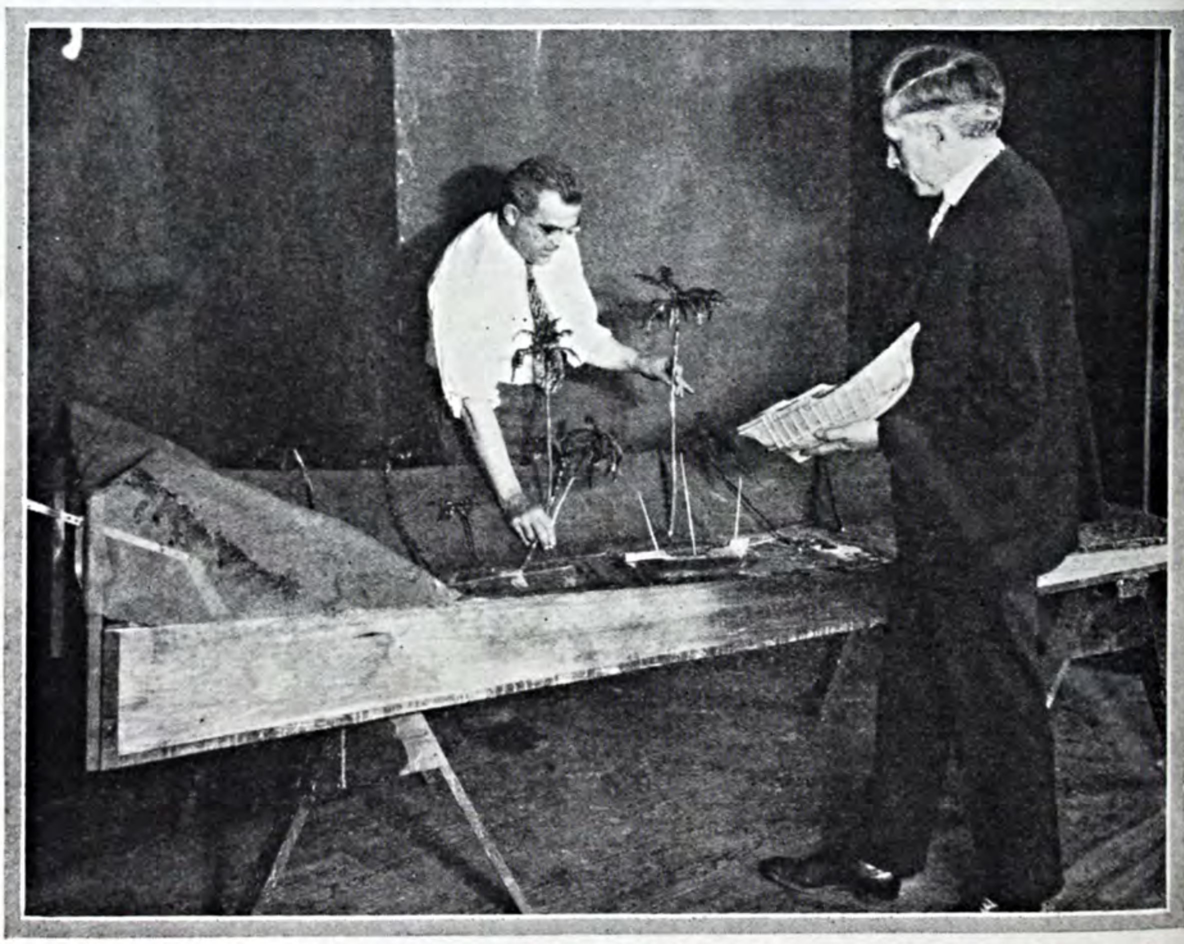
The crop is not an expensive one to raise as the seeds are sown in rows on the side of the specially prepared field. When the seedlings have reached the height of 6 to 7 inches, they are immediately transplanted to their permanent field location by using a horse-drawn transplanter. The coarse transplanter used by tobacco men is used by Mr. McKnight. Setting an acre of cabbages with one of these machines is a matter of about 3 to 3½ hours' work, or a little longer if things do not run smoothly.

(*Turn to page* 50)

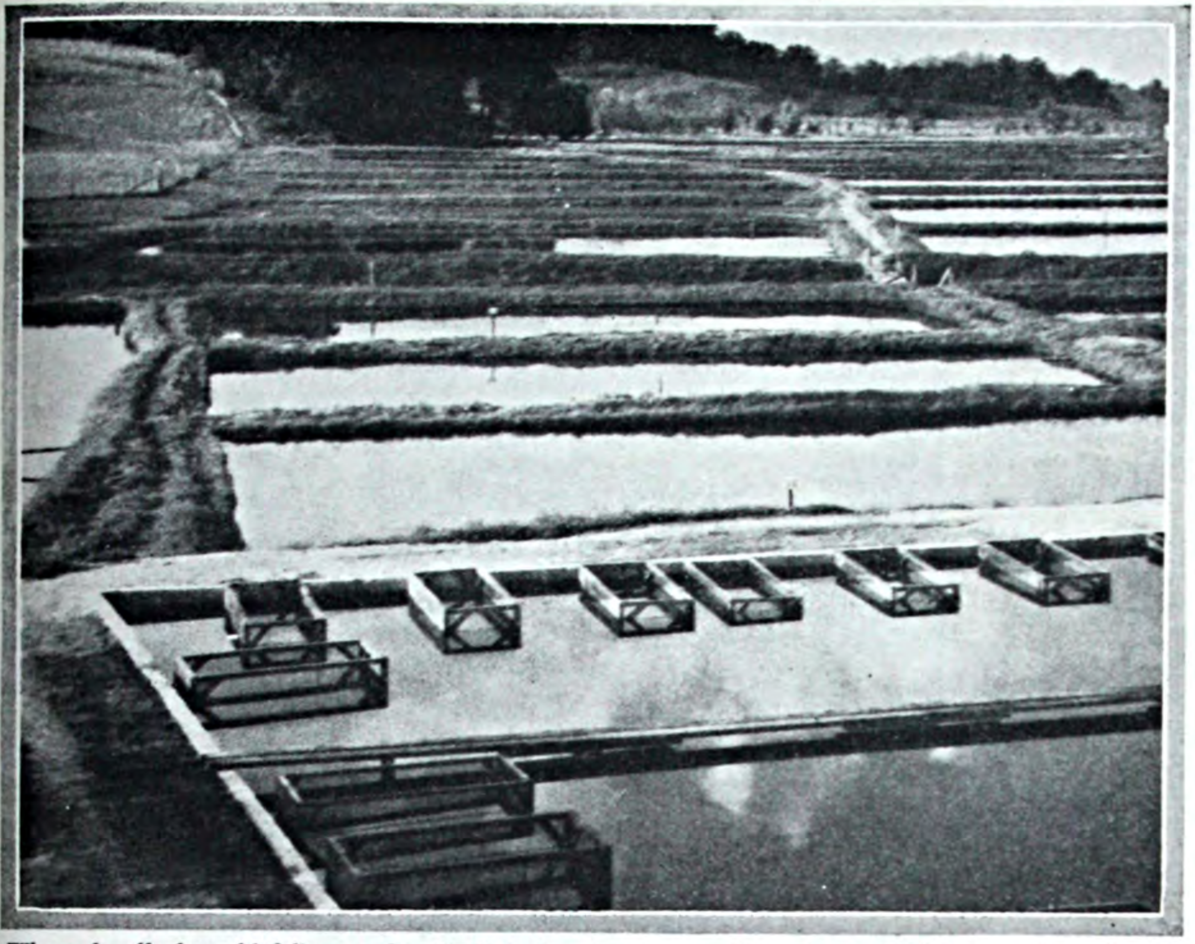
This is the way Mr. McKnight knows that he gets 20 tons per acre.

PICTORIAL

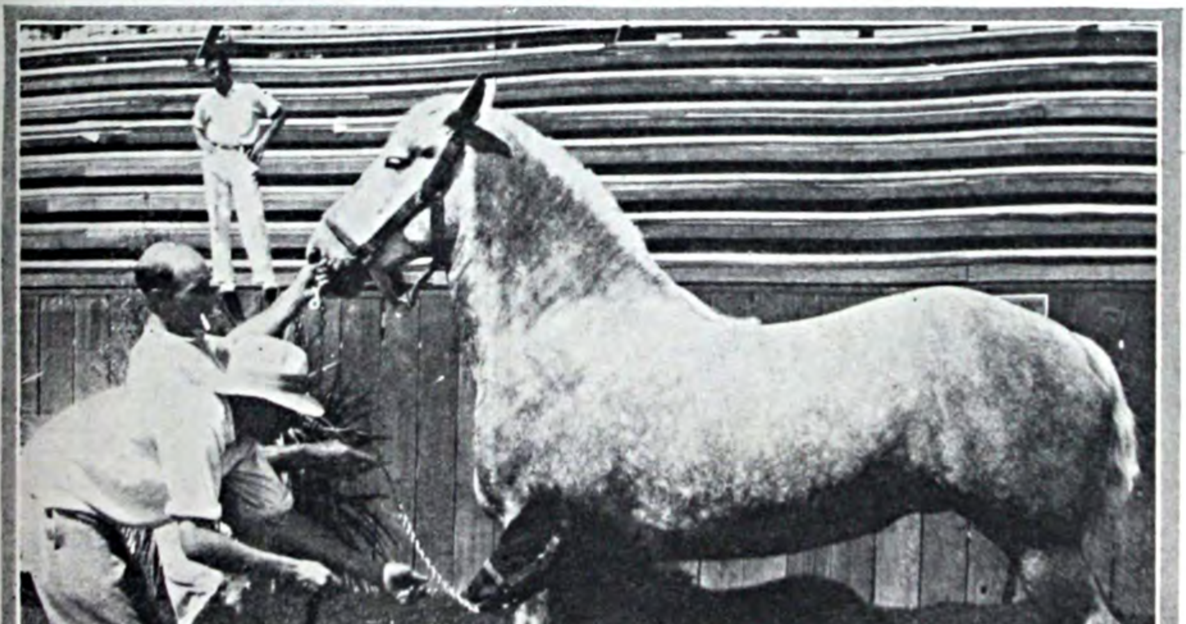
This monument was erected by the Pennsylvania State Horticultural Association in 1920 to the York Imperial apple, first propagated about 1820 in this orchard on Springwood Farms, York, Pennsylvania.



A scene, prepared by the U. S. Department of Agriculture for the Ibero-American Exposition at Seville, Spain, represents the landing of the first livestock introduced into America by early Spanish explorers.

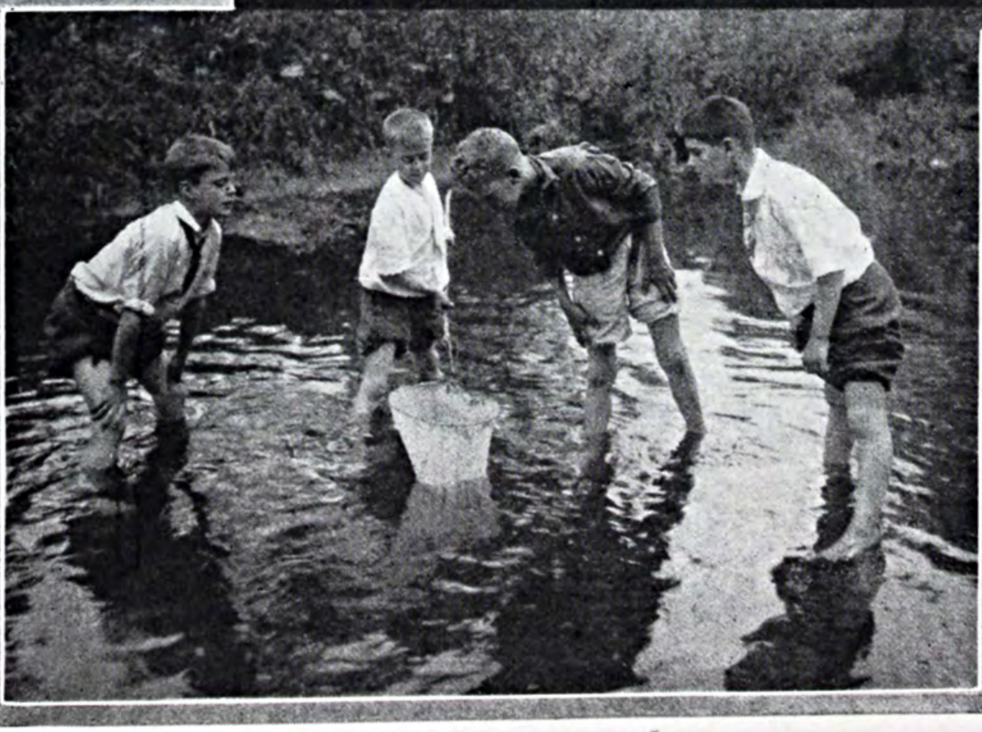


Where do all the gold-fish come from? Here is one answer. Above is a gold-fish farm located near Martinsville, Indiana, which yearly supplies large quantities of these little "ornaments."



The long and the short of a recent California horse show were Queen, weighing 2,060 pounds, and Demi Tasse, weighing 60 pounds. Queen, true to her sex, looks a bit indignant over the comparison.

A winning smile, laughing eyes, and curly hair are good bait for hearts.



The stockholders of the live bait industry hold a meeting on quality.

The Editors Talk

Coordinating Advice

The extension forces of the State Colleges of Agriculture, whose responsibility it is to give information to the farmer, now number several thousand. This extension work has been a phenomenon of rapid growth and development. For instance, there was recently celebrated at Houston, Texas, under the auspices of the Association of Southern Agricultural Workers, the twenty-fifth anniversary of the first appointments of county agricultural agents. There are now about 2,500 such agents in the United States.

Coincident with this remarkable growth of the extension forces, industries serving the farmer have organized advisory forces. It is only natural and to be expected that in work that grows rapidly in two separate fields, there will inevitably arise the need for coordination of advice and information. We are, therefore, very glad to reprint an editorial from the "Fertilizer Review" of April this year, which discusses meetings between industry and the extension forces that have been held for this purpose.

SEEK TO COORDINATE FIELD WORK OF VARIOUS FERTILIZER AGENCIES

The effort to develop a greater degree of cooperation between the various units of the fertilizer industry in demonstrational and experimental endeavors was given added momentum by the recent request by Dr. C. W. Warburton, director of extension work of the U. S. Department of Agriculture, for a joint conference of representatives of State and Federal Extension Services and of the fertilizer industry.

Members of the staff of The National Fertilizer Association had anticipated the situation which prompted Dr. Warburton's request, having arranged for a conference of directors of the agricultural staffs of all of the fertilizer raw materials companies and of the Association, which was held January 10. A second conference was held on March 25. The joint conference with the Extension Service was held on March 26.

In the industry's meeting on March 25, the group decided that cooperation between agricultural workers within the fertilizer industry is highly desirable, that cooperation around individual projects is the most feasible, and that a permanent committee should be organized to insure coordination and continuity and to serve as a clearing house for ideas and suggestions. The recent successful effort between different fertilizer organizations to conduct pasture demonstrations in the Northeastern States was cited as an illustration of what can be done by such cooperation.

In opening the joint conference, Director Warburton pointed out the need for coordination of effort in conducting demonstrations and various kinds of prize contests. These matters were discussed from many angles and the decision was reached that a second joint conference should be held in the near future, when it is hoped that some definite policies may be agreed upon. This second joint conference will be between representatives of the Committee on Extension and Research Organization and Policy of the Association of Land-Grant Colleges and a committee representating the various units of the fertilizer industry.

This is an excellent move in the right direction. It is to be commended. It will be of great benefit not only to the groups concerned, but to agriculture as well. It is to be hoped that definite and practical plans of continuous coordination can be evolved as a result of these initial meetings.

Farm Relief

Farm relief is the basis of much discussion throughout the United States at the present time. Turning from the conflicting arguments of the experts on the good and bad joints of various programs and measures of relief, we are glad to read in the Purdue News Service the following statements of Professor G. P. Walker.

"The value of land is determined largely by what it can be made to return in profits. With prevailing systems of general farming in Indiana, labor, taxes, and interest on the farm investment make up most of the cost of producing each acre of crops. These cost items can be influenced but little by the farm operator and the prices for the things he has to sell are fixed by conditions over which he has no control. These cost items are increased but little when larger yields per acre are produced as harvesting the extra produce is the principal item of increase. Soil treatments that raise crop yields more than their cost are the most effective means of increasing returns and raising the productive value of the land.

"Experiments on a number of important soil types in Indiana show that intelligent liming or fertilization or both raises yields to the point of increasing profits and gives substantial boosts to the productive value of the land."

Here we have a plain, common-sense method for the farmer to help himself. He can hoe his own row and not be dependent upon the whims or ideas of others. These are only good business ideas and as such deserve careful consideration by the farmer who is really progressive and desirous of improving his situation.

When competition in industry becomes keen and profits fall or disappear, the first remedial step is always the same. The industry seeks to lower its production costs. Reducing production cost per unit without sacrificing quality means greater profit. This has been done time and again and nowhere with more outstanding results than in the automobile industry.

Why not let the farmer take a lesson from this and follow suit? The farmer has complained that he cannot make enough money from his land to show a profit. Professor Walker shows that by increasing his yields by the comparatively inexpensive practice of fertilizing and liming, the farmer can increase the productive value of his land enough to make a profit. The fact that many farmers already have solved their difficulties in this way speaks for its practicableness.

It cannot be claimed that the above is a panacea for all supposed or real agricultural ills. However, it is a fundamental factor in efficient agriculture and certainly merits attention.

Procrastination

"He who hesitates is lost." Why hesitate? That is what our county agents and other extension workers should ask a lot of our farmers who are on the verge of being "lost."

It is a human trait to postpone as long as possible the things we dislike to do or which may be unfamiliar to us. The student often will not prepare his lesson until forced to recite, nor will the farmer change from the customs of his father until necessity drives him to it. These are the people who in these days of strenuous competition are on the verge of being "lost." Why do they hesitate? That is the problem which faces many an agricultural extension worker.

In traveling through the older agricultural sections of the South, for instance, we find lands once thought to be inexhaustible in plant productiveness now so poor that crops grown on them are costing more than they will bring. Poor buildings, a dejected people, and all the other outward signs that go with poor tillage are in evidence. On the other hand, we find, often in close proximity, indications of prosperity and thrift on the part of owners of land known to be of much less natural productiveness.

We have in mind large areas of the Coastal Plain soils which twenty-five years ago were thought to have little or no agricultural value because without artificial aid they would produce little. Their owners were forced to use fertilizers from the start. Such lands today are producing better crops, and their owners are showing many more evidences of prosperity, than the average of those living on much richer soils. Many factors may be cited in an explanation of this situation, but it cannot be denied that one big one is procrastination—a hesitation to depart from the practices of our forebears.

There is an old saying that "Construction follows destruction." The truth of this is aptly illustrated by the changes now going on in a large part of the older agricultural regions of the South. It took the ravages of the boll-weevil to force the extension idea, and now this idea is fast showing the farmer how he is losing hundreds of dollars annually by failing to produce his crops as economically as possible by a more general use of fertilizers.

Regardless of what has been accomplished, we still find all over the United States farmers who are just "getting by." These farmers know, for instance, that the use of some fertilizer might double or treble their profits, yet they keep on postponing the start. They are loath to give up farming as their fathers farmed. They put off fertilizing because they say that once started they will be forced to keep it up. It gets to be a habit.

One might think that the buying of fertilizer by the way it smells is entirely a thing of the past after the years of schooling to the contrary. This idea is becoming less wide-spread, yet a recent survey of some 50,000 farmers made by the National Fertilizer Association showed that twenty-six per cent for the country as a whole and forty per cent in the Carolinas and Georgia let the odor influence them in their purchases of fertilizers. This seems almost incredible in the present age of enlightenment, but it takes a long time to break down prejudice.

Most commendable work has been done by our colleges and extension forces toward the education of the farmer to better practices. We see the results everywhere. However, there is still much to be done, especially in defeating procrastination. Anything which will break down the "bad habits" of our farmers is a step forward in our agriculture.

The March of Industry

No one needs to collect a lot of data or figures to prove that industry is exerting a much more powerful influence in our social life than was the case even a few years ago. Material in the press and government publications, the activities of the stock market, the wide circulation of trade and technical journals, the expanding activities of scientists and scientific societies, all indicate a growing power of industry.

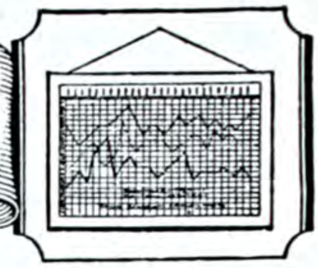
Our outlook is changing. There is a new enthusiasm and a new vigor inspiring industrial and commercial effort. Industry is changing from something merely incidental in our daily life to something fundamental. Practically every large industry is basing its work more and more on scientific research. Various books have been written to prove this in detail. There are now more than a thousand laboratories in the United States whose sole work is to conduct research work. This is drawing the scientific man from the seclusion of his laboratory to the pressing affairs of industry.

The faster the pace, the more serious the problems become. In the march of industry today, while the dominant note is prosperity, there is much that is complex and obscure. There is much activity that needs to be coordinated to a more definite purpose.

The industries that more specifically serve agriculture have their full share of problems and complexities. Therefore, the question of how the agricultural industries are availing themselves of science and the help of technical men is a matter of importance, not only to industry itself but to organized practical and scientific agriculture as well. Activity in such movements alone is not sufficient. A viewpoint and background against which the ever-increasing activities of industry in the field of utilization can be clearly seen is needed.

For this reason we believe that the short series of articles, *Industry Presses Onward,* starting in this issue of our magazine is of timely interest. It is to supply something of this background against which the problems can be seen that this series of articles is intended.

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

OBSTINATE APPLE TREES

Strong but stubborn apple trees—those that are apparently healthy yet persistently fail to bear good crops—should be made to do so by heroic methods, says W. H. Alderman, horticulturist of the University of Minnesota. The method he recommends consists in a light girdling of the trunk about the first of June. If only the thin bark is cut and the girdle is only a half inch wide, the tree will not be harmed and fruit buds will be forced out. The chances are the following year will bring a crop of apples. Another way is to bind the trunk tightly in early June with a fine wire. But, the horticulturist warns, be sure to take off the wire not later than August. Unproductive trees that are weak, he says, should not be given this treatment. They may need heavy pruning and fertilization. Or it may be that the tree lacks pollination and that the problem could be solved by planting near by some trees of other varieties.

TAKING STATIC FROM BELTS

Static electricity that accumulates on the moving belts of machines on the farm and in the factory has been responsible for many destructive fires and sometimes for the loss of life. The Department of Agriculture has developed dressings for belts which causes the electricity to be carried off and grounded. For rubber belts: Lamp black, which is finely divided carbon, and spar varnish the thinner of which consists of a mixture of mineral spirits and carbon tetrachloride. This dressing will not flame and cause a fire risk. For leather belts: A dressing made of liquid fish glue, glycerine, sulphonated castor oil, water, lamp black, and ammonium hydroxide. Details may be had from the Bureau of Chemistry and Soils.

CO-OPS NOW BUY A LOT

Farmers' cooperatives are usually looked upon as selling organizations, but studies by the U. S. Department of Agriculture show that their buying activities have grown to be of great importance and variety. Reports obtained in 1925 from more than 10,000 active farmers' cooperative associations showed that nearly half of them made purchases for their members. In 1927 farm cooperative associations bought feed, seed, fertilizer, containers, and other supplies to a total value of more than \$300,000. Two farmers' business organizations that year each handled a cooperative purchasing business of more than \$10,000,000 and another handled about \$7,800,000 in cooperative purchases. Half a dozen associations each did cooperative purchasing in excess of a million dollars. A few years ago 62 per cent of the associations that reported bought feeds, 47 per cent bought fuel, 30 per cent bought containers, 20 per cent bought seed, 19 per cent bought fertilizers, 15 per cent bought building materials, 13 per cent bought fencing, 11 per cent bought implements and machinery, 7 per cent bought hardware, and 30 per cent of the associations bought miscellaneous commodities. A recent development has been the formation of cooperative associations for the buying of gasoline, kerosene, lubricating oil, and similar products. Forty of them in 1927 made an average saving of 10.3 per cent.

BIG MEAT LOSS

Even though the meat packer owns the animals at the time they are condemned by the Federal inspectors, he refuses to be the loser. He watches disease conditions in various parts of the country and when he locates a region of heavy disease infestation he may quit buying animals produced there. On the other hand, he now pays a premium for hogs coming from counties that the Department of Agriculture has pronounced "modified accredited areas," or, in other words, practically free of tuberculosis. The condemnation of hog carcasses alone by Federal inspectors in the packing plants of the country removes from the food trade enough meat to supply a city the size of Cincinnati, Ohio. A marketing specialist at the Ohio Agricultural Experiment Station uses this fact to call the attention of Ohio farmers to what they might save for themselves. Other States may use other cities to make the comparison and show how big the loss is and how great the gain might be.

ANOTHER CROP INSECT

When the farmer takes over a weed and makes a profitable crop of it he can feel pretty sure that before long some pest is going to find out the plant is no longer a weed and will set to work making a living off the new crop. This has happened to the sweet clover crop in North Dakota. At a recent meeting of the International Great Plains Crop Pest Committee it was reported that the bertha armyworm is becoming of economic importance in the prairie provinces of Canada and that it has become a serious pest of sweet clover, flax, cabbage, corn, beans, and other plants. Fields of sweet clover and other crops in northern North Dakota have already suffered severe damage. The insect feeds on the leaves and cuts off seed pods. The method of control so far recommended is fall plowing.

FOR BETTER CONCRETE

The proportion of water to cement is more important in securing strength than is the proportion of gravel to cement, it has been shown recently by tests made by experiment stations and others. It has long been thought that the most important factor in the strength of concrete was the proportion of gravel to cement.

Here is the new rule as given out by engineer D. A. Albrecht of the University of Illinois: As long as the mixture is plastic and workable, the strength of the resulting concrete will depend solely upon the ratio of the volume of the mixing water to the volume of cement. The first thing is to determine the strength of the concrete necessary for the use to which it is to be put. To get a mixture that will meet the requirements of ease of placing and proper consistency, the amounts of sand and gravel are varied in a test mixture until this consistency is secured. With moist sand and gravel, 6 gallons of water should be used with each sack of cement for foundation walls which need not be water-tight and for retaining walls, engine bases, and for mass concrete. Five gallons of water to a sack of cement should be used for water-tight walls or pits, dams, silos, or dipping vats, and 4 1-4 gallons of water to a sack for water-storage tanks, sidewalks, driveways, steps, and porch or basement floors. For fence posts, flower boxes, and work of thin sections, use 3 3-4 gallons to a sack.

Foreign and International Agriculture

Turkey Talk

Fred F. McKenzie

Missouri College of Agriculture

TO be transplanted suddenly from the corn belt of the United States to the rocky, barren, burnt hillsides of Western Asia Minor is a transformation almost as shocking as that which overcomes one who steps on a banana peeling. But with the October rains the long five-month drought period terminates, and Smyrna Vilayet (or province) takes on new life. The grass-green that all summer was pent up along the creek bottoms, now spreads over the whole countryside. Of course the vineyards, the fields of tobacco stalks, and the olive and fig groves provide their different shades of green, but apart from them there is a marked lack of vegetation throughout the summer.

Plowing begins as soon as sufficient rain has fallen to make it possible. The steel plow drawn by oxen is used by many. Not infrequently, however, one sees the old-type wooden plow that may or may not have an iron point.

A Smyrna Milk Pedler.

Horse beans, oats, barley, and wheat are the crops sown in the fall. Besides the plow the Turkish farmer depends a lot on one other implement, namely, a type of harrow which consists of a plank in which are driven wooden pegs, two or three inches of each peg being exposed. This plank is dragged over the fields, the small seeds broadcast, and the beans dropped one by one in the shallow drills made by this plank harrow. Then the whole field is again dragged. Later in the winter the tobacco ground is thoroughly prepared.

Tobacco, fruits, and vegetables are produced in quantities in the country, and cotton, tobacco, vegetable oils, dyestuffs, wool, raw skins, and metals are some of the leading commodities exported.

As for the livestock, the Texas Longhorns would assuredly grade good to choice as compared to what goes on the hooks in Smyrna. Beef is sold in the shops at about 12½ cents a pound, whether it be neck or loin. Custom prescribes that all meat must be consumed within two days after killing. Certainly it must not be marketed after this limit.

Many of the cattle are kept for work purposes, but some farmers keep a few cows for milk. A farmer milks each cow about five months in the year, and sells to a milk collector, who calls with his cans on a donkey. The milk is carried to the city and sold from house to house. The cow barns are poorly lighted, many have stone floors, and all lack good ventilation.

A common sight in Odemish, a real old Turkish city some 65 miles southeast of Smyrna, is that of the cows being turned out on the streets about eight o'clock in the morning, to be driven by five or six men and boys to the outlying grazing areas for the day and to be brought back in the late afternoon.

Sheep are numerous, the mutton type predominating. Goats are everywhere. A fair proportion, possibly a third, of the milk supply of the city of Smyrna is from sheep. It was interesting to the writer to learn that it is customary for the shepherds to herd their flocks in their own fields during the day, and at night to shift to the other fellow's farm.

Horses are scare on the farms but are numerous in the cities. Not many mules are to be seen in the Province. Donkeys are thick and always loaded with bundles their own size or larger. Camels travel the roads continuously, usually in caravans of five with a

(*Turn to page 51*)

This Turkish farmer with his slow water buffalo and cumbersome cart has come to the city of Odemish to do some trading.

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 Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. 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 1928 fertilizer control reports for a number of states were received this month. These reports listed below are more than mere compilations of analyses. They contain explanations of fertilizer terms and laws, describe materials, and discuss trends in the use of fertilizers as shown by the goods on the market. An interesting table in the Vermont report shows that the average guaranteed analysis of mixed fertilizers in that state in 1919 was 2.5-9.5-.5, while in 1928, it was 3.33-8.75-6.17. A table on the Wisconsin report shows the following analysis to be the most popular—2-12-6, 2-12-2, 5-8-7, 3-10-10, 4-8-6, 3-12-12, 0-12-12, 6-12-9, 0-14-14.

"Commercial Fertilizers Agricultural Minerals," Dept. of Agr., Sacramento, Cal., Spec. Pub. 91, Warren G. Marshall.

"Commercial Fertilizers, 1928," Agr. Exp. Sta., Orono, Me., Official Inspections 129, Oct., 1928, James M. Bartlett.

"Report of Fertilizer Analyses, Season 1927-1928, and Mississippi Fertilizer Law," Dept. of Agr., Jackson, Miss., Dr. W. F. Hand.

"Inspection of Commercial Fertilizers for 1928," Agr. Exp. Sta., Durham, N. H., Bul. 238, Jan., 1929, T. G. Phillips, T. O. Smith, and F. S. Schlenker.

"Commercial Fertilizers," Agr. Exp. Sta., Corvallis, Ore., Sta. Cir. 87, Jan., 1929, R. H. Robinson, C. F. Whitaker, and D. E. Bullis.

"Commercial Fertilizers," Agr. Exp. Sta., Burlington, Vt., Bul. 287, Aug., 1928, L. S. Walker and E. F. Boyce.

"Commercial Fertilizers," Dept. of Agr., Madison, Wis., Bul. 95, Jan., 1929, W. B. Griem, F. L. Gunderson, B. E. Garey, H. Lousma.

Soils

The latest bulletin by Dr. G. S. Fraps on his researches dealing with potash in the soil presents correlations among various methods of determining potash availability in the soil. In a number of pot experiments he compares the amount of potash removed by various solvents and also replaceable potash with the potash removed by plants. The replaceable potash correlates very closely with the potash removed by plants. The author concludes that it is a measure of the strength of the soil as regards potash. Interesting and significant correlations were found among various solvents, plant removal, and basic replacement of potash.

The author prefers the active potash determination for securing available potash as it seems to be nearly as significant and is more easily manipulated than the replaceable potash determination.

This bulletin is technical in its nature and will appeal primarily to research workers.

"Liming Western Oregon Soils," Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 237, Dec., 1928, R. E. Stephenson and W. L. Powers.

Crops

Several annual reports have been received this month. We are listing these reports in this section. They deserve careful consideration as a summary of outstanding work of the year at the respective experiment stations.

The Georgia Coastal Plain Experiment Station, in cooperation with the Bureau of Plant Industry, U. S. Department of Agriculture, has issued Bulletin 10 on "Bright Tobacco in Georgia," which contains much useful information for tobacco growers. The investigations made were to determine chiefly the percentages of nitrogen, phosphorus, and potassium to be used in mixed fertilizers to make a well-balanced mixture for tobacco, a good cropping system, varieties best suited to Georgia, and any improvements which might be made in cultivating, harvesting, and curing. The experiments have been underway 4-6 years, and although the information is not considered conclusive, it is given to the farmers as most recent findings.

In the various fertilizer analyses tested, the highest yields of tobacco per acre and the highest total and net (less cost of fertilizer) values of an acre of tobacco were obtained by using 1,000 pounds per acre of a 3-8-8 (N-P-K) fertilizer.

Gray, sandy loams of a mellow nature with a yellow friable subsoil are mentioned as good tobacco soils. Early plantings usually give the best results. The present fertilizer recommendation is 1,000 pounds per acre of a 3-8-5 mixture, and in addition from two to four tons of well-rotted horse manure applied in the drill before planting. The phosphorus should come from superphosphate; the ammonia to be from one-half nitrate of soda or nitrate of soda and ammonium sulphate, and the other half from some organic source or sources. The potash should be a mixture of sulphate of potash and high-grade muriate of potash, the muriate supplying not more than half of the potash.

Lime was of little value on tobacco land except where the dolomitic form was used to prevent sand drown.

The tobacco usually should be planted two feet apart in the drills and the rows should be about four feet apart. Frequent and thorough cultivation, control of insects, removal of suckers when they are not more than three or four inches long, thorough ripening before harvesting, and curing done by experienced persons are other principal recommendations.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Cal., Vol. XVIII, No. 2, Feb., 1929.

"The Effect of Topping and Suckering on Havana Seed Tobacco," Agr. Exp. Sta., New Haven, Conn., Bul. 297, Nov., 1928, N. T. Nelson.

"Report of the Tobacco Substation at Windsor for 1928," Agr. Exp. Sta., New Haven, Conn., Bul. 299, Jan., 1929, P. J. Anderson and T. R. Swanback.

"Fall Sown Oats for Georgia," State Col. of Agr., Athens, Ga., Vol. XVII, Bul. 355, Nov., 1928, R. R. Childs.

"Vegetable Gardening," State Col. of Agr., Athens, Ga., Vol. XVII, Bul. 358, Jan., 1929, R. L. Keener.

"Bright Tobacco Culture," State Col. of Agr., Athens, Ga., Vol. XVII, Bul. 359, Jan., 1929, Edison C. Westbrook.

"Five-Acre Corn Production Contest, 1928," State Col. of Agr., Athens, Ga., Vol. XVII, Bul. 361, Feb., 1929, E. D. Alexander.

"Results of the 1928 More and Better Cotton Per Acre Contest," State Col. of Agr., Athens, Ga., Vol. XVII, Bul. 362, Mch., 1929, Edison C. Westbrook.

"Director's Report 1926-1928," Agr. Exp. Sta., Manhattan, Kans., Dec., 1928, L. E. Call.

"American Potato Journal," The Potato Association of America, East Lansing, Mich., Vol. VI, No. 3, Mch., 1929.

"Forty-first Annual Report, 1928," Agr. Exp. Sta., Ithaca, N. Y., A. R. Mann.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XIV, No. 2, Whole No. 137, Mch.-Apr., 1929.

"Seed Potato Certification in Pennsylvania," Dept. of Agr., Harrisburg, Pa., Vol. 12, No. 2, Feb., 1929, Gen. Bul. 471, K. W. Lauer.

"Forty-first Annual Report of South Carolina Experiment Station, Clemson College, S. C., Dec., 1928, H. W. Barre.

"Forty-first Annual Report, 1928," Agr. Exp. Sta., Knoxville, Tenn., C. A. Mooers.

"Department of Agriculture Immigration of Virginia," Richmond, Va., Bul. 255, Mch., 1929.

"Cranberry Growing in Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 230, Feb., 1929, D. J. Crowley.

"Grain Crops in Western Washington," State College, Puyallup, Wash., No. 11-W, New Series, Jan., 1929, M. E. McCollum.

Economics

It is often assumed that margins between prices of farm products at the country shipping points and the terminal markets are too high. Bulletin No. 246, "Country Elevator Margins and Costs in Marketing Kansas Wheat," by R. M. Green of the Kansas Agricultural Experiment Station, and E. B. Ballaw of the U. S. Department of Agriculture, is a study of these margins. It is stated in the bulletin that "60-85 per cent of the elevators reporting attempted to buy wheat on a margin of from 4 to 6 cents." To cover all legitimate costs an average buying margin of 7 to 8 cents per bushel is necessary under present operating conditions in Kansas.

"Systems of Farming for the Hill Sections of Mississippi," Agr. Exp. Sta., A. & M. College, Miss., Bul. 257, Sept., 1928, Louis E. Long and R. S. Kifer.

"Improving Quality by Grading Cannery Products," Dept. of Agr., Harrisburg, Pa., Vol. 12, No. 5, Apr. 1, 1929, Gen. Bul. 474, D. M. James and R. B. Donaldson.

Diseases

"The Combination Cleaning and Treating of Seed Wheat," U. S. D. A., Washington, D. C., Leaflet No. 33, Feb., 1929, F. C. Meier, E. G. Boerner, G. P. Bodnar, C. E Leighty, J. Earl Coke.

"Equipment for Spraying and Dusting Pecan Trees," Agr. Exp. Sta., Gainesville, Fla., Pr. Bul. 413, Mch., 1929, R. E. Nolen.

"Pecan Scab Control," Agr. Exp. Sta., Gainesville, Fla., Pr. Bul. 414, Mch., 1929, R. E. Nolen.

"Potato Experiments for the Control of Rhizoctonia, Scab, and Blackleg, 1922 to 1927," Agr. Exp. Sta., Manhattan, Kans., Tech. Bul. 24, Oct., 1928, R. P. White.

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Worth While Fertilizers

(From page 26)

purchased. The production of nitrogen by the growth of legumes is in most cases limited by the lack of enough phosphate and potash in the small amount of fertilizers applied when wheat is used as a nurse crop for the clovers.

Of recent years scientists have discovered that potash plays a much more important part, than was formerly believed, in the profitable production of many crops. Thousands of farmers are producing sugar beets with little or no potash. Yet tests have shown that potash will pay for itself many times over with more sugar per pound of beets. It should be used in larger quantities in the production of all root crops than it has been. We know now that certain plant diseases are caused by a lack of potash, which fact should encourage its use, and it is quite remarkable that the price of potash is as low as it is in view of the long freight haul involved, part on sea and part on land.

It would not require a very long time to educate the farmer to use 125 lbs. of a 6-32-12 which contains 62½ lbs. of plant food, and certainly this is not too much to use on an acre. It would benefit the two crops which must feed from one application, the wheat crop and the grass crop.

We all know that clover or grass crops are heavy feeders, despite the fact that farmers think the land is resting while growing grass or hay.

Perhaps a 6-32-12 is not perfectly balanced, but it is probable that some day farmers will fertilize the soil not according to the type of soil, but according to the plant food requirements of the crop being grown. If they ever do, manufacturers will sell more fertilizers and farmers will grow better and larger crops per acre. And because the farmer will be enabled to buy more plant food for the dollar, the law of diminishing returns will not apply to fertilizers as quickly as it does now.

In Germany, many farmers get an average of 50 to 60 bushels of wheat per acre. It is not all due to cheaper labor, and certainly not due to better soil, for we have better soil in the United States than Germany has. But German farmers use large amounts of potash and phosphate, as well as nitrogen on every crop grown.

Let us raise the analysis of the fertilizer sold for we can then lower the price and encourage more general use of it.

Chlorosis

(*From page* 20)

tic mottled appearance. Eventually the foliage may become completely yellow. This stage is usually reached about the flowering or fruit setting stage on tomatoes and soybeans. On spinach it may occur after the unfolding of the first set of leaves. Following this complete yellowing, necrosis sets in appearing first as brown points in the yellow areas farthest from the veins and expanding until there is a complete breakdown of the tissue. This condition is accompanied with very little or no growth, early ripening of fruits of inferior quality, and a generally low yield.

The Treatment

Investigators have found that various treatments will prevent the appearance of chlorotic plants. Chlorosis seems to be due to a soil condition which is not the same for all soil types and locations. Gilbert and others working at Rhode Island Station have noted chlorotic conditions on oats, spinach, lettuce, corn, beets, and beans grown on neutral soils. Iron and magesium treatments did not remove the malady, but small amounts of manganese salts cured the chlorotic condition. This result was correlated with their finds of a lower manganese content in chlorotic plants than in normal plants.

Miller at the Indiana Station has obtained similar results for tomatoes. Schreiner and Dawson working with the highly calcareous soils of the glades in Date county, Florida, under greenhouse conditions found that tomatoes developed a characteristic chlorosis but that it rapidly disappeared with subsequent applications of manganese.

For several years soybeans have exhibited a chlorotic appearance on certain of the fertilizer plots at the Delaware Experimental Station. This condition seemed to be more pronounced on the limed fertilized plots than on the unlimed fertilized plots. Samples of the soil (Sassafras Silt Loam) upon which chlorotic beans had been grown were moved to the greenhouse for study. In making this study, Runk tried applications of commercial fertilizers at a ton rate of 5-8-5, chemically pure salts in the same ratio, and single elements from commercial and chemically pure sources. He found no difference between plants that were treated with chemically pure salts and those treated with commercial fertilizer salts. Untreated soils produced slender plants with slightly chlorotic leaves. Nitrogen and phosphorus produced greater growth and larger leaves, but chlorosis was more prevalent. Plants receiving potassium were larger than those untreated and did not develop chlorosis.

A complete fertilizer applied at time of planting developed normal growth, and a complete fertilizer applied after chlorosis developed prevented further chlorosis. Treatments with soluble iron or manganese did not correct the chlorotic conditions.

It seems that all the conditions that produce chlorosis are not known and that further research is necessary in order that proper recommendations may be made.

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Potash Turns the Trick

(*From page* 6)

plots on soil that would not be entirely uniform. Then came the 12 rows fertilized with the 3-8-0 mixture; next the 3-8-6 strip; then a 12-row check plot or control. The 3-8-12 was applied on the next 12 rows, and finally came the dozen rows of 3-8-16. The remainder of the field was unfertilized.

Although field visits were made at various times during the growing season, there was no noticeable difference in growth until August. At that time all plots showed a slightly better vine growth than did the control. In September the vine development on the 3-8-12 and 3-8-16 plots had increased to form a nice contrast when compared to the unfertilized control area. The 3-8-0 and 3-8-6 mixtures showed some advantage, but less noticeably than the higher potash compounds. A lighter green color existed where the vines showed the greatest growth.

Harvest, on October 2, told the real story. Two rows of each plot were dug and weighed. Digging was accomplished by hand, because excessive rainfall made the use of a digger impracticable. The potatoes were sorted into "marketable" and "culls." On the day that digging took place potatoes were selling at local markets at 30c per bushel. This price was taken as the basis for computing returns above fertilizer costs.

In short, potash turned the trick on this Miami Fine Sandy Loam. Neighbors who had been interested in the demonstration all summer turned out to witness the digging and weighing,

FERTILIZER TESTS ON POTATOES, BERLIN, GREEN LAKE COUNTY, WIS., 1928
PER ACRE

Plot No.	Area in Plot	Fertilizer Used	Rate of Application	Fertilizer Cost	Per Acre Yield Marketable Potatoes	Per Acre Yield Culls	Value of Crop Increase @ 30¢ per Bushel	Returns per Acre above Fertilizer Cost
Check	1/3 A.	None	None	....	74 bus.	15.5 bus.	....	...
No. 1	1/3 A.	3-8-0	600 lbs.	$ 9.75	111 bus.	12.5 bus.	$11.10	$ 1.35
No. 2	1/3 A.	3-8-6	600 lbs.	11.70	146 bus.	6.5 bus.	21.60	9.90
No. 3	1/3 A.	3-8-12	600 lbs.	13.65	163 bus.	10.0 bus.	26.70	13.05
No. 4	1/3 A.	3-8-16	600 lbs.	15.60	193 bus.	5.0 bus.	35.70	20.10

Farm—Henry Traugott, Berlin, Wisconsin.
Cooperating—Messrs. Henry Traugott, Ed. Lichtenberg, County Agent James Lacey, and Harold G. Frost of Portage, Wis.
Soil Type—Miami Fine Sandy Loam.
Variety—Selected and treated Rural New Yorker potato seed.
Crop—Planted May 31. Dug October 2, 1928.

and to view the results. After the whole matter had been decided among themselves, they were satisfied that potash was what they needed most on that good potato soil in northern Green Lake county.

Profit in Late Cabbage

(*From page* 30)

Seed planting takes place from the 5th to 10th day of May, and the seedlings are ready to transplant to the field from the 20th of June to the 1st of July. Weekly cultivation of 10-day intervals until September 10 keeps the crop growing with the abundance of fertilizer applied correctly.

The only other point that needs to be emphasized in this work is that of keeping down the insects, particularly the imported cabbage worm. Mr. McKnight starts early in the life of the plant in order to catch this insect when it is small. Very soon after the plants are set in the field, the first application of poison is given, sometimes even in the seed bed if the small yellowish butterflies are abundant. If one application is washed off too quickly, he gives a second one in a week or ten days. Enough poison is found on the young leaves to kill the worms as soon as they eat any of the foliage.

It is a pleasure to go through his field, find the rows straight, the plants evenly spaced in the row, each plant of about the same size and same stage of development and hustling to maturity as fast as possible. It makes one feel good to get in a field of this nature. Mr. McKnight is justified in the great pride he takes in raising the crop.

More and Better Melons

(*From page* 25)

cent of the superphosphate and from 4 to 6 per cent of the potash can be tried by the grower.

Organic matter and good soil drainage are co-workers with chemical fertilizers in the matter of producing bumper yields of fine flavored melons. Good drainage is essential, but the use of organic matter needs careful management. For example it is very easy to burn the hills up with the use of organic materials applied in the hill. The turning under of green manuring crops such as soybeans, cow-peas, and sweet clover is the best way of adding organic matter to the melon field.

The addition of manure to the hill requires caution. Only well-rotted manure is used in any case. Where it is used, it is best to mix it well with the soil in each hill. The chief source of trouble with the use of manure in the hill lies in the often resultant drying-out of the hill and the premature death or burning-up of the vines.

The melon grower who can hit upon the easiest and best and cheapest way of producing a fine flavored melon can corner the market. At the present time his best bet is to use generously and frequently the copper-lime and the gypsum arsenate dusts for disease and insect control and to depend largely upon chemical fertilizers in connection with green manure crops as a source of plant food.

Turkey Talk

(*From page* 44)

donkey in the lead. The camels here are not ridden. Hogs exist only in the wild state. Males of all kinds except a few oxen are entire.

Rarely do farmers live as isolated families, but rather in groups, or villages. In the rich agricultural section near Odemish, about 15,000 people live in the city proper, and 65,000 live in the many villages around the town.

In a seaport like Smyrna one sees much that is Western, but a visit to the interior reveals much like we read about. The fez is replaced by the hat, but beyond this I have seen little in the interior that is Western. As a guest of a well-to-do family, I slept on mats on the floor; washed in the morning squatting while my host poured water over my hands. Everything was the best they had and Turkish hospitality is unsurpassed. I was not permitted to see the women of the home, except as I glimpsed them crossing the courtyard.

Turkish schools are rapidly increasing in number and quality. The difficult Arabic script has within the past few months been replaced by the Latin characters. The war-ravaged sections are being gradually built up along well-defined lines and in a creditable manner. Some of the roads are receiving sorely needed repairs. The Turk is making rapid strides of progress, and the "Terrible Turk," the "Unspeakable Turk," really "isn't." In fact he is quite human and is forging ahead.

Beardless Barleys

(*From page* 22)

Many of the beardless or hooded varieties, as they properly should be called, shatter very readily. The writer is familiar with one variety at least, however, that does not shatter. A strain of hooded barley developed at the Union Experiment Station at Union, Oregon, by hybridization methods, is of a non-shattering type. This variety has never been named or distributed to growers.

The smooth condition of the beard is known to plant breeders as a recessive character. Therefore, plants in their second year after hybridization that show this smooth-bearded character breed true for this particular character. In other words, if a smooth-bearded variety is crossed with a common growing variety of a community which has barbs on the beards and is otherwise high yielding and desirable, the smooth-bearded types appear in the second generation after the cross, and all of these smooth-bearded types breed true for that particular character.

Because of this comparatively simple inheritance of the smooth-bearded character, many plant breeders are working on the development of these new types of barley. The introduction of a half dozen new smooth-bearded varieties in a short period of time indicates that many breeders are thinking along these lines. Without a doubt much more will be heard in regard to the development of smooth-bearded varieties in all sections of the country.

Under the arid conditions of the West, it appears that beardless or hooded barleys, as they should be called, have a place. The Colorado Station has developed a beardless barley known as Colsess which has given fairly good results in some sections. A standard beardless barley in many places in the West is known as Success.

Winners of Gold

(*From page* 29)

River, with his yield of 127.1 bushels came within .35 bushels of tying for first state honors with O. L. Bryant, Allen county, whose yield of 127.45 bushels per acre was the highest in Hoosierdom.

"I am certain that I would have won first place," said Mr. Williams, "but the wind blew a large amount of my corn down, and 16 days before the tests were made, I turned 150 head of hogs averaging 85 pounds into the field to clean up the waste corn." When asked what he credited his high yield to, Mr. Williams replied, "narrowing down the rows to 36 inches, drilling closer in the rows, and the application of plenty of commercial fertilizer were the main factors in my high yield.

"I know fertilizer played an important part," he declared, "for the drill clogged up and two rounds of the field were made without drilling any fertilizer. After the corn came up you could stand back and tell the exact places missed. The corn wasn't as sound, it was later maturing and it wasn't as big where the fertilizer was left off, and my experience has taught me that early maturity is a very important factor to consider in growing corn on river bottom land."

Walter Jones, age 17, with a yield of 120.68 bushels per acre, and his father, Elvis Jones, with a yield of 117.92 bu., won fourth and fifth places, respectively, in the state contest, thus giving Martin county three of the first five high score winners. They both give a great deal of the credit for their high yields to the application of commercial fertilizer.

The five other Martin county farmers in the list of gold medal winners were Harry Tedrow, William G. Nikam, Wilson Chenoweth, John T. Larkin, and Cosmos C. VanHoy.

Warren Nikam and Clarence Jones were among the silver medal winners for having yields of between 85 and 100 bushels per acre, and Martin Thimling's name appeared in the list of bronze medal winners for producing between 75 and 85 bushels per acre.

Thus all of the Martin county contestants finished 100 per cent medal winners, while considerably less than half the total number of entrants in the state-wide contest succeeded in qualifying for even a bronze trophy.

Limestone in Bulk

(*From page* 28)

he can spread his job of hauling over the entire year—for we know limestone is good any season and at any time.

All of us in Linn county are interested in better crops. And just as selfishly, perhaps as you are, we like those crops to be the best possible. So our banker friends got together, also some of the merchants, farm club exchanges, farmer cooperatives, and the Burlington railroad.

At every town where lime was wanted, we decided to maintain a lime bin. Now that isn't much more than a platform for unloading the cars. It doesn't cost much for materials, and the railroad cooperated by leasing the space on its right-of-way for practically nothing. In addition to this the banks put up $100 each, without interest, and this was used as a revolving fund for limestone purchase, unloading cars, and other incidental expenses, all of which were added to the cost of the lime to the purchaser. For instance the average cost of unloading a car of limestone has been 15 cents a ton. Shrinkage and loss has amounted to about 5 cents a ton, weighing 5 cents. So in addition to cost of limestone and freight, there has been added an average of 25 cents a ton to the cost. In this way the bankers have not donated anything except the interest on their $100, although they were willing to give this amount had it been needed.

The first spring 35 carloads of lime were handled in Linn county, which is more than was handled during the entire year of 1925. The success with lime has created greater interest in its use. This has resulted in many full cars being ordered and hauled to the farms on arrival in 1927 and '28. Last year the business was sufficient to allow us to pay interest to the cooperating bankers.

This plan has spread to other counties in Missouri and Illinois. On one railroad crossing northern Missouri, there is a lime bin at more than half of the stations. Lime is now stocked at nine of the ten railroad stations in Linn county.

The cooperating agencies are: The farm clubs at Browning and Brookfield, the farmers' cooperative at Laclede and Marceline, a lumber company at Purdin and Meadville, the general store at Forker and St. Catherine, and the Farm Bureau at Linneus. These folks are handling the cars and weighing what the purchasers take out for from $2.50 to $3 a car. So now we are laying down the lime at the bins purchased from quarries at $2.00 a ton.

Many of our farmers who gave up the idea as hopeless before are using lime. They were not in position to handle an entire carload.

I might add that the Brookfield Chamber of Commerce has provided storage space and leased the right-of-way from the Burlington Railroad and paid all expenses of constructing a driveway to the bin. All around it has been cooperation in a worth while way, showing what can be done when all agencies cooperate to the advantage of all, since surely our increased farm prosperity will be reflected in better business for all the agencies that have helped. We earnestly commend the plan to every sour soil community that wants to get ahead via the legume route to prosperity.

Rye

(*From page 27*)

states than in the states farther west, a general decline in the United States average production per acre is noted.

For the five-year period before the World War—1909 to 1913—the average yield per acre for the United States was 16.1 bushels, while for the period 1921-1925 it was only 13.9 bushels. A marked increase in the acreage of this crop occurred during the war when it exceeded six million acres for several years. Since then, however, it has declined to a figure slightly above that of the years just before the war.

Much of the American rye consumed in the United States is used as a feed crop. Normally from about one-fourth to one-half of the production is exported. European countries, particularly Germany, as well as Canada, are constant buyers of American rye. As a rule, the United States rye exports are about equally divided between Canada and the various European nations.

In some states, notably Wisconsin and Michigan, rye is commonly grown on the lighter soils and its straw often has considerable value. In the states farther west where the largest acreages are now found, it is frequently grown as a substitute for wheat. It is more hardy than winter wheat; hence, it is a suitable winter grain in sections which lie outside of the main winter wheat belt. This accounts in a large part for the present location of much of United States acreage of this crop.

It will be noted from the map that the principal rye belt of America lies for the most part a little to the north of the most important wheat regions. A small portion of the acreage also lies farther south than the wheat belt. In the Northern states rye is grown almost wholly for grain, while in th Southern states it is frequently use for forage and green manure in addi tion to its use for grain.

While rye bread is well enoug known to be familiar to almost every one, its use in general seems to be de clining. When allowance is made fo our exports, the entire United State consumption of rye becomes only about three-tenths of a bushel pe capita. Our total production is less than a half bushel per capita at present, whereas in 1850 it exceeded a bushel.

A Viable Agriculture

(*From page* 16)

an honest report of an actual accomplishment that can be duplicated many times in North Carolina. The sum of these accomplishments means that farmers are influenced by these earnest college workers to fertilize as the crop and soil demands.

In his study of the county agents' reports, Mr. Blair finds other things equally as interesting. Farms look neater, he says, where crop rotations are followed. Some of the men who have been conducting definite rotations for a number of years have built new homes and barns, and a general air of prosperity pervades the environment. North Carolina farmers, like those of other states, have suffered from low prices of products in recent years, but all over the State there are men who make money each season. These men do not fool themselves. They apply sound business principles to their enterprises. They are balancing their farming, building their soil, using the right kind of fertilizers, and they are making the investment in all of these pay them a return, either in money or in a richer soil for future profits. Sometimes they are checked here and there by unforeseen incidents, but progress generally is steady and sure.

Glancing Ahead

(*From page* 19)

that official forecasts tend, by the very weight of their authority, to come true even when supply-and-demand conditions work in the opposite direction. It was apparently some such feeling that impelled Congress to interdict cotton price forecasts last year. The complaint was not that the cotton price forecasts previously issued by the Department had been wrong, but rather that they had been right. A price forecast issued in September, 1927, evoked strenuous protest, though the subsequent course of prices fulfilled it almost to the letter. It was charged that the Department, instead of merely forecasting prices, was practically fixing prices.

The accusation of course was unfounded. Statistical research has demonstrated that nothing resists supply and demand, except for brief periods. Many governments have recently rediscovered this truth in vain attempts to ignore supply conditions in naming prices. In comparison with the efforts exerted, for example, by the British Government in attempting to carry out the Stevenson rubber restriction scheme, the effect of price analysis on prices can only be trifling. As a matter of fact, the most authoritative market forecast can scarely do more than keep prices from fluctuating too far above or below the natural supply-and-demand level. This, indeed, is the proper function of official price analysis. The object is to increase the quantity of informed opinion bearing upon prices, so that the influence of uninformed opinion and guesswork may be reduced.

After reckoning up the cotton outlook in 1926, the Department warned farmers against expanding their acreage. Yields above the average on an acreage equal to that of the previous season, it said, could easily result in prices unprofitable to many producers. It added a warning that an increase in acreage would aggravate matters. This warning went unheeded. The farmers added a million acres to the 1925 cotton area, with the result that the 1926 crop, though much larger than that of the previous year, brought the farmers $450,000,000 less. In 1927 the outlook report advised the cotton growers to reduce their acreage 30 per cent. This recommendation was based, not on a mere hunch, but on a detailed analysis of supply-and-deman prospects, as indicated by carry-over figures, world consumption, and other data. Whether the farmers paid any attention to the Department's advice, or were influenced merely by the memory of low prices in 1926, is not known; but they did reduce their acreage, not 30 per cent as the Department recommended, but 14.6 per cent. It is by no means a coincidence that cotton prices advanced.

Long experience has established some important facts about cotton prospects. Farmers tend to be guided, both as to the area they will plant and as to the amount of fertilizer they will use, by the prices received for their last crop. This makes it possible as early as January to forecast the area likely to be planted, and also the quantity of fertilizer likely to be used. It is also known what prices are likely to prevail for different sized crops; in other words, analysis of past supply-and-demand relationships has yielded a fairly accurate schedule of the *extent* to which changes in production will normally send prices up or down. With such information at his disposal, the farmer can decide intelligently whether he should increase or decrease his planting. The fact that collectively he has never yet done so is beside the point. Knowing the cotton acreage, and knowing also the price that usually prevails for an average crop grown on an equal acreage, the up-to-date farmer has a fair guide as to whether he should increase or decrease his own plantings.

A comparison of the outlook report issued by the Department a year ago (February, 1928) with the subsequent course of farm-commodity prices shows that nearly all the forecasts made were correct. Thus the report predicted a beef-cattle market averaging higher than the very satisfactory average of 1927. In September, 1928, beef-cattle prices were the highest since 1919, and in unit purchasing power beef animals were at the highest point on record. For the hog market, the outlook report for 1928 predicted "some strengthening." By mid-September the hog price level was 50 per cent above that prevailing earlier in the year. The forecast for corn did not come so close to the mark. Corn prices, the February statement said, were "more likely to approach the average for the 1926 crop than those which have prevailed to date for the 1927 crop." Large production in the United States tended to bear out this estimate of the probabilities, but a short corn crop in Argentine as well as a short corn crop in Europe introduced an unanticipated factor into the situation, with the result that a United States corn crop larger than that of 1927 was worth on December 1 a slightly higher average price at the farm.

Oats, said the February, 1928, outlook report, are likely to meet a less favorable market in the next crop year. In November, 1928, the average farm price of oats was 29 cents a bushel, compared with 45 cents in November, 1927. For the dairy industry, the Department predicted only moderate expansion in production, with consumption likely to increase faster than output. Butter prices, the best index of dairy product values, averaged higher in 1928 than in 1927. An optimistic forecast for wool was borne out. Wool prices advanced in the face of apparently increased supplies, and were well maintained until the last of the crop has been sold. Flax acreage could be profitably expanded, the outlook report said. Flaxseed prices were considerably higher in October, 1928, than in the corresponding month of the previous year. Barley, said the report, was unlikely to bring prices as high in 1928 as those it brought in 1927. On December 1, 1928, the average price of barley at the farm was 55 cents a bushel, compared with 67 cents in December, 1927. Fruit growers were told to look out for congested markets and severe competition, and such conditions prevailed.

Winter-wheat growers were told as early as August 23, 1927, that with normal yields in the important producing countries, the world market situation during the next year might become less favorable for marketing our export surplus. Spring-wheat growers were advised in January, 1928, that market prospects indicated "they should hesitate to increase their acreage." This was sound advice, for wheat prices in the heavy marketing months of 1928 averaged about 23 per cent lower than in the corresponding months of 1927. It detracts nothing from the significance of such forecasts that as yet they do not influence the producers greatly. Their potential value is indubitable.

Illustrations could be multiplied, but those given should show that the price analysis work of the Department of Agriculture is not guesswork. As a matter of fact, the expectation of accuracy is from 80 to 90 per cent. Forecasts of long-time trends, like those given in the outlook reports, must allow a margin for the unpredictable influence of the weather on production. Yet the outlook reports, in spite of this difficulty, have been about 90 per cent correct in the last three years. This average may be compared with that of the weather forecasts in the Washington district for the period 1915 to 1919, which ran about 85 per cent. Citing these figures in a recent address, Dr. Stine urged that the utility to the farmer of reliable price forecasts is certainly not less than that of reliable weather forecasts. Though price forecasting is still experimental, it is already of practical value.

Useful results are expected from recent progress made in the study of demand. Heretofore the volume and the accuracy of the available statistical material have been much greater on the supply side than on the demand side, for two principal reasons. First, supply fluctuates more than demand. Studies have shown that the analysis of supply alone will explain 90 per cent of the annual average price of hogs, for example, over a long period of years. Variations in the supply of cotton are even more influential in determining prices. In the experimental stages of price analysis, it is relatively more important to have information about supply than about demand. In the second place, the measurement of demand is considerably more difficult, depending as it does on such factors as the influence of the general price level on purchasing power, the relation between business prosperity and food consumption, and the substitution of one commodity for another in various uses under different price conditions.

It is important, nevertheless, that the study of demand should not be shirked. Under certain conditions, such as those prevailing during the World War, the demand for farm products may vary more than the supply. Even in peace time an exceptional demand situation may arise. Adequate price forecasting can not be confidently based on the assumption that the usual influence exerted respectively by supply and by demand on prices will always prevail, because it most certainly will not. But progress in estimating the significance of changes in demand will unquestionably take place. Meantime, it is well to remember that the thorough analysis of supply alone can throw much light on market prospects, since the demand for the principal crops is fairly constant as a rule.

Price changes depend, in the Department's opinion, on tangible and measurable elements in the supply-and-demand equation, and not on caprice, speculation, or monopoly. This opinion has statistical backing. Price studies covering important farm products over many years have shown that all other factors combined are negligible in their influence on prices, compared with supply and demand. Occasionally speculation, or some other special influence, causes prices to move away from the supply-and-demand line; but this condition never lasts for very long. That is the testimony, not of theory, but of facts, particulars concerning which are available in the Department to any interested person. Ups and downs in prices as a result of factors not representing real supply-and-demand changes soon cancel out, leaving the underlying economic law to dominate the situation. It follows, therefore, that increasing facility in the measurement of supply and demand means increasing power to forecast price changes.

No fear need be entertained that the use of price forecasts by farmers will increase the speculative features of their business. It will have rather the contrary effect. Anticipations of the future are unavoidable in any business, and particularly in agriculture. Much time must pass after the farmer plants his crops or breeds his livestock before the result of the undertaking will be ready for the market. He can not avoid a speculative risk here, and he had best take it with his eyes open. The risk is less if he obtains the closest possible estimate of what conditions will be like when he comes to the market place. Traders in farm products understand this well, and strive constantly to cut down the speculative element in their business by seeking all the information that may bear upon it. Farmers still allow the speculative side of their crop planning to overbalance the scientific side, because they are not persuaded anything much can be done about the matter. Herein they are decidedly wrong.

As agricultural price forecasting becomes more reliable, it will lessen speculation in the agricultural commodity markets, as well as in the planning of farm work. Reliable information as to the supply and demand prospects, joined to the knowledge that the supply-and-demand relationship is the final determinant of prices, tends obviously to reduce the influence of speculative opinion on the course of prices. The publication of methods of analysis and forecasting, says Dr. Stine, gives many more people the opportunity to determine the real value of a product. Thus the higgling of the market is restricted within a narrower range, and the price at any time during the marketing season is more nearly equal to the true supply-and-demand value.

Much has already been accomplished toward preventing unnecessary price fluctuations. Wide distribution of authentic market and production news reduces the influence of rumor, and diminishes the excuse for wide differences of opinion as to crop values. Further progress in the same direction, with supply-and-demand prospects indicated in terms of price probabilities, will narrow the scope of speculation still more.

Maryland

(*From page* 12)

experiments with soils and animal feeding, and variety tests of the staple farm and fruit crops.

Some of the early tests, however, have been continuous and have formed the basis for valuable information that has been utilized in recent years. The wheat variety tests, for example, the oldest of their kind in the country, have supplied the necessary information for determining the effect of environmental factors on wheat yields. From these plots, too, came the original seed for approximately 70 per cent of the wheat now grown in the State.

The first soybeans ever grown in Maryland covered a three-acre plot on the experimental farm in 1888 and from there have spread over approximately 50,000 acres of land in the State, constituting one of the important hay and forage crops of Maryland.

New lines of research work, notably dairying and poultry, have been inaugurated from time to time until there are now about 185 projects under way. There are two branch experiment stations, one at Ridgely, Caroline county, for varied crop and soil fertility investigations, and the other at Upper Marlboro, where important tobacco investigations are under way in cooperation with the United States Department of Agriculture. In addition, many fruitful trials and tests of various kinds, involving specific problems, are conducted throughout the State in cooperation with individual farmers.

It would be next to impossible to give any comprehensive idea of the research work now under way at the Maryland Agricultural Experiment Station without going into interminable details. It would hardly seem fair to describe some lines of work to the exclusion of others. About all that can be said is that the major lines of work now under way come under such general heads as agricultural economics, agronomy, animal husbandry, plant propagation, canning, dairy husbandry, entomology, home economics, plant pathology, plant physiology, pomology, poultry husbandry, seeds, soils, tobacco, and vegetable gardening.

The recent progress of experimental work in Maryland is due to the directing genius of Dr. Patterson more than to any lavish appropriations for expansion. Headquarters of the Experiment Station remain within the red brick walls of the old Rossbourg Inn, a noted rendezvous for the traveling public in stage coach days. Two frame buildings, built many years ago at a cost of $750 each, one to be used as a dairy building and the other for a horticultural building, are still in use.

The Maryland Agricultural Experiment Station under Dr. Patterson has truly been a service institution. The statement that results of its work return to the State more in a single year than maintenance of the station has cost during the entire period of its existence is probably short of the actual facts.

Industry Presses Onward

(From page 13)

agriculture and to the industries that more specifically serve the farmer. Some complain that the march of industry is building and crowding our cities and depleting our countryside; that it is one of the influences that is changing the farm home from a way of living to a demonstration in efficiency. The loud cry is heard in the land that the growing industries of our great cities are competing with the farmer for the nation's prosperity —in the exchanges for the finance and in the day's work for the best labor.

"Industry," says Sheldon, "is absorbing some of our best brains; it is marshalling in its ranks both scientists and artists, teachers and theorists, educationalists and engineers. It is offering wider responsibilities and requiring more expert practitioners."

The farmer is behind in the march. Many of the industries that serve him are behind with him. But in the face of these complexities and added responsibilities that in recent years have been so large a share of the day's work of all interests allied with agriculture, the industries that serve the farmer have taken their definite place in the march of industry as a whole. Far-reaching internal and external adjustments in production and distribution have been accomplished.

Industry Aids Agriculture

Not the least important development, largely of recent years, has been the organization within these industries of technically trained forces to aid the farmer in the utilization of the products of industry. Typical of this development are the scientific and agricultural staffs maintained by the companies that supply some millions of tons of fertilizer to the farmer. Where even twenty years ago such forces were quite limited in number, the mixed fertilizer and fertilizer materials industries now employ agriculturally trained men totaling in the hundreds. Other industries serving the farmer are doing similar work. For instance, agriculturally trained staffs are maintained by machinery and equipment, seed, feed, lime, insecticide and fungicide companies, railroads, banks, and others. The organization of such forces is a growing movement. It is assuming proportions that no longer can be ignored.

The question arises, why is this maintenance of trained agricultural forces on the part of industries of any importance? Primarily because it is a part of the much larger movement, the march of industry as a whole; intimately associated with the growing idea that industry is fundamental to and not incidental to the life and well-being of the nation.

In addition, four other reasons might be cited. First, because the organization of such forces on the part of industry is vitally related to the use of our greatest national resource, the land. Second, because in advising the farmer regarding the best use of the products of industry, the agricultural colleges and industry have much in common. Some degree of unity in broad objectives is essential if their respective obligations to the farmer are to be properly observed, confusion avoided, and the greatest benefit accrue to industry and agriculture. Third, because the organization of agricultural staffs within industry affects the utilization of the products and services of commerce and industry and therefore the success and prosperity of the farmer. Fourth, because the introduction of scientific reasearch into industrial production calls at least for more exact, if not for more technical, knowledge in the utilization of these products and services.

Principles for Harmony

It is particularly the principles underlying the work and place of the technical agriculturists in industries that serve the farmer that it is my desire to discuss briefly. Details of such work may and do vary. No one man may be qualified with any degree of authority to discuss the variety of methods and details that comprise the sum total of such work. It, therefore, will not be attempted.

If, however, the definite goal of such work within industry is to be defined; if the relationship of agricultural workers in industry to the workers in scientific agriculture is to be harmonized, then underlying the work of the industrial agriculturists must be defined some principles which will serve as the basis of broad policies for the work as a whole.

Neither must it be forgotten that the agricultural group in industry, isolated from the business man, can accomplish nothing. His leadership, his expert knowledge, his long experience in the ways of commerce are making significant contributions to the march of industry. In the industries that serve agriculture, as in others, technically trained workers can only fulfill their purpose so long as they become business-minded with a tolerant and sympathetic outlook on industrial leadership and a willingness to work in harmony with it.

Such principles must, therefore, provide a working basis for two significant relationships of agriculturists in industry—on the one hand with the men of business—on the other with the men of science in agriculture. It is only when these relationships are harmonized, when a common meeting ground is defined clearly, that we shall possess sufficient knowledge and experience to formulate a definite plan, to see the goal, and to make that contribution to the march of industry that the changing concept of industry in national life demands.

Editor's note: In subsequent articles in this magazine, Mr. Callister will discuss some of the principles involved in this movement on the part of industry and endeavor to determine something of its direction and dimensions.

Mothers

(From page 4)

on too much trimming and embroidery in the life of the older child. The frills on the old-time infant's outfit meant little to his welfare, but tickled the mother's vanity. It's the same way now—the fancy furbelows we insist upon for foolish adolescents do them little good, but help us to "keep step with the neighbors" and "in tune with the times."

In this direction the mother is led—nay pushed, and even pulled and yanked—by a motley crew of supersales agencies, often in disguise, but forever insistent. They belabor the besieged budget from every angle and array the heart motives on their side regardless of financial obstacles.

Children are raised in an era of magnetic expansion, of commercialized education, of industrial supremacy—and the fortitude and resistance of modern motherhood must be like steel and concrete compared with the logs and thatch of earlier eras. And yet how hard it is for mothers to be hardboiled, especially if daddy is a softboiled egg.

Somewhere in my browsings I found what is purported to be a mother's confession of faith:

"I owe a debt to my children. Having brought them into the world, their father and I owe it to them to furnish a happy, free life of physical health, cheerful industry, intellectual growth, moral dignity, and sanity. To pay my part of the debt, I have at my command a certain amount of money, physical strength, intellectual vigor, nervous energy, and spiritual force. If I am to be honorable, I must, as every honest debtor does, use my resources first of all to keep up my payments."

I like part of her creed, but I would adopt it with reservations were I in her shoes. Self-abnegating motherhood is not always so well appreciated as the kind which sometimes asserts its own rights. The germ of selfishness which is found in every youngster may flourish too fast where mothers efface themselves completely and give up everything to the nursery. Grown-ups are entitled to a part of life's joys and freedom, and many a mother entangles herself in those proverbial apron strings.

This need not mean "farming out" the children to a governess or a nurse maid from breakfast time to bed. But the companionship of other capable adults on specified occasions may have some advantages, to wit:

When I was in knee-breeches, our nature study consisted of robbing birds' nests and frying frogs' legs. The only kind of scouts we knew about were those who "made the redskin bite the dust" between the breathless, dog-eared pages of Dead-eye Dick. But my nephews are out once a week, rain or shine, in flannel shirts and leggings tramping after a sturdy friend of mine with gray hair and jolly wrinkles around his eyes. He is a disciple of Baden-Powell and Teddy Roosevelt, and he can splice rope, skin rabbits, make whistles, and talk "Injun." He knows more about boy language than most mothers, and he heads off a streak of meanness by walking the legs off his troopers.

Girls learn to become "hard as nails and dipped in sunshine" through the kind offices of a "foster mother" of the camp fire and the trail. And finally, both genders mingle without self-conscious diffidence in the wholesome tasks of head, heart, health, and hands.

Mothers whose youngsters are in the company of such substitutes need not fear to take a moment's recess. They may for a moment throw off their professional vigilance. The parental relief squad often is indeed making citizens of a broader kind than "mothers used to make" when outside activities were regarded with suspicion.

Now here I pick up an author who says that "every single person has a trace of youth about him, but no parent is young." I am aware since our children grew taller that we parents belong to the older generation, but I don't want their mother to get wise to it. I don't want her to feel less spiritually buoyant than is humanely possible after ironing my shirts and darning the school socks all day. Strange, isn't it, that she and the other girls of our own set look just about as young to me as they ever did? That's why I cannot get over buying her size 36, regardless of the horrors of a return trip with the stuff.

It all depends on the self-culture of mothers. Some of them have ample time for enjoying life anew in the lives of their children, and relish the opportunity. Others go into mourning after the first diaper is made and never find the secret of youth again.

WE still have too many old mothers at middle age, but, thank heaven, not so many as before. Although I am not an extremist, I would tolerate a glimpse of a mother's bare knee under a short skirt rather than see her wear the dismal drapes that used to make grandmothers out of young matrons. The rejection of yards of black alpaca and smudgy old bonnets, together with the elimination of dust catching curlicues in the parlor, have followed the bitter doses of Lila Spinkham into the vanished age of feminine despair.

In the good old days both parents and children were trying to see who could get old quickest, but now they are striving to see who can stay young longest.

Mothers have to face two conditions that challenge no other great professions of the world. A teacher may find the classroom irksome and seek employment in an office; the stenographer may prefer to dictate rather than to receive dictation, and turn to the school for occupation. But a mother, once started on her responsible career, is morally and sentimentally obliged to carry on no matter how hard the task becomes.

Then, again, compare a mother's job to that of two vocations to which she is often related by romantic poets. The gardener may be likened to a mother as he weeds the tender plants, waters them refreshingly, and watches them bloom with radiance. The sea captain may be taken as a metaphor of motherhood as he weighs anchor and steers his craft through perilous reefs to some fair haven.

Yet where is there a gardener who can hope to learn his profession in one season of experiment, and what would happen to his flowers by such a method, or to his ambition, were he doomed to enjoy but one pleasant fleeting term of employment?

Where is there a shipmaster who would enjoy assuming command on his maiden voyage over the bounding deep, or who would spend much effort learning the ropes if he should be told that his first voyage must be his only one.

But poets are not practical and they have never given mothers credit for undertaking the greatest job in the universe without chance for experiment or without hope of repeating the job with different materials. The mother has but one garden of children and can make but one voyage with her lusty crew.

OUR grandmothers with their larger families did not perhaps face the emptiness and yearning as soon as many of the mothers now, but perhaps the modern life holds more to do for our *mothers emeritus*. However, *mothers emeritus* cannot set themselves up successfully as parental pedagogues. Young mothers resent too much interference and prefer to develop their own technic of fondling and spanking. It may be just as well, therefore, that the accumulated knowledge of mothercraft is not so readily or so easily taught by experts as journalism or plumbing. Things too easily taught are just as apt soon to be forgotten or miserably bungled.

Mothers can be proud of one achievement, namely, they are the ıly human beings to whom successıl men, besides themselves, give credit or their success. In many cases the uccessful men in achieving it secretly urprise their mothers more than anyody else who knew them as kids. But nothers are good sports and never give he boys away.

On the other hand, let us be generous with the failures. No jailer or oorhouse manager ever heard inmates lame their ill fortune upon motherood. They pick on paterfamilias, the limate, tough neighbors, or the proective tariff. This shows what a acred symbol motherhood has become hrough the ages, and testifies that the aving grace of humanity depends on he women folks.

SET down the sacred word, "Mother." Let M stand for nercy, O for obedience, T for tenderness, H for humanity, E for energy, and R for resignation.

Of what good are our protestations of devotion and our worshipful reverence to an Ideal if we do not blend into our own lives in some degree those inherent attributes of maternal majesty!

"The quality of mercy is not strained; it droppeth as the gentle rain from Heaven upon the earth beneath," says the old Thespian. He shows us that mercy is not a weakness in all cases and that if we would have mercy shown to us, we must ourselves acquire it.

"Obedience is the first law of the land," remarks an old Saxon sage. Too many of us are behaving like children these days just to find out if there isn't a thrill in the still and a wallop in the liquid leg of a malevolent mule! Those who take high command must first learn to obey, and liberty is secure only through respect for law—even though you *didn't* make it, like the law of Moses.

Tenderness is not the spiritual opposite of endurance, but it is tbe antithesis of cruelty and intolerance. It is the crowning gift of motherhood to her children, and is often more startling and appealing in men than it is in women. When I see a sober man try to hide a tear of compassion, he is my friend.

Humanity is the art of remembering that this world has held few angels since quack-grass sprouted in Eden. It is the intricate art of discrimination in judging our fellow passengers and making allowance for some who seem to have forgotten their tickets. That's why we ought to take as much pains picking our judges and policemen as we do golf clubs and bridge partners. But we can't all be as wise as our mothers, and so our criminal trials and punishments may take a little more time for adjustment.

Energy is the attribute of which a mother must have nothing else but. It is the main spring of her entire works and the chief element of success in her managerial ability.

Resignation does not simply mean sitting with folded hands on an urn. No, you are thinking of some bootlegger's monument. Resignation means being willing to finish what you started if there is anybody depending upon you or it. It means doing the little dishwashing obscurity jobs as nicely and bravely as you hit a homerun with the bases full. It means cheerily forgetting that your great aunt predicted you would be president. Remember, many a man has also had all the qualifications of some who reached there, and without choosing to run either!

And so, finally my friends, we have arrived at the end of the chapter—right back again to Mother's Day. Therefore, pin on your posy and sally forth to show the folks what a master hand your mother was at doing her duty to the waiting world.

No wonder they refer to colleges as Alma Mater—great places for breaking in freshmen!

A Few Whinnies

USEFUL

The man from the backwoods led his overgrown son into country schoolhouse.

"This here boy's arter larnin," he announced. "What's yer bill o' fare?"

"Our curriculum, sir," corrected the schoolmaster, "embraces geography, arithmetic, trigonometry, —"

"That'll do," interrupted the father, "that'll do. Load him up well with triggernometry. He's the only poor shot in the family."

"Johnnie," said a teacher in physiology class. "Can you give a familiar example of the human body as it adapts itself to changed conditions?"

"Aunt gained fifty pounds in a year, and her skin never cracked."—Methodist Recorder.

PLAIN LANGUAGE

"Au revoir," said Ikey.
"Vat's dat?" asked Izzy.
"Dat's goodbye in French."
"Vell," said Izzy, "carbolic acid."
"Vat's dat?" asked Ikey.
"Dat's goodbye in any language."

50-50

"Half the City Council Are Crooks," was the glaring headline.

A retraction in full was demanded of the editor under penalty of arrest.

Next afternoon the headlines read: "Half the City Council Aren't Crooks."—*Kreolite News.*

ON HIS WAY

Two elderly men, both extremely deaf, met on a country road. Dave had a fishing pole in his wagon. When he saw his friend Jim he stopped the horse.

"Goin' fishin'?" shouted Jim.

"No," Dave replied. "I'm goin' fishin'."

"Oh," said Jim, "I thought mebbe you was goin' fishin'."

"What's the fuss in the schoolyard, sonny?" asked the gentleman passing a ward school.

"Why, the doctor's just been around examinin' us, an' one of the deficient boys is knockin' hell out of a perfect kid."—*Weather-Vein.*

Officer—"Say, didn't you see that stop light?"

College Boy—"Sure, but I didn't see you."

"Son, what does this 60 mean on your report card?"

"That's the temperature of the room, father."

Sambo—"Yes, suh, business ben fine. Mah wife done gib me ten dollars an' Ah bought a pig. Ah kept tradin' fo' eberything under de sun, till finally Ah gets a bicycle, and Ah sold it fo' ten dollars."

Rastus—"But you-all doan' make any money."

Sambo—"Co'se not. But look at de business Ah's been doin'!"

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Agricultural and Scientific Bureau
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SEE-SAW!

Better Crops with PLANT FOOD

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Jeff says that this is not the only month for—

Romance

By Jeff McDermid

ROMANCE should not be confined to balmy nights of June and faded Knights of heraldry. It should not be laid away ımid crumbling rose petals and beaded bridal slippers, becoming ɒnly a mossy epitaph above forgotten hopes.

Once upon a time a man I knew ery well became engrossed in bread-vinning and forgot a reminiscent ɔouquet of jonquils as a wedding re-ninder for the woman who shared his fe. He never quite recovered from he effect of this relapse of romantic nemory, but his error will not be re-ɔeated.

There was no breakage of furniture r household calamity involved, but is failure to acknowledge the truth f his troth and the firmness of his aith deprived him of that peace of mind which every earnest husband cherishes.

There are times when flowers are as important and sustaining to life as groceries, provided the love of the giver is stronger than the tissue they are wrapped in. On this sentimental journey of ours, affection plus recognition is better than affection taken for granted.

No true woman ever gets beyond the romantic stage, but she doesn't like to mark the calendar ahead so that her partner won't overlook the marital milestones. Yet on the other hand, it takes a pretty adroit man to anticipate such dates of conjugal consequence without being suspected of ulterior motives. Sudden and unforeseen attacks of romance hold some danger for the zealous husband to adopt. Hence chronic romance is a better disease than the acute kind that breaks out like the measles and soon disappears.

"Behold, the Bridegroom cometh," says the Good Book; and good men who follow the Book as best they may should measure their steps occasionally to the hushed cadences of the long-ago Lohengrin.

"Behold, the Bridegroom cometh," so let him gallantly give arm once more to the devoted one who has spanked his kids and kept him out of jail with sentiment and sacrifice. The bridegroom cometh, but not so fast as he goeth under our commercialized circumstances.

THERE is a rasping old saw to the effect that "all the world loves a lover." The only thing of this kind that the world admires more than a youthful swain is an elderly "old-school" gentleman whose constancy toward his wife is as delicately reverent as his age.

Once I went with my wife-to-be on a joyful summer outing, and we saw a grandpa proudly and blushingly tender a nosegay to his spouse. We saw him help her over the rough places and find her a comfortable seat. If my memory serves me right, my little Friend confided to me that she hoped my ardor and devotion would be as lasting and endearing on the down grade when we faced the sunset.

I have never forgotten that admonition, and she at least has done nothing to make that same sentiment less probable. If expectant brides would thus open life's vistas to the visions of their lovers there would be a more wholesome index afforded to the book of life. Pink cheeks, fa hair, and glowing eyes do not last for ever. They are only the temptin preface to the chapters of a text-boo of many pages, often hard to rea and sometimes difficult to under stand.

Brides are just as faulty and short sighted in this as their companion They think only in terms of June an seldom turn the leaves of the almana in anticipation to December. So w see that romance itself is in need o foresighted conservation measure just like our other natural resources.

I claim that a well-balanced roman ticism is more important to us as nation of creditable citizens than har work, common sense, and religior We cannot enjoy the last three full without some inkling of the forme trait in our lives.

Hymeneal education is often sadl deficient. From the time when ado lescents are told that sentiment i "silly" to the time when the judg fixes the alimony, what sort of con jugal curriculum do we provide Next to nothing. We have experi mental colleges in liberalism; we hav professors of eugenics and genetics we have authorities on weight reduc ing, Chinese rugs, and salads—but w lack an intelligent course in a com bination of such things that mak weddings permanent and romance last ing. Our students go to college an get romance languages and musica harmony, but they are often deaf an dumb to both things after leaving th altar.

YET I am convinced that most mar riages are as successful as anybod could expect of a nation which put most of its sentiment in the twenty five-cent magazines. I believe w should credit our children with mor discernment in the romance line tha we often give them ourselves. Thu a father who remembers his weddin

(*Turn to page* 61)

Cotton Wilt Control

By J. C. Pridmore

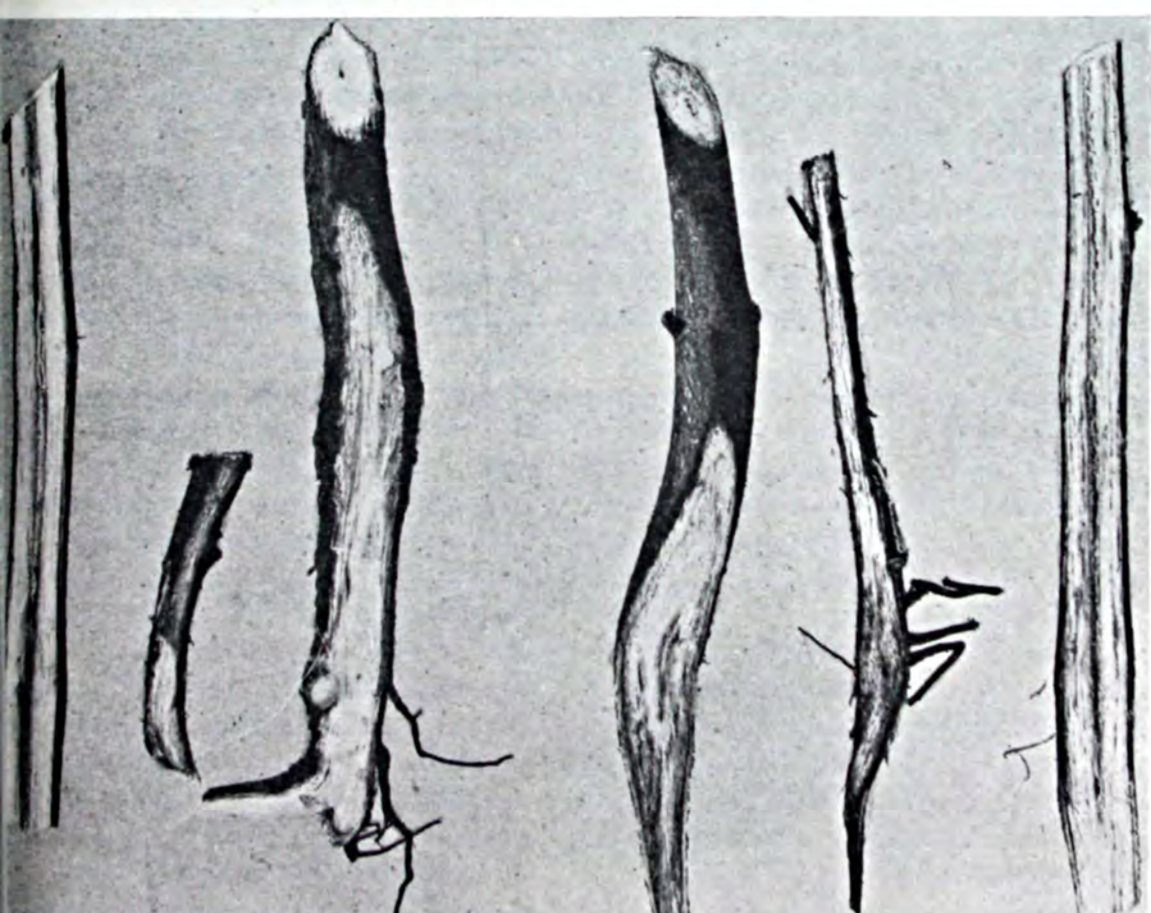
Director, Southern Division, Soil Improvement Committee

LANTS are susceptible to many diseases just as human beings are. otton is no exception to this rule or this plant, like others, has a long st of diseases that may attack it and revent its normal growth and devel- pment, precluding the possibility of a tisfactory yield and profit to the lanter.

While the cotton plant is suscep- ble to a number of diseases, probably ne most important, from an economic andpoint, is wilt. The damage caused y this disease in cotton naturally aries because of soil and seasonal con- itions, the variety of cotton used, ind and amount of fertilizer used, nd probably other factors. This particular disease, however, is widely distributed over the cotton belt and will spread over still larger areas from year to year unless preventive measures are employed.

It is difficult to estimate accurately the annual cost of the presence of wilt to the farmer in the cotton belt. Naturally it is worse in some localities than others. It is worse some years than others. In the light of available information, it is safe to estimate that the annual toll from this disease alone amounts to from 10 to 15 per cent of the crop in some states, or an average loss of one-half million or more bales per year for the belt.

The cause of cotton wilt is now



ne three stalks on the left are from normal, healthy cotton plants; those on the right show wilt-diseased tissue.

Where an 8-4-0 was used, there were missing hills and dead plants. The yield was only 666 poun seed cotton per acre.

known to be a fungous growth or development. It is able to live in the soil over a period of several years, which makes impracticable the use of rotations of crops as a control measure.

Evidences of the appearance of wilt in fields may be found when plants begin to wilt and die without any apparent cause. Areas affected usually appear in more or less circular sections of the field, frequently in close proximity, and cover the entire field on badly infected land. The easiest method of discovering the plant infected with wilt is to cut cross-wise in the root or near the ground the stem of a freshly wilted plant, and if dark brown or black areas appear on the cut surface this indicates that the plant is wilt diseased.

In order to get more complete information on the causes and remedial measures in the control of cotton wilt, Dr. D. C. Neal, Plant Pathologist of the Mississippi Agricultural Experiment Station, began some investigations on the subject in 1925.

For a long time, it has been thought by farmers, as well as others, that the nutrition of the plant has a direct bearing upon its resistance to wil Practical demonstrations have bee conducted that would lead one to be lieve that well-nourished cotton plant have resistance and do not succum to the attacks of wilt as is the cas with poorly nourished plants.

Show Importance of Potash

An outstanding demonstration c this character was conducted by L. I Rast in 1922 while he was with th southern division of The National Fer tilizer Association, cooperating wit C. N. Alexander near Little Rocl Arkansas, with a view of determinin whether fertilizers could be used t advantage in this particular soil. Th grower used 500 pounds per acre of fertilizer containing 10 per cent pho phoric acid, 3 per cent nitrogen, an no potash, during 1920. That yea the rust was so plentiful and the yiel so small that no records were kept c the yields.

The following year the same amour of a 10-3-0 fertilizer was applied c half the area and to the other half a additional application of 500 poun of kainit was applied. On the ar

en the fertilizer contained potash (8-4-6), the stand was good and the yield of seed cotton 1,278 pounds per acre.

here the 10-3-0 was used the plants gan dying long before maturity was ached and appeared to be infected ith wilt fungus. Upon investiga- on Dr. C. W. Elliott of the Ar- nsas Experiment Station, who ex- ined the fields, found approximately per cent of the plants wilt-infected here no potash was used, and this ea yielded only 225 pounds of seed tton per acre.

On the adjacent field where the 500 unds per acre of a 10-3-0 fertilizer d been applied and supplemented th 500 pounds per acre of kainit, r. Elliott stated that there was no idence of wilt, and from this plot 127 pounds of seed cotton per acre ere harvested. This demonstration ves to confirm general reports from rmers who have had similar experi- ces which lead them to believe that well-balanced fertilizer is one of the ctors of cotton wilt control.

Using these general reports, and ch evidence as was available at the ne as a guide, Dr. Neal set out in the ginning of his work to study the re- ionship of the nutrition of plants to lt resistance, in addition to other gles of the problem. In his green-house experiments the data are not conclusive, but in his field experiments to determine the effect of commercial fertilizer upon the control of wilt, definite indications are determined, particularly in the fields at the Poplarville, Mississippi, Station where the land was most heavily infected.

On the experiment station plots at Poplarville, approximately 1/12 of an acre in size, where each plot had been given the same treatment for five years, excellent opportunities were afforded for wilt study in 1926 and 1927. From these studies in 1926 the following data were obtained:

	Fertilizer Analyses Used	Seed Cotton per acre lbs.	% Wilt
Plot No. 1	8-4-0	666	45.84
" No. 2	None	468	22.19
" No. 3	8-4-3	1206	17.76
" No. 4	8-4-6	1278	1.04
" No. 5	None	648	2.22
" No. 6	8-4-6	1080	.92
" No. 7	4-4-13	1080	1.21
" No. 8	None	216	2.78
" No. 9	0-4-6	630	.15
" No. 10	8-0-6	486	.0
" No. 11	None	72	.19
" No. 12	8-8-16	990	.0

(Turn to page 50)

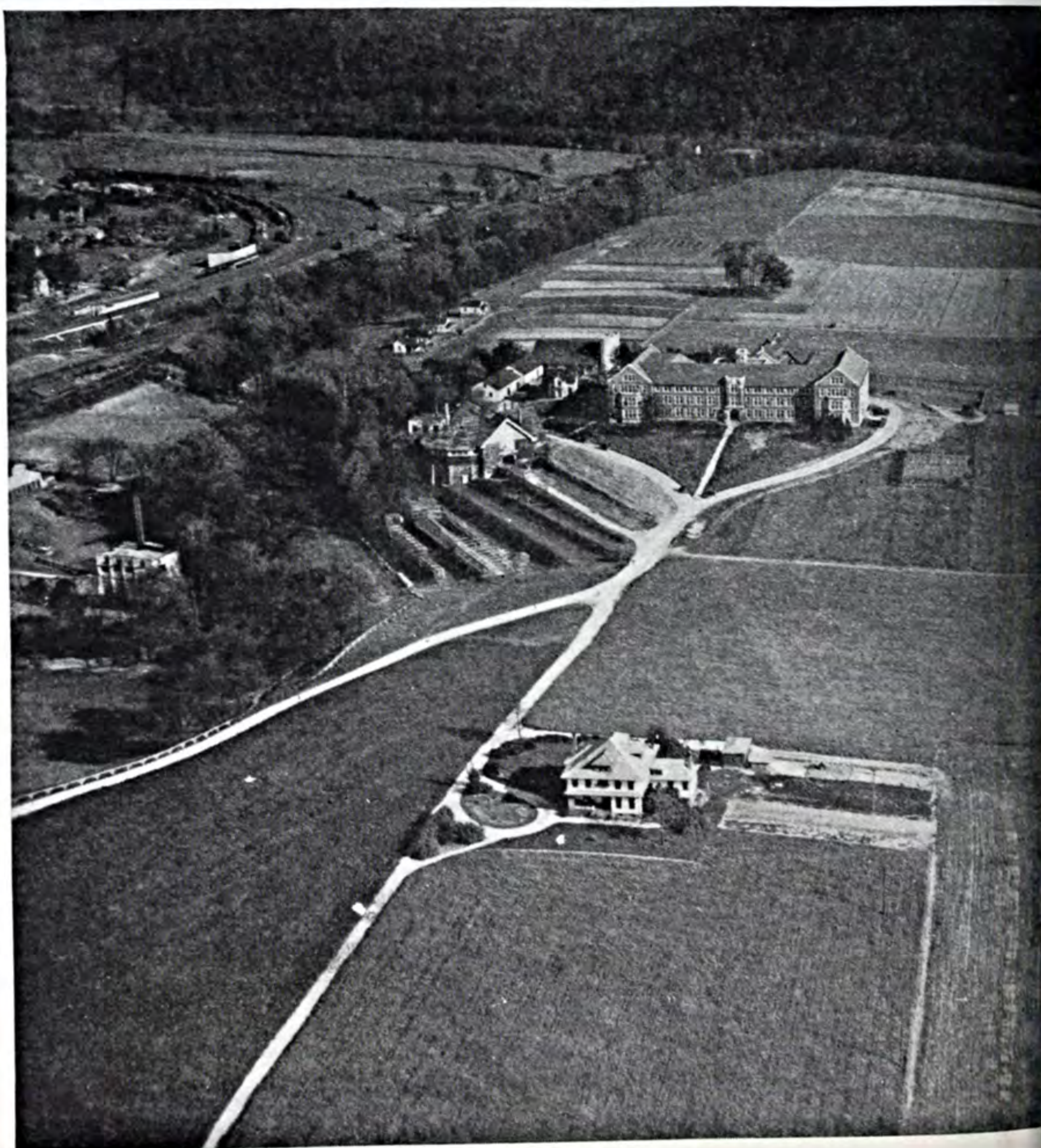
TENNESSEE

By A. J. Sims

Agricultural Editor

¶ Here's Another Station Story

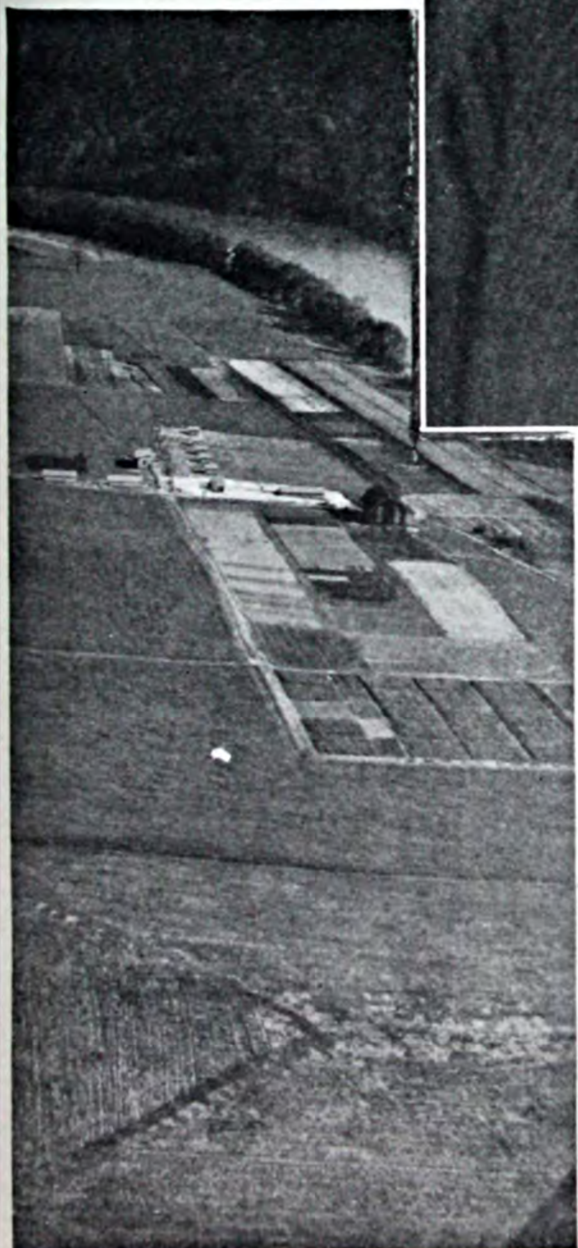
BEGINNING with a staff of five men and 100 acres of land in 1887, the Tennessee Experiment Station has developed a program to match the wide diversity in the farming interests of the State. Today there is scarcely a tiller of the soil from the delta, cotton-growing lands of West Tennessee to the mountain coves of East Tennessee who has not benefited by the work of the institution. A staff of 30 specialists is employed an the experimental plots, fields, pasture feedlots, orchards, and the State's fou substations and farms contain approxi mately 1,000 acres with two-scor buildings and purebred herds an flocks. Enough wealth has been re alized by the State from the resul of research, experiments, investiga tions, and recommendations of th Station to cover many times over th



cost of the entire University which runs into millions of dollars.

The board of trustees of the University of Tennessee was the first, and, with the exception of Cornell University, the only corporation in the United States to establish an agricultural experiment station without any special endowment. It was also one of the first five stations to be established in America.

The Station developed out of a combined school



C. A. Mooers, Director of Tennessee Agricultural Experiment Station.

Left: A bird's-eye view of a part of the experiment station farm at Knoxville.

of agriculture, horticulture, and botany which was started in 1870 at Knoxville. The College of Agriculture had been founded in 1869 under the first Morrill Act, passed by Congress in 1862. The original college farm consisting of 100 acres, where the experimental work of the main station is now carried on, was also purchased that year.

Professor Hunter Nicholson was the first head of the school, and experimental work was begun by Professor J. M. McBryde who was at the head of the school from June, 1879, to June, 1882. Experimental work done by Professor McBryde with field crops and livestock feeding led to the establishment of the Experiment Station as a distinct department of the University in June, 1882, with Professor John W. Glenn as its first director. Professor McBryde severed his connection with the institution in 1882 to take the presidency of the University of South Carolina. He later became president of the Virginia Agricultural and Mechanical College and Director of the Virginia Experiment Station.

Introduced Bordeaux Mixture

In 1887 the Station was reorganized under the Hatch Act of Congress, which gave to it an annual income of $15,000, and was placed under the immediate supervision of a director and a committee of five members of the board of trustees of the University. Dr. Charles W. Dabney, Jr., newly elected president of the University was also made director of the station. He had associated with him, four specialists: Charles S. Plumb, assistant director, in charge of field and feeding experiments; E. Lamson Scribner, botanist and horticulturist; W. E. Stone, chemist; and H. E. Summers, entomologist.

All of these men later gained nation-wide prominence either in educational or investigational work. Professor Plumb is noted for his work in animal husbandry at Ohio State University, Professor Summers was professor of entomology and entomologist for the experiment station at Iowa State College for a number of years. Dr. Stone became president of Purdue University. Professor Scribner left the institution in 1894 to join the staff of the United States Department of Agriculture as agrostologist.

Professor Scribner introduced into this country from France the celebrated bordeaux mixture which was used by him for the first time in America in spraying a vineyard near Knoxville where it was applied to prevent rot of grapes. The tests were successful. Other experiments covering a wide range of disease control were made and now this mixture is considered indispensable in the production of grapes, peaches, and other crops throughout the country.

The Station at the time of its reorganization in 1887 was without buildings, laboratories, apparatus, li-

A tomato plant grown from wilt-resistant seed, selected at the Tennessee Station, was healthy and normal in every respect.

brary, or other equipment. A small building on the campus which had been used by the agricultural school was turned over to it. In 1890 Dr. Dabney was made chemist and Professor Scribner was elected director and botanist. During this year the college farm of 100 acres with its buildings, equipment, and livestock was turned over to the station. One of the conditions of the transfer was that the farm should be so conducted that it would serve to illustrate the methods taught in the agricultural classes.

Charles F. Vanderford, professor of agriculture in the University, was made assistant director of the station and manager of the farm in 1891. In 1893 the office and title of director were abolished and the duties of the director were transferred to the president of the University who was assisted by a secretary. Professor Vanderford was selected for this office. That same year Professor C. A. Mooers, now director of the station, joined the staff as an agricultural chemist, and Professor S. M. Bain was added to the staff as assistant botanist.

Professor Vanderford died in 1899 and Dr. Andrew Soule, now president of the Georgia Agricultural and Mechanical College, was elected to succeed him. In 1903 Dr. Soule was made director and the Station entered an era of rapid development such as it had never experienced before. The State Legislature became interested and in 1903 made its first appropriation to the Station, $10,000 for the purchase of 40 acres of land adjoining the 100 acres already owned. Farmers of the State for the first time began to take a real interest in the work of the Station and requests for branch experimental farms began to be heard.

This tomato plant, grown in the same patch as the one on the opposite page but from ordinary seed, was badly damaged by wilt.

Progress was temporarily interrupted in 1904 by the resignation of Director Soule to become director of the Virginia Experiment Station, Blacksburg. He took with him the assistant agriculturist and the assistant for plat work. Dr. H. A. Morgan, now president of the University, was selected to succeed Dr. Soule as director. Dr. Morgan came from Louisiana State University where he was professor of entomology in the university, entomologist for the experiment station, and state entomologist. He was elected president of the University in 1919 but continued as director until 1923. Professor C. A. Mooers, who had been chemist and agronomist for several years was acting director from 1919 to 1923 and director and agronomist from 1923 to the present time.

Investigations Are State-wide

Tennessee being a state of multiform soil types, it became evident early in the history of the Station that experimental work must be conducted in the sections of the different soil types. It was realized that a central station, carrying on some investigations that applied to the State as a whole, could not render the needed service along agronomic and soil lines. The State appropriation for the branch station in West Tennessee at Jackson was followed in 1917 by a similar appropriation for a Middle Tennessee station at Columbia. Dairy and beef cattle herds are maintained at both places and extensive experiments with all the leading crops of each section are carried on.

In 1907 the Bureau of Entomology of the U. S. Department of Agriculture established some tobacco insect investigations at Clarksville, Montgomery county, in cooperation with the Station. In 1913 there was established at the same place a substation for other tobacco investigations in cooperation with the U. S. Bureau of Plant Industry which has been of much value in determining the most profitable kinds of fertilizers, the effect of liming, and the comparative effects of various crop rotations on tobacco. The value of work of this kind so impressed a prominent citizen of Clarksville, Hunter M. Merewether, that he gave the University a farm and buildings valued in the neighborhood of $40,000 to be used for permanent investigation in agriculture.

The headquarters of the scientific staff, the laboratories, and special equipment of the Station are located at the University of Tennessee at Knoxville. The chief lines of investigation now being carried on are as follows:

Plant-food and lime requirements and the crop adaptabilities of the various soil types throughout the State; the effects of liming on various soil constituents, such as nitrogen, sulphur, and potash; maintenance and increase of soil nitrogen; study of crown gall, or "hairy root," a serious trouble of apple trees that threatens the nursery business of the State; a study of the root rot of wheat and the possibility that this disease is materially reducing the wheat yield; selection and breeding of various crops to get strains immune or highly resistant to the wilts and blights which are prevalent; and the fluosilicates as insecticides;

For a number of years the Station has been studying, particularly by laboratory methods, two important subjects, soil nitrogen and the effects of various liming materials when applied to the soil. The laboratory methods, which have included the use of plots, cylinders, and lysimeters or leaching tanks, have been supplemented by field experiments. The lysimeter equipment, the essential features of which were developed by Director Mooers, has been enlarged from time to time until it is now the most extensive to be found anywhere. This equipment has enabled the Station's present soil chemist, Dr. W. H. McIntire, to make an enviable reputation by his investigations concerning liming.

Conclusions Are Reached

Listed below are some of the practical conclusions reached from the field and laboratory studies.

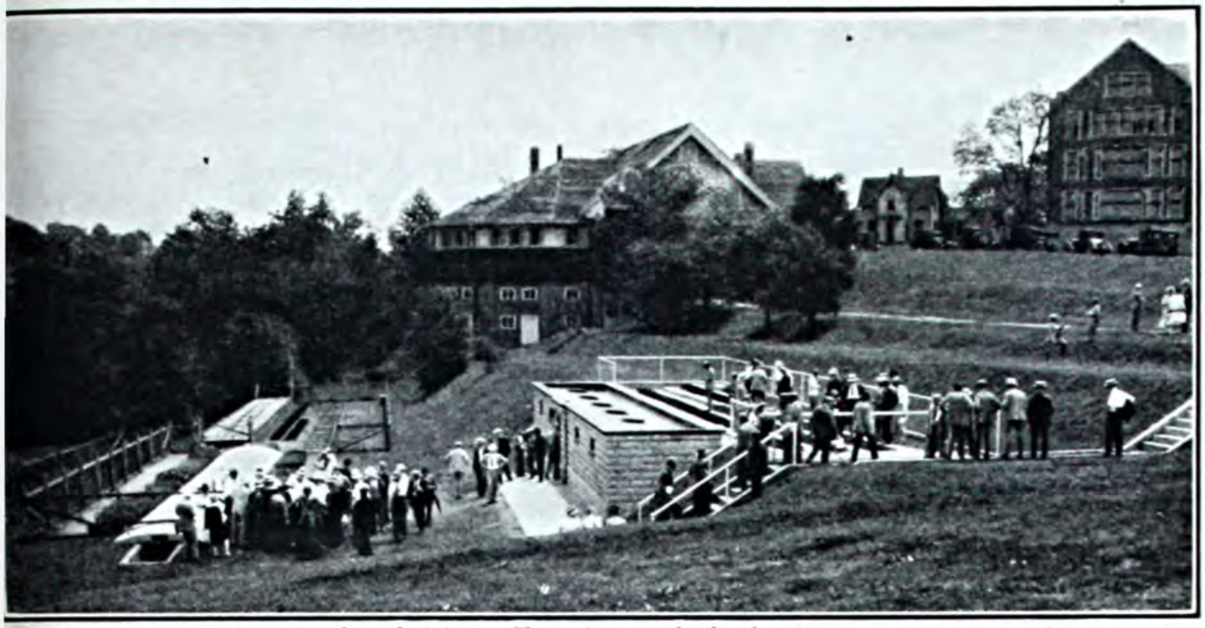
1. Large areas of the State have become greatly depleted in soil nitrogen, so that an increase of this element is a first requisite to their improvement.

2. Crops of alfalfa, sweet clover, and red clover are the most efficient practical means of increasing the supply, but such legumes as cowpeas and soybeans must be either pastured off or turned under to be of any special value.

3. Nitrogen is lost from the soil both by the removal of crops and by leaching. Soil in grass which was harvested yearly for hay was found to lose much less nitrogen than the same soil on which cowpeas harvested for hay were grown and the soil left bare through the winter.

4. The larger the crops grown, of any kind, the more is the soil supply of nitrogen conserved, soluble soil nitrogen not utilized by crops being lost by leaching.

5. Limestones are generally cheapest, are the easiest to apply, are "fool-



Members of the International Soil Science Tour inspected the lysimeter equipment at the Tennessee Experiment Station.

proof," and in the Station's experiments were found to be effective over a longer period than burnt lime which may be used to advantage under some conditions. Other materials, such as marl and wood ashes, may be used when available. Liberal applications of duplex basic phosphate were found to supply sufficient lime for red clover on some soils.

6. Alfalfa and sweet clover have the highest lime requirements; next come red, alsike, and white clovers, also garden beets. Cowpeas, soybeans, corn, wheat, hay grasses, and a number of garden crops are highly responsive to liming on Tennessee soils, but liming was found of little direct benefit to cotton, tobacco, peanuts, sweet potatoes, and strawberries, though it may be of much indirect benefit to some of these crops when they follow clover, for which liming is necessary.

Lime Increases Yields

In five series of experiments on representative soils in different sections of the State, the average yield of alfalfa with lime was 3.13 tons per acre of cured hay, but without lime only 1.16 tons. In 11 series of experiments, the average yield of clover hay on common soils of East, Middle, and West Tennessee was 2.31 tons per acre with lime; but only 1.48 tons and badly mixed with weeds, where no lime was used.

Numerous experiments have been made to determine the effects of liming on both corn and wheat under common farm conditions throughout the State. The results show a marked and rather uniform increase in yield from liming. In 12 series the average yield of corn was 36.5 bushels per acre where limed, but where unlimed the average was only 30.8 bushels. The actual increase in bushels per acre for wheat on limed land is not so great as for corn, but the percentage increase is about the same.

The average yield of 13 series with soybeans was 1.78 tons of cured hay per acre under liming, and 1.45 tons without liming. The average of eight series with cowpeas was 1.13 tons of hay per acre under liming, and 0.85 tons without liming.

The effect of even a moderate liming was found to last for a number of years. Appreciable increases in crop yields from a single application have continued for at least eight years at the Station. To build up a poor soil that is deficient in lime without the aid of liming is an especially difficult task for several reasons. One reason is that the best improvement crops cannot be satisfactorily grown where lime is deficient. With the aid of ground limestone, clover flourishes on farms where it has long been a stranger.

The effects of liming both on crop production and on changes taking place in the soil have been subjects of special investigation by the Station. Much of the work is only of scientific interest at the present time but may well be of practical significance as the knowledge of soils increases.

Liming Increases Potash Need

A rather outstanding practical discovery was made, however, in the continuous experiments in a rotation of cowpeas and wheat, with regard to the effects of liming on the availability of soil potash, which was clearly demonstrated to become more quickly deficient on limed land than on unlimed land. Later it was shown in lysimeter tests that less potash leached from limed than the unlimed soil. Still later soil samples from various places in the State where lime and fertilizer experiments were being conducted were analyzed for water-soluble potash with the result in nearly every instance that less potash was obtained from the limed than the unlimed soil. The conclusion seems now to be well established that liming will increase the soil need of potash rather than diminish it as has been generally believed.

More than $3,000,000 is spent annually by Tennessee farmers for fertilizer, and it is conservatively estimated that five times this amount could be profitably utilized. The Station maintains a staff which long has been studying the various soil types, their plant food requirements, the most economical fertilizers for the various types, lime requirements, crop rotations, etc. The most extensive work done by the Station is along these lines and the results have laid a solid foundation for the rational use of fertilizers and for the improvement of the various kinds of soil found in the State, which has been subdivided into a dozen or more well-defined large areas with special requirements.

The Station has conducted experiments for 19 years to determine the value of barnyard manure in increasing soil fertility. The average gross returns in increased crop yields were found to vary greatly with the crop on which the manure was used, but averaged more than $4.00 per ton of manure.

(*Turn to page 56*)

Tobacco plants at the Clarksville, Tennessee, Station show the effect of fertilization. The plants on the left received four pounds of 8-4-4, while those on the right were unfertilized.

This is what happened when the pressure dropped in turning the sprayer around at the ends of the rows. The plants in the foreground are all dead, while those in the background are alive and healthy.

Spraying Potatoes

By *E. R. Lancashire*

Ohio State University

RECENTLY the Ohio Experiment Station released information to the effect that bordeaux mixture has an insecticidal value. This work was done on the potato leafhopper. It was found that the copper in bordeaux mixture entered the juices of the potato plant and that when the leafhopper sucked these juices into its body the copper caused the insect's death.

There is a feeling among potato men that the shading effect of a copper-lime bordeaux is another valuable aid to the potato crop. Then there is the older and better known repellent action of bordeaux against insects and the fungicidal action on potato foliage diseases such as early and late blights. Some have reported that a stimulation of the foliage results from the action of the copper in the bordeaux on the plant. This stimulation has been noted even when insects and diseases were almost entirely absent. All things considered, such an imposing array of reasons for the use of a bordeaux spray would make the proposition worthy of investigation.

Where leafhoppers are plentiful, spraying is especially desirable. These small active insects have sucking mouth-parts with which they remove the potato juices. This fact alone would not be serious. On withdrawing their mouth-parts these leafhoppers leave some toxic substance which in time causes the tips and edges of the leaves to turn brown, become crisp, and take on a burned appearance.

This often occurs a few weeks before the normal death of the vines. In such a case the potato plants are dead before the tubers are much more than half grown. Many times the vines die down within a few days. Often the grower thinks some disease has wiped out the field. Where leafhoppers are uncontrolled, it is very rare that the foliage is not entirely killed by the last part of August.

Leafhoppers work on the under side

(*Turn to page* 51)

Industry Presses Onward

¶ Bringing to colleges of agriculture and to industries that serve agriculture special problems and opportunities.

By G. J. Callister

IN the preceding paper it was shown that industry is more and more being regarded as fundamental to our national life, rather than incidental to it; that this change is exerting far-reaching influences in our every-day affairs; and that the great need of industrial activity today is for a more definite goal. It was further noted that even though agriculture is behind in the march, industries that more specifically serve agriculture still have made significant contributions to the march of industry as a whole. Far-reaching internal and external adjustments in production and distribution have been effected. Technically trained forces to aid the farmer in the utilization of the products of industry have been organized. These technical forces are growing in number and the scope of their activities.

Thus agricultural industries and the forces of scientific agriculture are confronted with problems and opportunities that have much in common, problems which must be solved if their respective and growing obligations to the farmer and society are to be fulfilled.

The soundness of two broad viewpoints, therefore, is of vital importance: First—that of the changes and developments within industry and especially their causes; Second—that of the derivation of sound principles on which the work of the various groups involved may be harmonized.

To refer briefly to the first viewpoint, among such developments are the modern phases of the so-called industrial revolution, the influence of labor and science in this movement, the effect of such forces in adding to the social responsibility and scope of business management, the necessary distinction between agricultural and urban industries, and finally the vital emphasis that now is being placed on the utilization of the products of industry, for around this emphasis on utilization centers some of the chief problems with which management has to deal. Capacities for production and distribution are being revolutionized. An increased emphasis on a more scientific, fruitful, and socially acceptable utilization is inevitable.

It is the purpose of this article to discuss briefly these developments within industry.

II Industry Changes

That there has been and still exists a revolution in modern industry hardly needs to be proved. Many publications proclaim this fact. The term is common currency in contemporary literature. Only recently, American, British, and European authors have ısed it. For instance, Wallace B. Donham[1] says:

"It is not at all strange, therefore, that the early advances of the industrial revolution brought about shocking abuses, . . ."

The British author, Sheldon[2], uses the term in a more qualified sense:

"We have traveled fast; in a few years, as in the era in the so-called Industrial Revolution . . ."

The French author, Andre Siegfried[3], states:

"Now, two huge events have taken place since; namely, the Industrial Revolution, which has transformed the conditions of production, and the World War, which has completely altered the relations of Europe with other continents."

Undoubtedly, the term "industrial revolution" properly represents in most countries an evolutionary social movement, characterized by relatively slow growth and orderly development, rather than a radical, sudden change. It has culminated in many industries, in standardization of operations, and mass production.

Whether good or bad, desirable or not, this industrial revolution is going on. It is affecting society; its effects cannot be ignored. If agricultural industries are to make sound adjustments of these changing conditions; if confusion and loss are to be avoided, then the causes of this change within industry are of some practical and social significance, to everyone connected with agriculture.

What are the causes? According to Sheldon, there are two causes within industry making for change—labor and science. These two causes, he points out, are of major importance.

"Looking immediately ahead, the two major forces making for change with which management has to deal are Labour and Science. The greater the changes these forces portend, the greater the responsibility of management for the safe pilotage of the vessel. The activities of these two forces indicate most surely that the sea which has to be traversed in the years ahead will be far from placid."

Thus both labor and science are vital forces within industry making for industrial change; for the evolution of changing concepts and practices.

III Utilization Comes In

We are concerned here particularly with the influence of science, especially in the field of industrial utilization in connection with the technical forces organized within industry. The significance of this influence in industry is strengthened by the fact that the effect of science on industry, trade, and commerce, is far from a modern development. As a practical concept it has been part of the thought of man for centuries.

Glance backward a moment. For instance in the Middle Ages, it is recorded that science transformed the whole social system of certain centers, even in that remote day. Paul LaCroix[4] brings this point out rather vividly.

"Venice, which had so long been hostile to the psychological chemists, showed favour to practical and working chemists, and the same was the case in the cities and states where commerce throve. The metallurgists demonstrated to the public that they would consult their interests—always the main motive of human progress—by allowing them to construct blast-furnaces, foundries, and manufactories and in this way they transformed in a few years the whole social system."

If the social system of today is being transformed by the aid of science in industry, it is at least nothing new.

1—Donham, Wallace B. Harvard Business Review, Vol. V, No. 4, July, 1927.

2—Sheldon, Oliver. Philosophy of Management.

3—Siegfried Andre, Harvard Business Review, Vol. VI, No. 1, Oct., 1927.

4—LaCroix, Paul. Science and Literature in the Middle Ages.

There is an age-long precedent for this.

Stepping forward a few centuries to the seventeenth, the needs of trade and commerce were the chief reasons for granting the charter to the Royal Society in England in 1662. In fact, in that day men of trade and commerce belonged to the Royal Society for the good and practical reason that it was hoped that by such means the results of experimental work would be made available for the good of trade. As Ornstein[1] has recorded on this subject—

"Side by side with purely scientific problems, there went a consideration of things relating to trade and commerce and manufacture; and it was this phase of their interests which, especially in the first instance, won them royal patronage."

About the same time (1686) the practically-minded Louvois sent word to the French Academy to make the work of the Academy more practical. At a later date the classic scientific work of Liebig in aiding the establishment of the potash industry in Germany is well known, as is the work of John Lawes in England, who in the early days spent half his time in a superphosphate plant in London. Apparently the practical application of scientific work to easing the day's burden always has appealed to men.

America Steps In

Turning to America, at the end of the eighteenth century, industry, of course, was limited. The organized emphasis of scientific work was on medical societies and to cultivate "every art and science which may tend to advance the interests, honor, dignity, and happiness of a free, independent and virtuous people." At least this was the object in organizing more than one of the scientific societies of the day, a perfectly natural emphasis. People first looked after their health, their happiness, independence, and their virtue and dedicated science to these purposes. Whether the modern emphasis of science on industry is any real progress may be open to question.

To be more exact, prior to 1800 there were founded in the United States 12 scientific societies, 8 of them medical. In the first half of the nineteenth century there were founded 30 societies, more than half of these were medical. Even in 1870-80, when there were founded 52 scientific societies, twice as many as in the previous decade, medical societies still held first place. But of course in this period also were formed, as in the previous decades, other scientific societies, historical associations, natural history societies, etc. The modern organization of societies is well known, and it is in this modern organization that science has been more definitely linked with the growth of industry.

Broadly speaking, while the results of scientific work have been more or less allied with trade, commerce, and industry in a groping fashion since the Middle Ages, it is not until recent decades that Man has emancipated himself socially, has subdued continents, and has gained the time to develop scientific work or to avail himself fully of the results of such work in industry. The new thing is not the concept of science in industry; it is the volume and intensity of application.

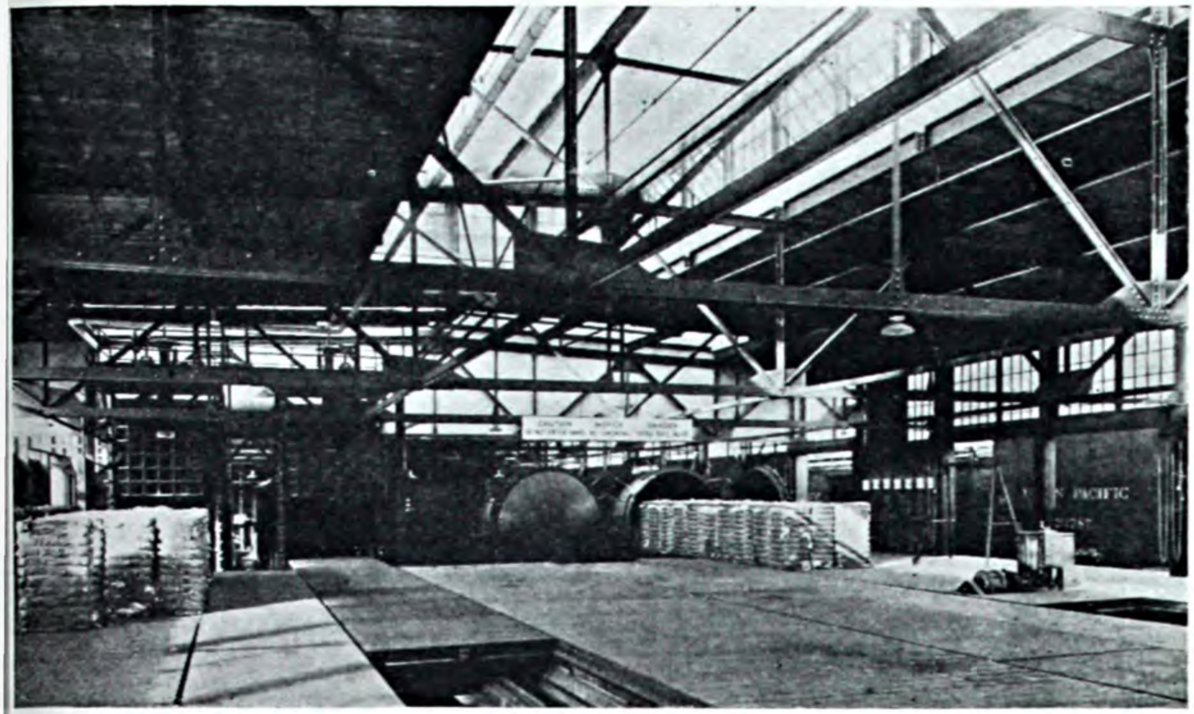
Thus, both from a contemporary and historical viewpoint, science as an influence in commerce and industry is a fundamental part of Man's thought and social effort, a vital part of his thinking, and undoubtedly will continue to be a force with which Man will have to seriously reckon in the decades immediately ahead.

This power of science influences two broad divisions of industry, namely,

(*Turn to page 47*)

NOTE: "Many of their number are men of traffic which is a good omen that their attempts will bring philosophy from words to action, seeing that men of business have had such great share in the first foundation . . . Several merchants, men who act in earnest, have adventured considerable sums of money to put in practice what some of our members have contrived." Robert Hooke.

1—Ornstein, Martha. The Role of Scientific Societies in the Seventeenth Century.



Cotton fumigation plants have been established at Mexican border ports to prevent the entry of cotton pests into the United States.

Agriculture Today

VII. Entomology

By Frank George

ENTOMOLOGISTS now are centering their attention upon the Japanese beetle, the cotton boll-weevil, and the European corn borer, the three leading crop pests in present-day American agriculture. The Japanese beetle at the close of the 1928 summer season occupied an area of approximately 20,000 square miles in New Jersey, Pennsylvania, Delaware, New York, Connecticut, Massachusetts, Maryland, and Virginia; the cotton boll-weevil is entrenched solidly in practically all parts of the cotton belt, and the corn borer is steadily encroaching upon the corn belt.

"It became evident soon after investigations of the Japanese beetle were begun in 1917," declares Dr. A. L. Quaintance, associate chief of the Bureau of Entomology, "that extermination measures were not feasible, and that efforts should be made to prevent long distance rather than local spread. Rapid multiplication and extensive feeding on economic crops indicated the possibility that the Japanese beetle would become one of the more serious of the introduced foreign pests."

Estimates compiled by the Crop Reporting Board indicates that for the cotton belt as a whole, yields per acre in 1927 were reduced more than 19 per cent by the cotton boll-weevil, the smallest percentage of damage being 1.3 per cent in 1911, and the largest percentage 31.2 per cent in 1921. Until 1914, boll-weevil damage was confined largely to the states west of the Mississippi River, and it was not until 1922 that it had spread over the entire cotton belt.

Regarding the corn borer, Dr. Quaintance says, "this pest is truly a grave menace to corn growers, but the outlook is not so dark as it first appeared. The clean-up method of control has been proved effective in Kent and Essex counties, Ontario, where complete destruction of the corn crop was observed over large areas in 1925 and 1926. Through the practice of clean-up measures, the corn borer has been reduced during both 1927 and 1928 in these areas."

Early realization of the potential seriousness of the Japanese beetle led to the inauguration of a quarantine in 1918 by the New Jersey Department of Agriculture, and since then quarantines have been maintained by the Federal Horticultural Board, the State of New Jersey, and, later by the States of Pennsylvania, Delaware, New York, and Connecticut. The first quarantine included only green, sweet, or sugar corn, since at that time this was believed to be the commodity most likely to carry the insect to points outside the garden area.

These regulations have been changed from time to time to meet the changed conditions brought about by the extension of the infested area and increase in the density of infestation. During the season of 1928 the movement of all farm products, with the exception of certain root crops and dry seeds, was restricted. Restrictions were also placed upon the movements of all nursery stock, sand, soil, peat, compost, and manure. It has been considered that restricting and safeguarding the movement of nursery stock and other plants are perhaps the most important phases of the quarantine work. These efforts, so far as known, have entirely prevented the distribution of the insect with nursery products during the last 10 years.

Parasites Control Beetles

Government entomologists have been making investigations in the Orient to discover and ship to this country parasites which are known to attack the Japanese beetle, and five species of these parasites have been established in New Jersey, New York, and Pennsylvania. One of these is a tachinid fly which has spread outward from the central point of liberation over an area of approximately 90 square miles. This parasite attacks the adult beetles.

Two dexiids, parasitic on larvae of the Japanese beetle, have been found to be established during the past year,

Native Japanese are employed to collect insect parasites of the Japanese beetle.

Release cages are used in the introduction of parasites of the alfalfa weevil.

nd two solitary wasps have been in-roduced and are now established in his country. One of these, *Tiphia opilliavora,* was sufficiently numerous 1 1927 near Riverton, New Jersey, to ermit the establishment of 11 sub-olonies of this parasite in New Jersey nd Pennsylvania. At present, two nembers of the bureau are located in apan and Korea, and one in northern ndia, for the purpose of collecting nd rearing parasites for shipment to he United States.

Poison the Boll-weevil

"In the early days of boll-weevil xperience," Dr. Quaintance says, we were forced to rely almost en-rely on cultural methods of control, nd for many years cotton was suc-essfully grown under that system. he natural conclusion is that it still as merit, and should be carefully racticed. Briefly, these cultural meth-ds include the selection of an early naturing variety of cotton, planting he seed as early in the spring as is onsistent with the procurement of a ood stand of vigorous plants, the fall estruction of cotton plants by burn-ng or plowing under, and the destruc-on of all volunteer plants in the pring."

Within comparatively recent years nore direct methods of control by the se of calcium arsenate, aimed at the dult weevils rather than the larvae, ave been developed. Criticism is heard frequently of the recommenda-tion not to begin poisoning until 10 to 15 per cent of the squares are punc-tured, but Dr. Quaintance defends this procedure because the cotton plant normally puts on many more squares than can be matured, and a certain number are shed naturally. Up to a certain point, squares which are shed because of weevil infestation merely take the place of healthy squares which the plant would other-wise discard.

Question is raised as to whether it pays to use poison dust on cotton. It will pay to poison according to Dr. Quaintance, if the weevils are really injurying the crop seriously; if the land is sufficiently fertile to yield at least one-third bale per acre with weevil injury eliminated; and if the farming organization is such that the poison applications will be made at the right time and in the right manner. Farmers should not poison if the cost of the calcium arsenate, the cost of the labor to apply it, and the deprecia-tion on the dusting machines will total more per acre than the current value of 100 pounds of seed cotton.

Farmers who use poison are urged to use only pure calcium arsenate in the form of a dry powder, applied in the dust form. The poison should con-tain not less than 40 per cent total arsenic pentoxid, not more than 0.75 per cent water-soluble arsenic pen-toxid, and have a density not less than

80 or more than 100 cubic inches per pound. The poison should be used when the air is calm and the plants are moist, at the rate of about 5 to 7 pounds of calcium arsenate per acre for each application.

The cotton must be thoroughly dusted until the weevils are under control, which usually means about three applications at the rate of one every four days. If the weevils become abundant early enough to injure the young bolls, one or two more applications may be made late in the season. A heavy rain within 24 hours after dusting requires a repeat application immediately.

Search for Borer Parasites

The corn borer was first discovered near Boston, Massachusetts, in 1917 when it was estimated that it had infested about 100 square miles of territory. Investigation of the pest was begun immediately and as the borer advanced into new territory, the Federal organization for research was expanded. At present, research problems regarding the corn borer are being studied at six Federal laboratories scattered throughout the infested area of the United States, and at one laboratory maintained in central Europe to study the insect in its native habitat. The search for effective parasitic enemies of the pest is being carried on by Federal entomologists in Europe and the Orient.

The use of parasites which prey upon insects that destroy American crops is regarded by some entomologists as the most effective means of holding these crop pests in check. Approximately 100,000,000 predatory parasitic insects, representing 45 different species, have been brought from Europe and released in Northeastern states to prey on the Gipsy moth. At least fifteen of the species have become established and are attacking the insect. More than 500,000 insects of eleven species of parasites which attack the Japanese beetle have been imported from Japan and liberated in the United States.

The search for parasites of the corn borer is being intensified as part of the national campaign against this pest. Entomologists with headquarters at Hyeres, France, are seeking the parasites in France, Italy, Spain, and Portugal. As yet, only 12 species of parasites of the corn borer have been found, of which six have become established in the United States. The idea of the entomologist is to find parasites which will attack the borer in each stage of its development.

Orchards Saved by Beetles

The Federal practice of finding and rearing parasites to attack crop pests began with the introduction of a ladybird beetle from Australia into the citrus orchards of California to check the ravages of the cottony cushion scale which threatened to destroy the citrus fruit industry. Entomologists obtained 127 specimens of the ladybird beetle which has been discovered in Australia feeding upon the scale. These beetles were released in the infested orchards in California, and within 18 months they had practically cleaned out the pest.

Since then, many species of introduced parasites and predacious insects captured in foreign countries by the Government entomologists have been imported and are assisting in holding in check the scale insects, aphids, and mealybugs in the citrus orchards of Florida and California. These beneficial species are being reared in large numbers in laboratories in California.

Fumigate Imports

Practically all foreign insect pests which have become established in the United States gained entry prior to the organization of the Federal quarantine system, only the pink boll-worm have

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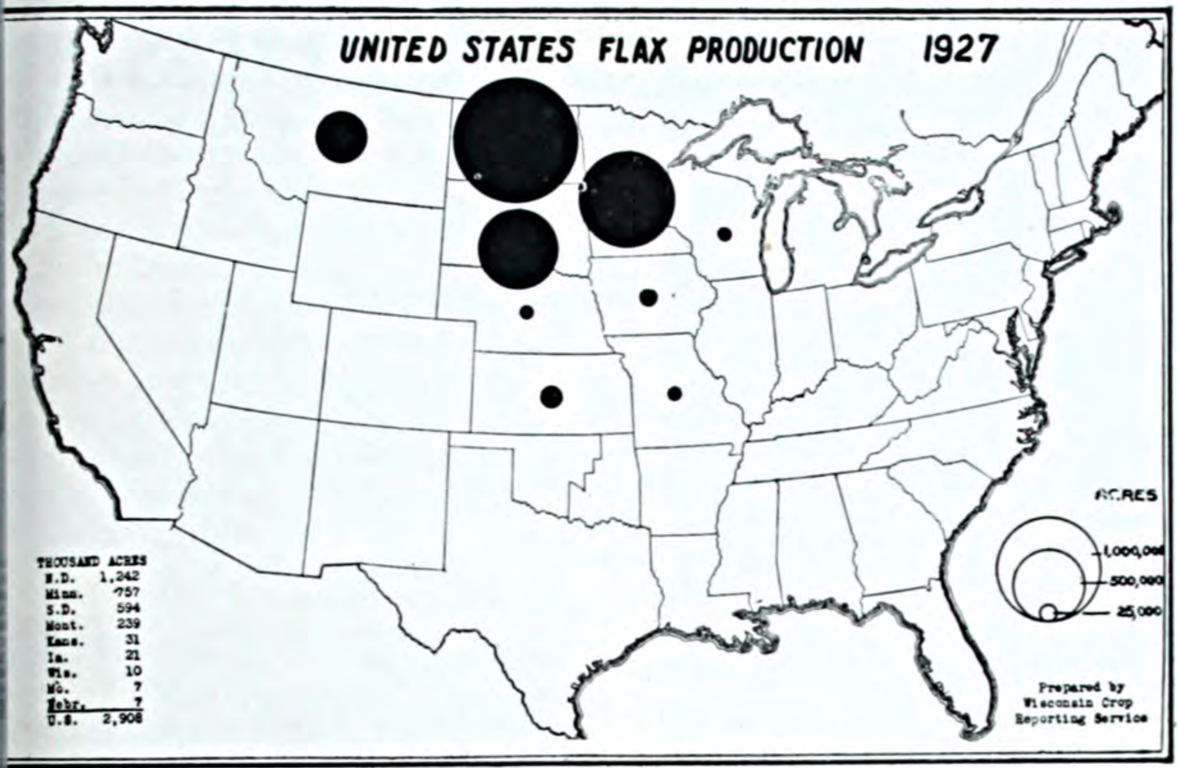

FLAX ¶ *Seventh of our crop series*

By Walter H. Ebling

Agricultural Statistician, Wisconsin

FLAX is one of the historic crops which has long held an important lace in the affairs of men. Its use or both oil and fiber has been comnon the world over for centuries.

The world crop at he present time still s grown for these two nain purposes, oil and iber production. The eed for oil is grown nder widely different onditions and in early all countries. 'iber production, on he other hand, is imited largely to a ew European counries, Russia leading. Recently it has been egun on a small scale in America.

The United States is not an important flax producer, growing only about 15 per cent of the world total and ranking fourth among the nations. The Argentine Republic leads with 35 per cent, followed by Russia with 22 per cent and India with 17 per cent. The production in the United States is limited almost entirely to seed which is used in the manufacture of oil. The four leading flax states are North Dakota, Minnesota, South Dakota, and

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Weeds or Crops?

By A. L. Stone

Agronomist, Wisconsin College of Agriculture

In many sections of the country farmers neglect noxious weeds like quack grass and Canada and sow thistles in a way that astonishes the observer. As one drives along the roads and notes acres of Canada and sow thistles going to seed in pastures and grain fields and no apparent attention being given to them, he wonders what is the philosophy behind this indifference to what seems like an extremely serious condition of affairs.

Conversation with the owners or renters on the infested farms shows that there are a number of reasons why the weeds are neglected. Some say that the lack of help makes it impossible to devote any time to weed-killing. Care must be given to the growing crops. Haying and harvesting follow closely after the "laying by" of the corn. Threshing follows harvesting. Neglect of any of these will be sure to cause a loss of crop which the farmer can ill afford. Labor is now more plentiful, and this plea has ceased to be a reason and has become an excuse.

Others say that they do not worry about the weeds because it makes little difference whether maximum crops are raised when the prices of farm products are so low. It is just as well to raise a small crop, "because the smaller the crop the better the prices."

On still other farms there are renters who have nothing in the contract with the farm owner stipulating that they shall cut or destroy the noxious weeds.

Many of these farms are operated on short time leases and the renter's interest is only temporary. His great aim

Perennial sow thistles have nearly ruined this barley field.

is to get the most possible off the farm with the least possible outlay in labor. To him time spent in weed cutting or eradication seems wasted effort. Sometimes the owner of the farm is a non-resident, and unless the weed commissioner comes and cuts the weeds they go to seed unharmed.

Some farmers say that a few patches of noxious weeds are a good thing because more intensive cultivation is required to keep the weeds down and this results in bigger crops than would be obtained if the weeds were not there and less cultivation were given. Somehow it never seems to occur to the men who advance this argument, that the same amount of cultivation could be given and a still larger crop raised if there were no weeds there. To use weed infestation as an argument for crop cultivation seems peculiar to say the least. It is a poor excuse.

The theory that the destruction of noxious weeds is a task to be undertaken only when there is nothing else to do is responsible for the appalling conditions in some of our northwestern states where Canada thistles or perennial sow thistles have taken possession of thousands of acres of our most productive lands. Many farmers who think things through and especially those who read good farm papers are beginning to wonder if this theory, that weeds can be neglected, is a good one.

Render Pastures Useless

While to care for and harvest the crops is, of course, essential, there is no doubt that in some cases it would pay better in the end to reduce the crop areas somewhat and devote more time to the destruction of weeds. On a recent trip the writer saw fields so thickly infested with Canada thistles that there was no possibility of raising any kind of crop on them. Fields of 20 or more acres supposed to be pasture were utterly useless as such. There were grain fields in which from

Quack grass, if given a good start, makes short work of a cornfield.

five to fifty per cent of the area was producing thistles instead of grain. In other fields the purple blossoms of the Canada thistle mingled with the yellow of the perennial sow thistles.

Hay fields were nearly as bad as the grain fields. One farmer who was asked if the thistles were not a nuisance in the harvested hay and grain said, "Oh yes, we have to wear buckskin gloves while handling it." In some sections noxious weeds already occupy completely an average of 25 per cent of the farm land. Strenuous campaigns are being started in the Dakotas, Minnesota, and Wisconsin to stir up the farmers to the danger which confronts the farming interests of those states.

Noxious weeds are spreading at an appalling rate. Anyone who doubts it has only to take an automobile trip through the states mentioned. And yet the farmers go on neglecting them without thinking of the future and what the result is sure to be if such neglect continues.

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Fertilize Your Alfalfa

By Robt. M. Salter

Agronomist, Ohio Agricultural Experiment Station

ALFALFA has been the most highly advertised crop in America. For a quarter of a century, its praises have been sung in the farm press, in publications of our agricultural colleges and experiment stations, in innumerable speeches by agricultural leaders. By reputation it is the forage crop par excellence, a great crop for feed, and a great crop for the soil. Most farmers would like to grow it. Large numbers have tried growing it. But, the fact remains that today, in the three states of Ohio, Indiana, and Illinois less than 1/50 part of the cropped land is growing alfalfa whereas other hay crops make up from 1/5 to 1/3 of the total acreage.

What is the reason? Most farmers know. Alfalfa is not an easy crop to grow. Many have failed for every one who has succeeded. Alfalfa is an exacting crop. It requires good drainage, plenty of lime in the soil, and last, but by no means least, an abundant supply of mineral plant food. It is the aristocrat of the legume family—quite different indeed from its lowly cousin, sweet clover, which grows almost anywhere if enough lime is supplied.

Alfalfa has suffered because of its reputation as a soil improver. The tendency has been to seed it and then let it shift for itself. To be sure, under proper conditions, alfalfa can gather enormous quantities of free nitrogen from the air. Unfortunately it can't get its phosphoric acid and potash in the same way but is dependent on the soil, just like corn or wheat or any other crop. What's more, it needs a lot more of these mineral elements than most crops.

A three-ton crop of alfalfa hay removes from the soil nearly twice as much phosphoric acid and fully three times as much potash as the grain and stover of a 60-bushel corn crop. Many farmers, who wouldn't think of growing 3 or 4 corn crops in succession on a piece of land without liberal applications of manure or fertilizer, will sow alfalfa and mow it 3 or 4 years without any fertility treatment whatever. When the stand thins out, apparently due to winterkilling, and the grass and weeds come in, few realize that this condition is often the result of phosphate and potash starvation.

Of course there are certain types of soil and certain kinds of winters when even the thriftiest of alfalfa plants will heave out and die. On the other hand, alfalfa stands, which have not been injured by too frequent or too late cutting and which are supplied with enough phosphate and potash in available form to permit a vigorous fall growth, will stand a lot more winter punishment than stands weakened by a lack of mineral elements in the soil.

How and What to Apply

How, then, shall we supply the plant food needed by the crop? First let us consider the treatment at seeding time. Most farmers are adopting the practice of spring seeding alfalfa in oats, barley, or wheat. Ordinarily oats doesn't come in for very heavy fertilizer treatment, the value of the increased grain itself being too small to pay for much fertilizer. We are finding in Ohio, however, that when seeding to alfalfa it pays to increase the application, the recommendation being from 250-300 pounds per acre

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An ordinary spike-toothed harrow was used to cultivate this field of corn up to this stage of growth, without damage to the crop and with effectiveness in killing weeds.

Why Cultivate?

By E. N. Bressman

Oregon Agricultural College

MANY reasons have been assigned to the important farm practice of cultivation. There is no doubt that many of these reasons have no basis and are misleading.

It has been said that corn cultivation warms up the soil, conserves moisture, makes plant food ready for use by the plants, improves the condition of the soil, and does many other things. On the other hand, many of the recent corn cultivation trials have shown that practically the entire value of cultivation is in the killing of weeds. The method of cultivation, therefore, should be designed to kill the most weeds at the least cost. Many methods of cultivation now being used do not do this. Particularly is this true in sections where they cultivate throughout the entire corn-growing season and cultivate when no weeds are present. In other instances, it appears that the method of cultivation is not designed to kill weeds but to stir the soil every little while throughout the entire season.

At both the Kansas and Illinois stations they find that by scraping off the weeds on the surface of the ground and not stirring the soil at all they get as good yields as when the ground is stirred thoroughly throughout the season. There have been many similar trials and all indicate that the chief value in the cultivation of corn is the killing of weeds.

There are two methods of cultivation, ridge cultivation and level cultivation. Most growers prefer the level cultivation because it does not require a deep stirring of the ground and has less liability of damage to the crop. Also, the yields are just as good if not better than where ridging is practiced. The same is true of deep

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In the coast regions, the strawberry fields are filled with negro pickers.

The Strawberry Season

By C. B. Sherman

U. S. Department of Agriculture

THE strawberry season is growing to be a very long one as Florida and Louisiana come more heavily on the early markets and as the ever-bearing strawberries are used more frequently in the late summer and even early autumn. Formerly the very early berries were used only as a luxury by the well-to-do, but during some recent years market prices of Florida strawberries have been unusually low from January through March. In February and March strawberries can sometimes be bought in retail stores in Washington, usually considered a city of high prices, at 35 cents a box.

Contrary to usual beliefs and to usual rules, strawberries shipped in from a distance, out of season, are sometimes cheaper nowadays than the local berries in season; and shoppers are finding this out. Reasons for this apparent anomaly are many. As strawberries are a "labor crop," farmers do not plant large acreages unless they foresee fairly cheap labor in fairly large quantities, although the crop does not respond to changing conditions as rapidly as do most truck crops. Unemployment sometimes leads to large plantings and comparatively low prices. If the prospects are for a large crop, the opening prices rule lower whereas later disasters in strawberry areas may send prices up at about the time local berries come on the market. Then the earlier shipped-in berries may be more subject to deterioration than are the later local berries.

All of these facts are encouraging housekeepers to use strawberries over a much longer period than formerly and are thus creating a more steady demand. Development of earlier and later commercial varieties, use of fast trains, and refrigeration have all contributed to this long season.

Acreage has been steadily growing during the past three years and now reaches approximately 200,000 acres. Yield per acre varies greatly according to weather and pest conditions, but in general it is increasing. It has ranged from 1,500 to nearly 2,000 quarts during the past four years, so that the crop is now valued at about

$50,000,000. Arkansas, Missouri, and North Carolina have made greatest and most consistent increases of any states.

The straight carlot movement of strawberries from all producing sections of the United States amounts to 18,000 cars in seasons of normal production and about 19,000 cars have been shipped from the big crops. Then large quantities of strawberries, grown within hailing distance of city markets, are taken to market by wagon or motor truck. It is practically impossible to obtain accurate data regarding these shipments, but the importance of truck haulings is shown on the following figures from one area during a recent season. The equivalent of 1,140 carloads moved by truck from the peninsula of Virginia, Maryland, and Delaware, compared with 2,600 straight cars by rail, 200 carloads on l.c.l. express shipments, and 155 carloads by boat. Many strawberries are hauled from this peninsula as far north as Philadelphia, Newark, and New York and some are even hauled to Boston. Shipments have also been made by truck from North Carolina, and many Michigan berries are hauled to such markets as Chicago.

In each of the last few years, 24 leading markets have taken about 60 per cent of the total carlot shipments of strawberries. New York City usually receives more than 2,000 cars, Chicago and Boston very roughly around 1,500 cars, Pittsburgh and Philadelphia use about 500. Philadelphia and New York City receive the equivalent of 300 to 600 additional carloads by motor truck.

Marketing Covers Three Months

The Federal Market News reports show that the opening of the strawberry movement in Louisiana and other states may vary from one to four weeks in different seasons, according to weather conditions, but the principal period of carlot shipments usually is concluded by the end of June. Movement begins to be heavy by April, increases rapidly during that month and May, and usually reaches its peak about June 1. These reports show that ordinarily there are two peaks, with a small depression between them. Shipments reach their first climax around mid-May, when Arkansas, Tennessee, and Virginia are active. A second and greater peak frequently occurs the first part of June, when shipments from Missouri,

Berries are carefully packed for shipment. Somehow when the inspector is away the crates will get out of line and the premises out of order!

Maryland, and Delaware are heavy. A sharp decrease occurs by mid-June, and only a part of the late crop moves by rail after that month. Most of the late strawberries are consumed locally and do not appear in carlot reports.

In spite of the fact that the season for strawberries is much longer than formerly, the bulk of this highly perishable crop must still be marketed within three months. This concentrated movement necessarily presents difficulties. Weather conditions at shipping and marketing ends must be considered. Cars must be ready. Prices must be watched, yet stock cannot be held over. In southern Louisiana where the crop matures so early that no competing sections are shipping in volume, the auction method of selling has been successfully developed at Hammond. During some seasons it has been estimated that about 90 per cent of the tonnage was disposed of by open competitive bidding. The remainder of the crop was handled by private selling agencies and individuals. Practically all of the shipments from the district are made in express refrigerator cars. Each day after the fruit is gathered, it is hauled to the respective loading stations, loaded in refrigerator cars, and rolled toward northern markets. In the evening, the rolling cars are sold to the highest bidder and the new owners then divert their purchases to desired destinations.

Strawberries form the favorite fruit of a very large number of people and are one of our most popular fruits, but if a good market is to be maintained for these large and growing crops, it is evident that increasing care must be given to their preparation for market. Careful picking to prevent injuring the fruit and to prevent including green berries and trash in the boxes is essential unless the berries are to be sorted and repacked. Even then care in the fields is desirable and care in sorting to prevent bruising is necessary.

Grading and careful packing are receiving much more attention than a few years ago, but the methods could be extended advantageously. The Department of Agriculture has issued specifications for standardized grades, the uses of which are being extended.

Important commercial producing sections are gradually eliminating the less desirable varieties and are concentrating attention on the varieties that are best suited to their conditions or are in greatest demand from those sections.

Fruit Is Inspected

An important factor in the promotion of all of these practices designed among other purposes to put a better strawberry crop on the market is the Federal-State, shipping-point inspection service which is now available in most of the strawberry shipping sections. Upon request of the grower, shipper, receiver, or any other person who has a financial interest in any lot of fruit, an inspection is made of the contents of a car. A certificate is issued which describes in detail the quality, condition, pack, grade, load, and other important factors. This certificate is accepted as prima facie evidence in any United States court in case of a dispute; it is generally accepted as a basis of buying and selling; it is used as a basis of settlement for allowances or rejections; and in connection with insurance and the settlement of claims. The service is optional and the cost is only enough to cover the expense involved.

The inspectors usually work on the loading platform or in the car while it is being loaded. Usually a casual examination is made of every crate in each lot of strawberries delivered to the car, to note the uniformity of the lot, and a thorough examination is made of representative samples of each lot.

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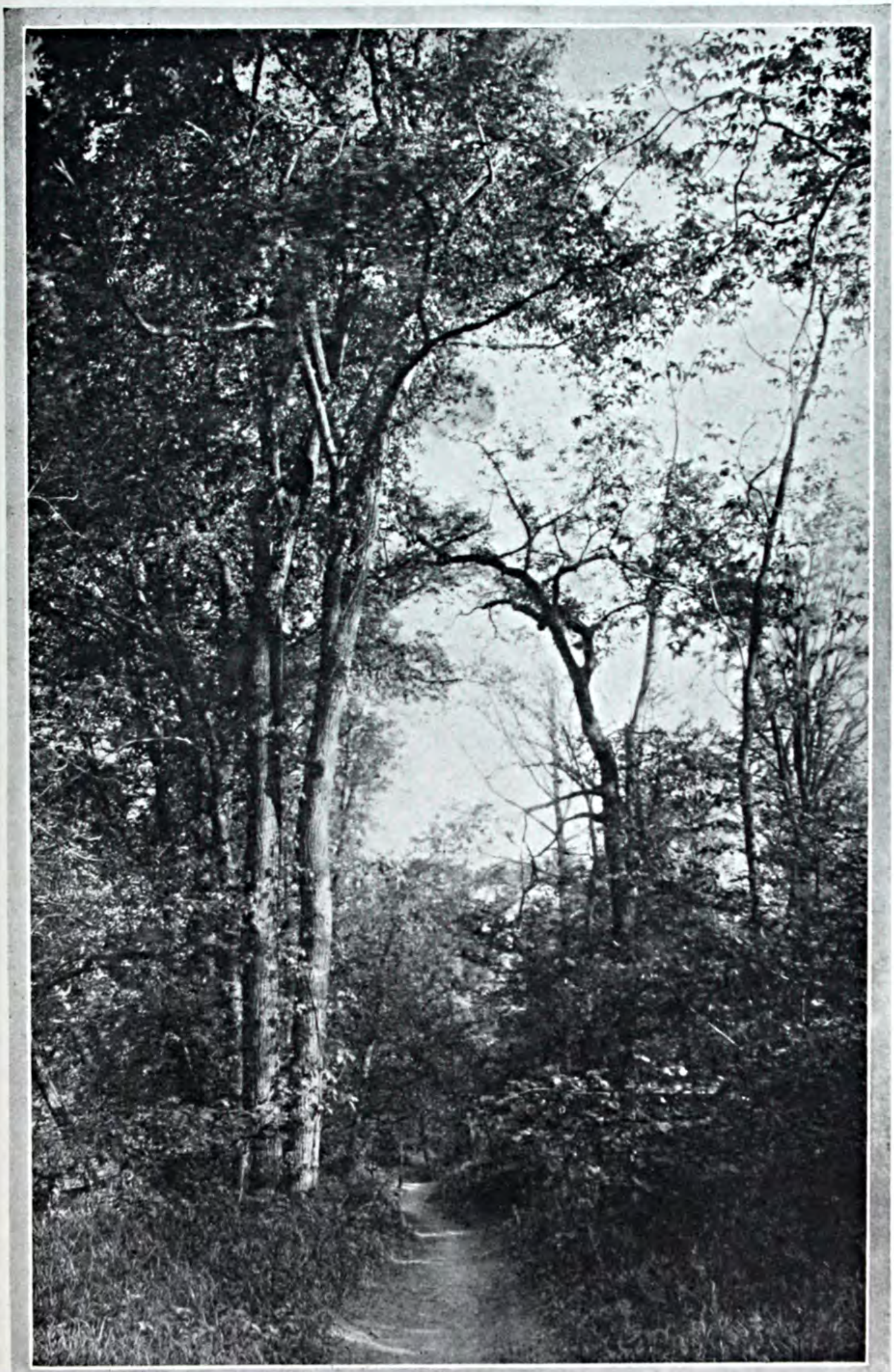
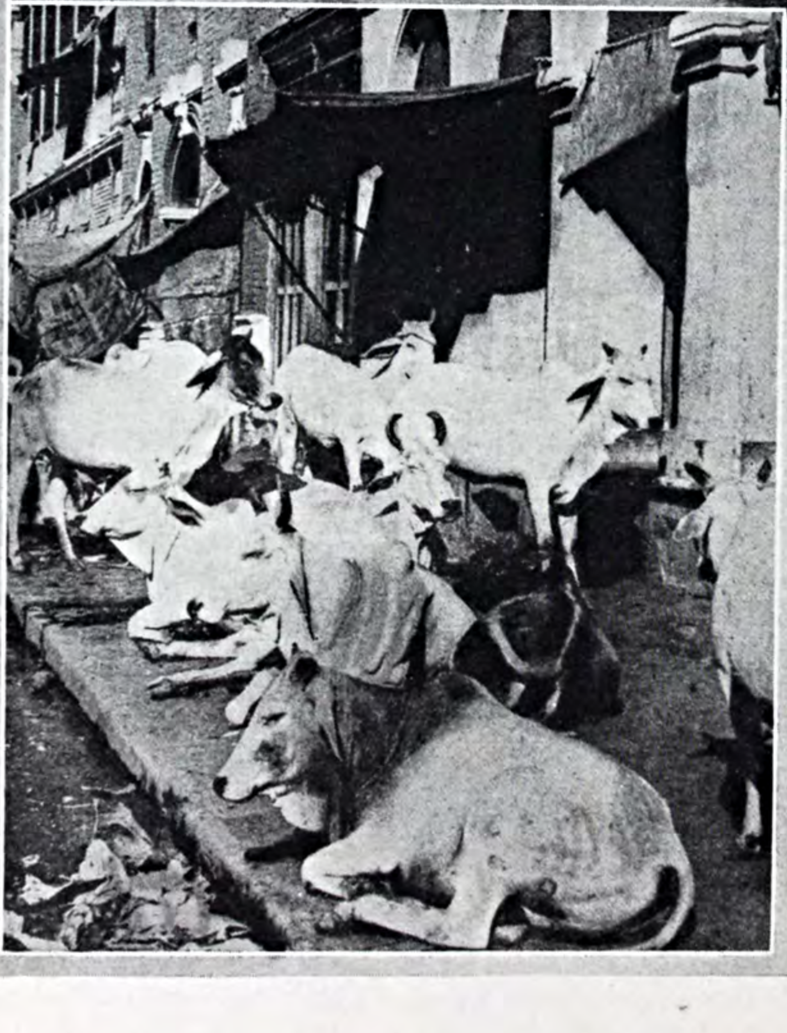


Lovers' Lane

PICTORIAL



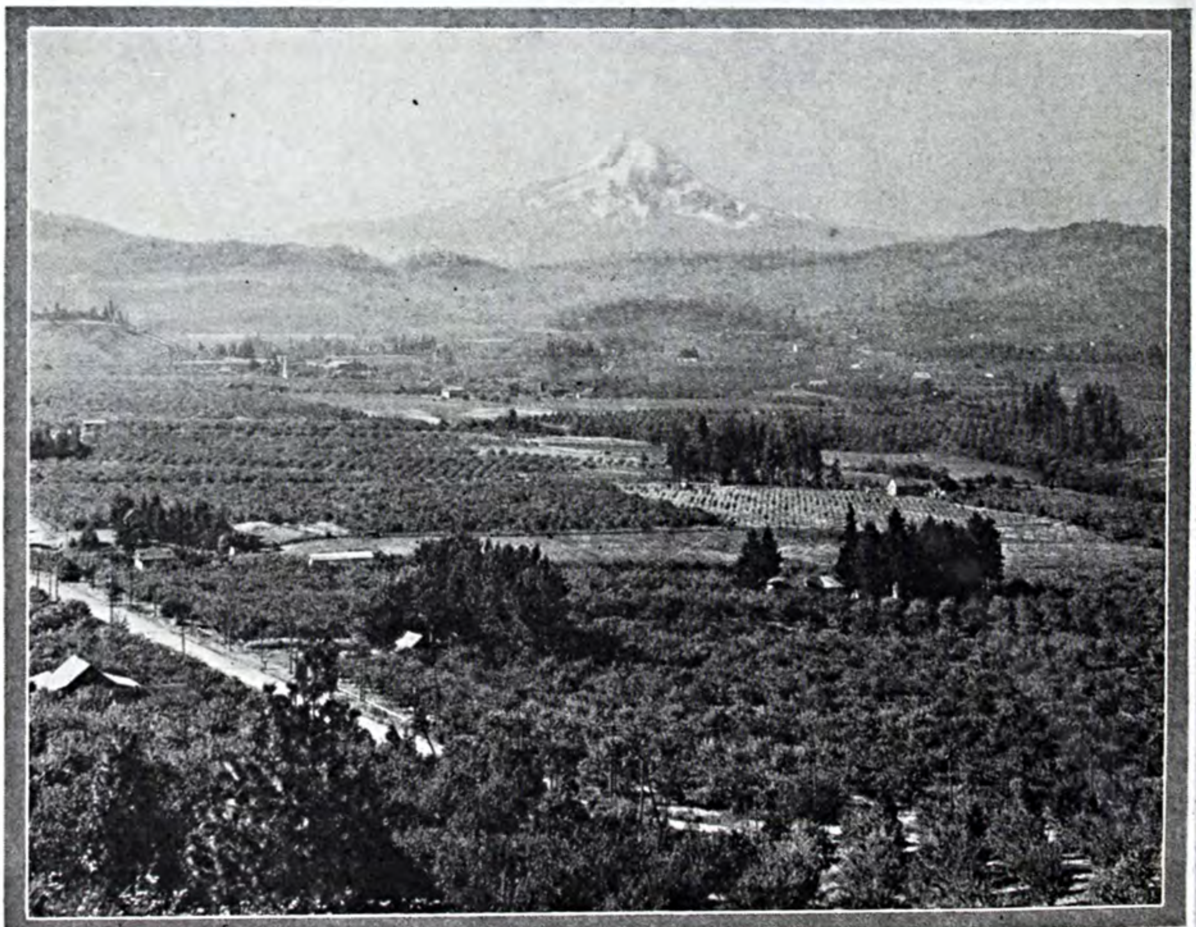
Above: These shy girls of high caste in India were photographed in a secluded garden by an American woman. They had never been photographed before because to have their faces seen by men, except the men of their own families, constitutes a disgrace to their families. Those with dark satin trousers are Hindus, and the others are Mohammedans.

Left: Hindu cows make themselves at home on the city streets in India. This picture was taken on a prominent street of Calcutta, and the cows seem as contented here as though they were in their green pastures.

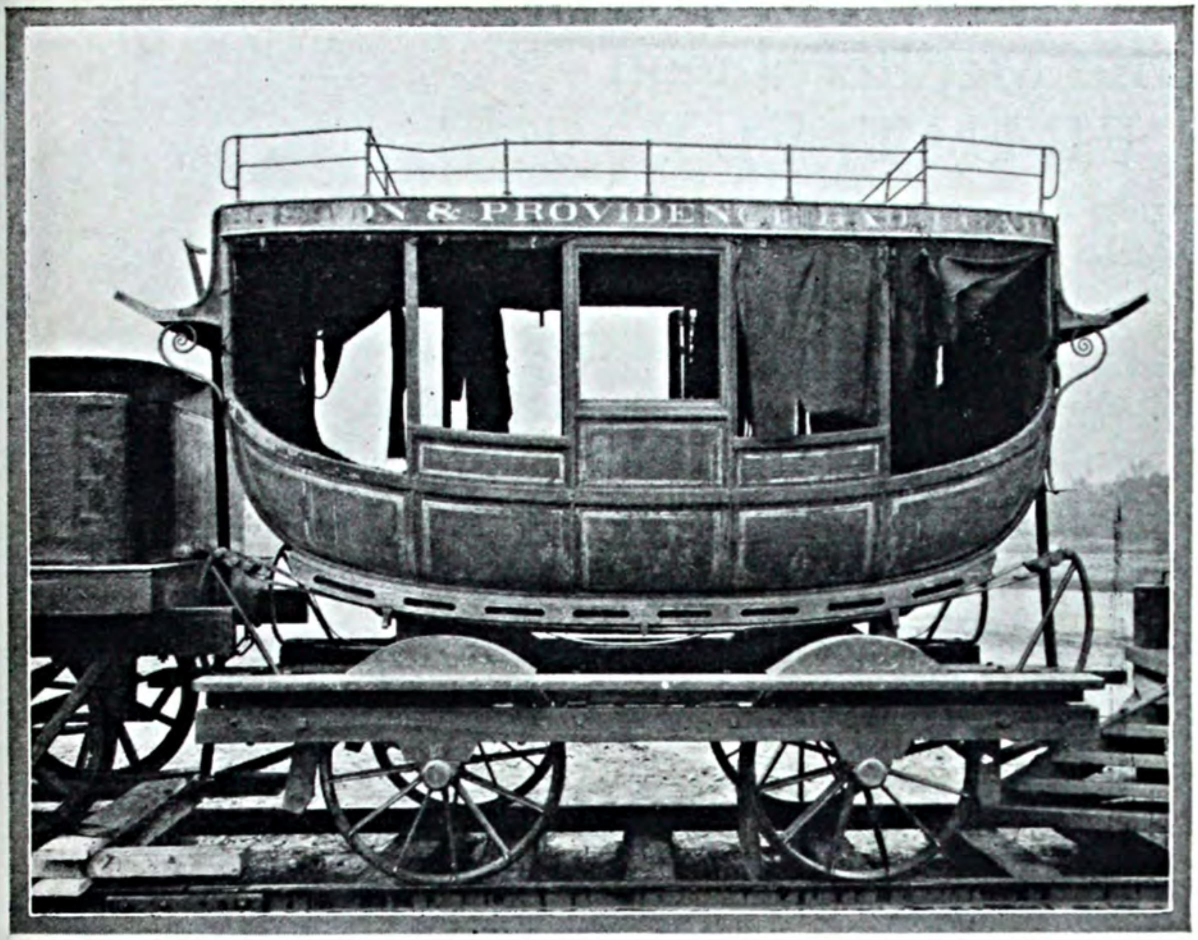
Right: Hundreds of cocoanuts are split and dried in the sun on the Solomon Islands, in the western Pacific. The dried kernel, without having the oil pressed out, is known as copra and is one of the biggest exports from the Islands.

Below: A strange farm is this snake farm at Sao Paulo, Brazil. Serums to cure snakebites are made with the venom extracted from poisonous snakes. It has been estimated that 5,000 lives are saved annually by serum from this place. The institute keeps all of its poisonous snakes in this enclosure, and the farm is a popular attraction for tourists.

Clarence Mallory of Greenville, Georgia, had his picture taken to "illustrate" his fish story about this large-mouth black bass.



This picture was taken across Hood River Valley, Oregon, and shows one of the famous fruit sections of the great Northwest.



An old Boston and Providence Railroad coach is now one of the points of interest in the museum at Purdue University.

Howard Mitchell of Alworth, Illinois, listens to baseball games and concerts while he cultivates his father's corn.

The Mediterranean FRUIT FLY

JUST as Florida was recovering from the real estate agent and floods, a new cross has fallen upon the State in the form of the Mediterranean fruit fly, one of the worst pests known to Horticulture. The insect, which is about the size and appearance of the housefly, is causing wide concern, and Congress recently passed a special appropriation of $4,250,000 to aid in its eradication. These pictures show a male fly in the flying stage, acres of ground covered with infested fruit, and a section of a grapefruit showing damage from larvae.

The Editors Talk

Asking for Results

We are interested in the leading editorial in the June 1 issue of the Illinois Farmer in which the editors are asking for reports on fertilizer tests from the publication's readers. Entirely commendable is this effort on the part of this publication to give publicity to the individual work which farmers are doing to improve the soils of the state.

Because of the variety of soil types in this country, variation in rainfall, and other local factors, it is often difficult to know in advance just which fertilizer analysis will produce the most profitable crop on any particular farm. Farmers are encouraged to make their own experiments. The interest of the local press in these farm experiments is a big step toward encouraging more farmers to determine for themselves the most profitable fertilizer to use.

We are pleased to quote the editorial herewith:

FEEDING CROPS FOR PROFIT

Our check on feeds and feeding methods of livestock in Illinois is more complete than similar knowledge and information about feeding plants for profitable returns. Always we have had to feed the animals. For several generations the plants helped themselves and found plenty of everything to supply their needs. The soil of Illinois, as civilization found it, supplied pretty much a complete ration for crops. Some of the items of plant diet meanwhile have been seriously depleted in supply, hence our growing concern about soil fertility.

In 35 states farmers feed to their crops 7,500,000 tons annually of prepared plant food in the form of fertilizers, in addition to the fertility conserved from livestock production, and added from the intelligent use of legume crops. Last summer the fertilizer association representatives asked a lot of questions of nearly 50,000 farmers in these states concerning crop feeding. "Based on your experience, what increase do you expect from the use of fertilizers on your most important crops?" This was one question asked. Illinois farmers numbering 286 answered this in regard to corn. The average of their experiences showed acre yields of 32.3 bushels an acre without fertilizers, and 41.7 bushels with fertilizers. Wheat farmers, 95 in number, reported average yields of 14.3 bushels without fertilizers, 21 bushels with fertilizers. In Indiana the figures for corn, with 1,918 farmers reporting, were 34.7 and 44.5 bushels an acre respectively, and for wheat, 1,931 farmers reporting, 13.1 and 21.2 bushels respectively.

We find that numerous Illinois farmers in all sections of the state are this year testing out for themselves, with check plot and test rows, just what commercial plant food may mean to their cropping system. We should like reports from readers on results as the season advances. The relation of cost to returns is the vital factor.

Autumn Fairs

It is not too early to begin thinking about and preparing exhibits for the agricultural fairs which will be held all over the country this fall. Long established as an important institution of the Better Agriculture of any community, commonwealth, or nation, the agricultural fair that best serves its purpose is the one which is well planned and faithfully supported by its farmers.

A county fair is one of the best breeders of interest in better seed, fertilization, and cultural practices. Added to this advantage, there is the knitting of community consciousness which has become recognized as one of the biggest factors in successful rural life. Obviously the greater the number of farmers who can be interested in the county fair, the greater will be the influence of that fair and the resultant agricultural strength of the community.

Much in the way of planning exhibits and stimulating interest among farmers can and should be done now. Many more farmers would exhibit if they were taught to watch crops during the growing season for indications of results which they could enter in the contests. A county agent can do much to stimulate interest among his farmers. His trained eye will see possibilities which most farmers miss.

The first exhibit material to be gathered are the grasses. Many farmers have good hay crops and would plan exhibits if they knew just how to save and cure samples. It is a simple matter for a county agent to get in mind what constitutes a good grass sample and look for possibilities on his visits around the county. The same holds true of the grains which come on a little later. A few hints on what to watch for as indications of promising results on the other crops may create an interest that will swell the exhibits at the fair.

And in this service there is a splendid chance for a county agent to widen his field of common ground among his farmers. To miss it, is to miss a big opportunity to insure his own personal success and the success of the agriculture of his county.

An athlete starts his training a long time before a contest. The county agent who starts his farmers early in their plans to exhibit at the fair has a good start in making his county an outstanding one.

Start your autumn fair early.

Service

The foundation of efficiency in business is service. It is the vitalizing force behind all true progress.

In times of great stress, national or local, the significance of service is most realized. During the World War, for example, the best minds of our country impelled by a desire to serve flocked to the call of service. Almost every group, particularly social, business, and religious, answered the call willingly. What was accomplished by wholesome response to this call is now a matter of historic record.

Following the years of the World War, service which had become a national habit was quickly capitalized by business. Realizing the efficacy, intense competition resulted in the practice of service as a means of attracting and holding the people. Today the American people not only expect service, but they demand it. The company that renders service efficiently and courteously is assured of the patronage of the discriminating people.

Noted in the house organ of a large tobacco dealer in Chicago, the following remarks on the meaning of service are significant:

"One of the best tests of our standing with our customers is their feeling about asking for advice and help when in distress.

"In such circumstances, we want our customers to think of us as our house. We ask this not because of our own protest of good will and claims of services, but because of the human touch and relationship established through years of fair and square dealings."

It is this human touch and relationship that is the vitalizing force behind all true progress. It represents the highest type of service that can be rendered in any business.

Prescribing for Agriculture

Before me is the prescription of a noted physician. In itself it is a very simple document; but when I think of the years of study and practical experience that were required to gain this information, I have a greater respect for the prescriber.

This simple piece of paper represents the best thought of the medical world, hours of diligent and tireless study in the library as well as in the laboratory, seeking a cure for the suffering. The medicines that make up this prescription are of known purity, even to a tenth of one per cent. Each has a definite duty to perform, but the proper blending depends on the skill of the prescriber.

Notwithstanding all these years of study and practice, this doctor prescribes for a patient only after making a thorough examination. When such an examination fails to reveal the trouble, a blood analysis is resorted to. A complete health history is made to study the relation of outside influences, such as food, inherited weakness, etc. At the bottom of this prescription is written "Persistence wins and cures," which reminds the patient to carry out instructions.

Let's study for a moment the perennial prescribers for agriculture. Not infrequently they are politicians, merchants, bankers, editors, or railroad presidents who have made some measure of success. The politicians prescribe what they think will get votes and bring about reelection. Incidentally they mention that they have voted for farm relief. The merchants usually recommend that the farmers keep better records and sell their crops as merchandise is sold. Bankers tell the farmers to put their farms on a business basis, so they can tell what crops are paying. Editors advise the farmers to advertise more, while the railroad presidents tell them that the key to success lies in better distribution.

All these prescriptions have some merit, but they are given by men who have a limited knowledge of only one need of agriculture. Each insists that his plan is all that is necessary to put agriculture in a favorable position. Men who wish their advice followed are careful about what they advise. So it should be with prescribers. Prescriptions, regardless of their source of origin, are valuable in proportion to the relief and cure they bring. Wise is the prescriber who studies before he offers cures.

The most practical prescription for agriculture should arise within the ranks of the farmers. Men trained in agriculture and in addition having a wide experience in growing and marketing farm crops should have the necessary information on which to work a prescription for agriculture that will result in its betterment.

Soil Improvement Contests

The Soil Improvement Committee of the National Fertilizer Association is announcing its sixth contest of soil-building programs in the northern and northeastern states. We are glad to see this announcement and hope that all of our county agent readers will familiarize themselves with the terms of the contest.

One of the most important problems in any county is the maintenance and improvement of the fertility of the soil. Even though a county agent may not be able to size up the problem sufficiently to have a clear and definite program, he will be interested in getting suggestions from the programs which will receive publicity as a result of this contest. On the other hand many county agents, after reading the rules in the announcement may be able to work out a program that will receive recognition.

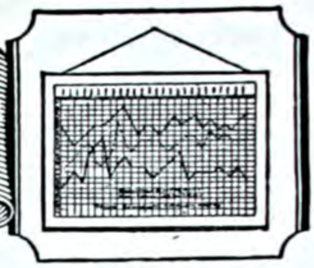
Because of the great diversity of conditions in the various states included in the territory covered by the contest, the committee leaves the *organization of the County Soil Improvement Program entirely to the judgment, individual initiative, originality, and organizing ability of the agents themselves, working with the extension forces of their respective states.*

Eight awards will be made to eight county agents, two from each of the four districts into which the northern states have been divided. The judging will be done on the basis of analysis of the soil problem, the program of work adopted, the methods used, and the results of the campaign. The judges for this year's contest will be E. S. Bayard, editor-in-chief of the Ohio Farmer and the Pennsylvania Farmer, chairman; Dr. F. J. Alway, chief in soils, University of Minnesota; R. J. Baldwin, director of extension, Michigan State College; Dr. R. J. Garber, agronomist at the University of West Virginia; and Dr. E. Van Alstine, agronomy specialist, University of Vermont.

The prizes will consist of educational trips to the annual meetings of the American Society of Agronomy in Chicago in November as guests of the Soil Improvement Committee.

For full details of the rules of the contest, it is suggested that interested county agents get in touch with Mr. H. R. Smalley, Director of the Soil Improvement Committee, National Fertilizer Association, 616 Investment Building, Washington, D. C.

AGRICULTURAL DEVELOPMENTS



By P. M. Farmer

PICKING YOUNG PULLETS AND ROOSTERS

Some Wisconsin hatcherymen have devised a plan whereby they can sort the potential roosters from the prospective pullets the day they are hatched. The secret is in crossing certain breeds as experimental breeders have been practising it for some time. The most popular method consists in crossing Barred Plymouth Rock hens with Rhode Island Red or Brown Leghorn males. As soon as they are hatched the distinctive marks are evident. The females are black while the cockerels are black with white spots on the backs of their heads and on the wings. When these birds mature the cockerels will be dingy barred and the pullets will be black with some red. Silver Wyandotte females crossed with Buff Leghorns, Buff Orpingtons, or Buff Rocks produce cockerels of a very light color while the pullets are very much darker. By this method it is possible to buy chicks and get 100 per cent pullets.

WILL STOP THE GULLIES

The war against erosion will fill up all the trenches cut by uncontrolled rain-water in a—well, not by Christmas, but in a period of years. Dr. A. G. McCall, Chief of Soil Investigations of the Bureau of Chemistry and Soils, chairman of the special committee appointed to deal with the erosion problem, has announced plans which will be put into operation with the $160,000 recently appropriated by Congress for the use of the Bureau of Chemistry and Soils, the Bureau of Public Roads, and the Forest Service. Forty thousand dollars which become immediately available for this campaign against the gully-washer will be used in the establishment of regional erosion stations. The first seven of these stations will be placed in the red land regions of Oklahoma and Texas; the gray lands of northern Missouri and southern Iowa; the black lands of central Texas; the light colored sandy lands of southwest Arkansas, northeastern Louisiana and east central Texas; the southern Piedmont lands of Virginia, North Carolina, South Carolina and Georgia; the northern Piedmont lands of New Jersey and Pennsylvania; and the dark prairie lands of west central Kansas. As funds permit additional stations will be located in other areas where erosion is bad. At these stations studies will be made of terraces, soil-saving dams, under drains, and cultural methods. Laboratory studies will be made of the physical and chemical properties of various soil types with relation to erosion and the erosion reconnaissance of the United States will be completed.

TEST COWS BY MAIL

Robert Amundson, county agent of Outagamie county, Wisconsin, says it is highly important to know what kind of cows there are in the barn, since 80,000 milk cows are sold out of the State each year and the farmer doesn't want to get rid of his best ones. Amundson is father of the "mail order" method of testing cows. Every year now 4,000 cows, 1/5 of all the cattle in the county, get a production test by the mail order method.

YOUTH RULES SUPREME

It won't be long now before the 4-H club boys and girls will be running the country, and after all perhaps that was the idea when the movement was started—that they would be taught to know their business so well that everybody else would follow them. There are now, according to reports of the Department of Agriculture, more than 666,000 members of these head, heart, health, and hand clubs.

FISH OR CUT BAIT

Potato raisers in Ohio are building up more and more competition for each other and it now looks as if the ordinary spud raiser who gets less than 150 bushels to the acre will have to do as his successful neighbors are doing or quit the spud game. E. B. Tussing of Ohio State University says the average cost of producing an acre of potatoes in the State is about $150, which includes grading and marketing. At 70 cents a bushel the grower of a 200 bushel crop wouldn't break even. With prospects of a large crop and low price, high acre yields are the only salvation to those who grew potatoes as a cash crop.

RED PAINT IS ALL WET

"Must a barn be red?" asks the Department of Applied Art at Kansas State Agricultural College. And then it answers the question by recommending that "angry" red paint be supplanted by softer hues. A red barn, say these art advisers to the farmer, doesn't merge into nature's landscape as all buildings should. Here are some guides to help the farmer who feels like becoming color conscious: Tan colored Jerseys, Ayrshires, or Guernseys show off to best advantage with a background of harmonizing tan buildings trimmed in a darker or lighter shade. White barns for black and white Holsteins. (This would probably go all right with Hampshire, Poland China, and Berkshire pigs and Dutch Belted cattle.) In general, the art advisers suggest, a buff color scheme with buff Orpington chickens, reddish pigs, a golden-haired Collie and a nice orange cat. Or a striking black and white effect wherein white buildings shelter a flock of Barred Plymouth Rock hens or Black Minorcas, dappled gray horses, a striped tabby cat, and a black and white terrier.

WHAT! NO ODOR!

Floriculturists have changed some flowers almost beyond recognition, and now it seems that certain horticulturists have a desire to turn many well-established vegetables into something that would make old timers turn up their noses and call them dude stuff. W. A. Huelsen of the University of Illinois expresses hope that the miracle of an odorless onion may come out of research now in progress. (Wouldn't a lot of the onion's charm be gone?) To support his contention that the onion may be greatly "improved," he cites what has happened to many sedate old vegetables: Green and wax beans now grow without strings; melons have been standardized; some pickles have lost their warts; tomatoes and bananas are ripened with ethylene gas and celery is rapidly blanched with the same stuff; we have vegetables, once sad weaklings, now resistant to all sorts of diseases.

Nowadays, if a man falls by the wayside, the chances are that he was a pedestrian.—*Life.*

Foreign and International Agriculture

Plowing in India

By J. J. De Valois

Agricultural Missionary, Katpadi, South India

WHEN the American farmer hitches his tractor to a three or five-bottom plow, the personal equation is largely reduced to that of mechanical skill. By adjusting a lever here, setting a bolt or a slide there, an expert can so regulate a plow as to almost guarantee a clean, smooth, uniform furrow. Such a job is very largely "machine made."

In the old days when the homesteader hitched "Nance and Charlie" to the breaking plow and cut a straight black furrow through the untouched prairies, it took more than mechanical skill to plow a straight, uniform furrow. It doubtless was a hard, monotonous grind to follow the walking plow day after day. A 40-acre field could not be turned over between sunrise and sunset. But what pride those early pioneers took in their plowed fields! How they put their personality into every ridge and furrow!

Of course no one would be bold enough to advocate a reversion to "Nance and Charlie" and the walking plow. Progress does not come that way. But still I do not wonder that some of the grey-headed veterans delight in reminiscence of days past.

In India, however, the plow that is still almost universally used is a wooden stick with a small steel covered point. Therefore, when we speak of improved plows in India, we are thinking of a tool quite comparable to the two-horse walking plow discarded by most American farmers several years ago. An aged pioneer of the West today must go to a museum to find his old friend the walking plow. If he would come out to India he could sing its praises to his heart's content and do a real service to his Oriental farming brother at the same time.

Still a Novelty

The single-bottom plow is still a novelty and an unseen, unheard of modern improvement to thousands of farmers in India. Plowing is such a fundamental operation in any agricultural practice that the introduction of a real plow is one of the first considerations that is engaging the attention of those of us interested in better farming for India.

The wooden stick used for a plow in India is really a misnomer. It does not invert the soil, it merely loosens it up a bit as does a harrow or cultivator. However, it is the only tool which millions of people have known for centuries. It has been handed down from generation to generation. Under primitive conditions it has been the best that could be used no doubt. Even today India has no blacksmiths or repair men that could put and keep a modern plow in condition. The wooden stick can be made with very little trouble and when worn out can easily be replaced by dressing down the branch of a tree.

When the early rains come in South India by June 15, the peasants mobilize every animal that bears any resemblance to the cow, the beast of burden in tropical India. The cow and her family are indispensable; I do not wonder they have for ages been considered sacred. The draft bullock, the buffalo, the milk cow, young heifers, and bull calves, anything that is at all capable of dragging the wooden stick, are put to work as soon as the first cooling shower has broken the long summer of heat and drought. They must need be on the job early because the ground soon dries up making it impossible to get in the crops of peanuts, Kaffir-corn, sorghum, and millets.

Experience Is Best Teacher

Over the ground the Indian farmers go lengthwise, crosswise, diagonally and at right angles five or six times to get the land in that condition of tilth that a real plow would do in one operation. "What a pity that after the previous crop was harvested these fields were not plowed up and allowed to lie fallow and conserve moisture," say the Westerners. But the Indian peasant has never had access to an agricultural college, experiment station, or extension staff, so how should he know how to do any better?

Farmers are a conservative group the world over. "We are from Missouri" applies to the Indian peasant as well as to the American farmer. When the advantages of an iron plow are mentioned, ever so many objections are forthcoming. "Our bulls are too small to pull such a heavy plow." "Our cattle are not accustomed to it." "The price is too much, we can't afford it." "Who will keep it in repair for me?" All these objections have to be met and rightly so. An Indian farmer's income is too small to gamble on an experiment.

We have found that one of the best ways to convince the Indian peasant is to give him a chance to try and work one of these plows himself. "An ounce of practice is worth a ton of theory." With this we try to link the personal equation, namely, pride in being able to do a certain thing better than the next fellow does it. Plowing competitions conducted at large festivals and fairs are our best preachers. Give a man a chance to operate one of these mysterious iron plows with his own pair of bullocks before a large crowd of curious, if not interested spectators, praise him a bit for his excellent plowing, and give

(*Turn to page 55*)

The parts of the plow which this Indian coolie is using are the same as in the American walking-plow, but the handle is adapted so that the coolie may have a hand free to twist the tails of his bullocks.

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 Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. 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 Report of the Proceedings of the Eleventh Annual Convention of the Michigan Muck Farmers Ass'n." contains many interesting and instructive papers which were presented to the muck farmers in that state at their 1929 get-together. Of special interest are several papers by Dr. P. M. Harmer on past and present methods of efficient muck management and on the use of fertilizers to secure the most efficient results in order to produce the highest quality crops.

Apparently among the most important factors in the successful farming of muck soils are proper drainage, the use of crops and varieties well adapted to this type of soil, proper cultural methods, and the use of necessary lime and fertilizers. The use of lime depends on the acidity of the muck, while the fertilizer depends to large extent on the crop to be grown. In general, fertilizers containing little or no nitrogen, moderate amounts of phosphoric acid, and large amounts of potash have proved to be most profitable on muck soils.

"Inspection of Agricultural Lime Products," Agr. Exp. Sta., Amherst, Mass., Bul. 46, Dec., 1928, (Control Series), H. D. Haskins and M. W. Goodwin.

"Michigan Fertilizer Bulletin," State Dept. of Agr., Lansing, Mich., Bul. 54.

Crops

With New England dairymen taking more and more interest in the possibilities of raising their own feed, the new bulletin 182, "Alfalfa in Maine," by A. K. Gardner, crops specialist of the Maine Agricultural Experiment Station, is both timely and valuable. In his well-illustrated treatise, Mr. Gardner points out that there is no reason why this crop cannot be grown successfully in New England if conditions are favorable. Along with his recommendations on other cultural practices, seeding, harvesting, and curing the crop, he emphasizes the necessity of soil well supplied with the plant food on which this crop draws heavily. From experiments it appears that potash and phosphoric acid are the elements most commonly needed to supplement the available soil supply of plant food in the soils of this state.

We again find recommendations on fertilizing alfalfa in the results of experimental work recently released in the "Forty-seventh Annual Report" of the Ohio Agricultural Experiment Station, Bulletin 431. Here a marked response of alfalfa to fertilizers high in potash used as a top-dressing is noted. The report is a very concise and understandable summary of the work which this well-known experiment station is doing along all lines for improving farm practices.

"Field Peas in Wisconsin" is the title of a new bulletin, No. 408, by E. J. Delwiche of the Wisconsin Agricultural Experiment Station. Exceptionally well illustrated, this publication is a good guide for the grower of this profitable crop and contains information which should not limit its range of interest to the growers within the Badger state alone.

"Elements of Grape Growing in California," Agr. Ext. Serv., Berkeley, Cal., Cir. 30, Mch., 1929, Frederic T. Bioletti.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Cal., Vol. XVIII, No. 3, Mch., 1929.

"The Home Vegetable Garden," Agr. Ext. Serv., Berkeley, Cal., Cir. 26, Feb., 1929, H. A. Jones.

"Report of the Agricultural Experiment Station," Berkeley, Cal., July 1, 1927, to June 30, 1928.

"Seed Inspection," Agr. Exp. Sta., Amherst, Mass., Bul. 47, Feb., 1929, (Control Series), Philip H. Smith, Elizabeth F. Hopkins, Oliver W. Kelly, Clarice L. Beane.

"American Potato Journal," The Potato Assn. of America, East Lansing, Mich., Vol. VI, No. 4, April, 1929.

"Tillage Practices in Relation to Corn Production," Agr. Exp. Sta., Lincoln, Nebr., Bul. 232, Dec., 1928, T. A. Kisselbach, Arthur Anderson, W. E. Lyness.

"High-Nicotine Tobacco," Agr. Exp. Sta., Geneva, N. Y., Bul: 562, Jan., 1929, R. C. Collison, J. D. Harlan, L. R. Streeter.

"The Quality of Packet Vegetable Seed on Sale in New York in 1926, 1927, and 1928," Agr. Exp. Sta., Geneva, N. Y., Bul. 565, Mch., 1929, M. T. Munn, Olive M. Hoefle, Mary E. Woodbridge.

"Pollination Study of the Anjou Pear in Hood River Valley," Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 239, Mch., 1929, Gordon G. Brown and Leroy Childs.

"Abstracts of Bulletins 366-392 and Circulars 48-52," Agr. Exp. Sta., College Station, Tex., Cir. 54, Dec., 1928, A. D. Jackson.

Department of Agriculture Immigration of Virginia, Richmond, Va., Bul. 256 and 257, April and May, 1929.

Economics

Rapid changes have taken place in the farming of the Great Plains regions in recent years. The introduction of improved power machinery and better varieties of crops have been important factors in causing these changes. In a new circular 142, the Kansas Agricultural Experiment Station discusses "The Effect of the Combined Harvester-Thresher on Farm Organization in Southwestern Kansas and Northwestern Oklahoma." The purpose of the authors, W. E. Grimes, R. S. Kifer, and J. A. Hodges, was to bring together information concerning past experiences, present conditions, and probable future trends that will be most helpful in adjustment to the changed and changing conditions. The publication ably fulfills the purpose in mind.

The cycle and prices of beef cattle have a marked effect on returns in the cattle industry. This is strikingly brought out in Bulletin 231, "Economic Aspects of the Cattle Industry of the Nebraska Sand Hills," by Harold Hedges of the Nebraska Agricultural Experiment Station. The study is based upon the records of 47 ranches for a period of three years, 1924-5 to 1926-7. For the year 1924-5, the average rate of return on the operators' equity was 0.5 per cent; in 1925-6, it was 8.8 per cent; and in 1926-7, it was 5.4 per cent. The year 1924-5 was a very poor year, while the other two were much better. These changes in net return were due in large part to the change in cattle prices. The average indebtedness per ranch was $25,104 in 1926-7. The availability of credit and the rate at which it can be obtained are important in ranching operations in this territory.

"The Use of Time in Farm Homes," Agr. Exp. Sta., Lincoln, Neb., Bul. 230, Dec., 1928, J. O. Rankin.

Diseases

Several important new publications on plant diseases have come into circulation during the past month. In one of these in particular, we find reference to the use of plant food in connection with disease control. Bulletin 432, "Ohio Potato Diseases," by Paul E. Tilford of the Ohio Experiment Station in this connection cites the effect of potash deficiency on the potato plant: "The upper surface of the leaflets is bronze colored. The tissue between the veins bulges upward and the leaflet margins curl downward. In this stage of development the trouble might be mistaken for hopperburn."

"Powdery Mildew of the Grape and Its Control in California," Agr. Exp. Sta., Berkeley, Cal., Cir. 31, Mch., 1929, H. E. Jacob.

"Curly Top Symptoms in the Sugar Beet," Agr. Exp. Sta., Berkeley, Cal., Bul. 465, Mch., 1929, Henry H. P. Severin.

"Spraying Tree Fruits," Agr. Exp. Sta., Lincoln, Neb., Cir. 36, Mch., 1928, C. C. Wiggans and E. H. Hoppert.

"A Chemical Control for Sweet Potato Wilt or Stem Rot," Agr. Exp. Sta., Raleigh, N. C., Tech. Bul. 35, Mch., 1929, R. F. Poole and J. W. Woodside.

"Potato Seed Treatment Experiments on Long Island with Special Reference to the Organic Mercury Instant Dips," Agr. Exp. Sta., Geneva, N. Y., Bul. 564, Feb., 1929, E. E. Clayton.

"Relation of Cotton Root Rot and Fusarium Wilt to the Acidity and Alkalinity of the Soil," Agr. Exp. Sta., College Station, Tex., Bul. 389, Nov., 1928, J. J. Taubenhaus, Walter N. Ezekiel, and D. T. Killough.

Insects

"Termites and Termite Damage," Agr. Exp. Sta., Berkeley, Cal., Cir. 314, Apr., 1928, S. F. Light.

"Apple Pests in Massachusetts," Agr. Exp. Serv., Amherst, Mass., Ext. Leaflet 131, Jan., 1929, A. I. Bourne, W. L. Doran, W. H Thies.

"The Nematode Disease of Sweet Potatoes," Agr. Exp. Sta., Raleigh, N. C., Bul. 265, Apr., 1929, R. F. Poole and Robert Schmidt.

Industry Presses Onward

(*From page* 18)

agricultural and urban industries. It also influences industry in two fields of activity—production and utilization. If any clear definition of the principles or problems involved is to be gained, these distinctions are essential.

Agricultural industries are, of course, those that supply the farmer or depend chiefly on the farmer for their sales volume, such as companies supplying fertilizer, lime, machinery, equipment, etc. It is true that the farmer buys everything that the city man buys, but a distinction between urban and agricultural industry is necessary because the state has a vital interest in what happens in agriculture, since the greatest of all of our natural resources, the soil, is involved. The state maintains colleges and experiment stations to help the farmer. The state defines certain controls regarding the conditions of sale of many commodities sold to the farmer. Thus, there is both a stimulus and control in connection with agricultural business that does not exist to the same extent in urban business. It is highly important to recognize this distinction between these two broad classes of industry if we are to understand with any degree of clarity the work and organization of an agricultural business and the functions of technical men in that business.

Utilization—The New Problem

Again, there is another equally vital distinction to be made in the effects of science in industry, namely, the distinction between production and utilization. In the past, science has been concerned chiefly with production. The problem has been how to produce goods cheaply; how to standardize; how to produce new products in large volume; to increase the efficiency of labor and by so doing to decrease the number of workers and increase the output per man. According to Holland, the effect has been to take the "time lag" out of production. The chief purpose in research is to reduce this "time lag" from basic invention to full scale application. It has been shown that this cycle has been completed in the case of several modern industries in less than 50 years.

So effectively has research influenced production that a new problem was inevitable, the problem of the scientific utilization of the products of industry. As the "time lag" is fast being taken out of the production of the products of industry, so is there growing a more intense effort to take the "time lag" out of the utilization of the products of industry. In other words, a balance of production capacities by a larger and yet socially acceptable utilization is one of the chief problems of the present day. It is reasonable to expect that in the next decade, while scientific work will still be vital in the field of production, the influence of science will be more pronounced in the field of utilization.

If this hypothesis is true, a survey of present industrial activities should show a growing tendency to organize in this field of scientific utilization. This seems to be the case. For instance, the leather industry is supporting special research to discover new uses for leather; the gas industry is finding new uses for gas in competition with electricity, especially as applied to refrigeration. Research work in the cement industry largely centers around new ways to use cement. Many of the agricultural industries that produce fruit and foods are more concerned with the utilization of the products than they are with the production—hence trade names and advertising campaigns. New uses are being found for paper as a means of mulching. In fact, so strong is growing the emphasis on scientific utilization that the question as to whether the products of the farmer cannot be utilized in a greater variety of ways arises in organized meetings. Forces are tending to shift the emphasis of the scientific work of the agricultural experiment stations from crop production to crop utilization.

What is the social significance of this growing emphasis of science and what is the business man's share of this burden? This question has been ably discussed by Wallace B. Donham.[1] He says:

"The social responsibility imposed on the business man of today is a logical outgrowth of the developments of science which so largely affect not only the economic and material things in our lives, but our whole attitude of mind."

Therefore, as the writer continues to point out:

"The creative scientists have lost control of the consequences of their thinking and have placed a heavy burden of responsibility on other groups. This burden is the heavier because nothing in the hundreds of thousands of years that the human race has been developing prepares it for rapid changes and environment; all the practical developments of scientific thinking, including power, machinery, and factories, railroads and automobiles, the fast mail, telegraph, and wireless, have revolutionized both our intellectual and material environment within a few decades."

Responsibility Falls on Business

In a few words, the scientist has taught the world to change its methods of production. He is now confronted with the fruits of his own labor, to show Man how to scientifically use what he has scientifically produced. He is asked to do this for Man's social good in socially acceptable ways.

At present the practical application of this burden falls largely on the business man. He controls manufacturing, transportation, and finance. His problems are becoming more complex; he is dealing with fundamental changes in industry that in all probability will continue to increase in intensity and in the breadth of their application.

Sound principles are needed if the growing forces influencing industry are to be turned to socially productive ways for the ultimate good of industry, the farmer, and society.

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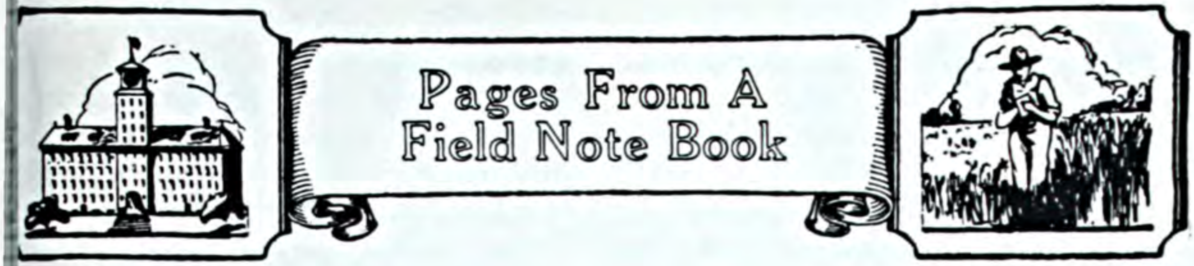
[1] Donham, Wallace B. Harvard Business Review, Vol. V, No. 4, July, 1927.



Kentucky Tobacco Tests

By W. H. Scherffius

A PROGRESS report has just been issued by the Kentucky Experiment Station, giving interesting results of experiments conducted on the various experimental fields located in different parts of the State.

Greenville, Kentucky: In a crop rotation, including tobacco, with various fertilizer treatments running through 12 crops, the fertilizer treatments without potash gave an average of 831 pounds of tobacco per acre, whereas the treatments containing potassium gave 957 pounds of tobacco per acre. This increase of 126 pounds of tobacco can be attributed to the addition of potash.

Mayfield, Kentucky: In a crop rotation, including tobacco, with various fertilizer treatments running through 12 crops, the fertilizer treatments without potash averaged 916 pounds to the acre, whereas the treatments containing potash averaged 1,003 pounds of tobacco to the acre. An increase of 87 pounds of tobacco to the acre was obtained by the addition of potash.

Campbellsville, Kentucky: In a crop rotation, including tobacco, fertilizer treatments, consisting of limestone, superphosphates, rock-phosphates, and manure, were conducted over a period of five years. Last season the tobacco plots were split and in addition to the regular treatments, one half was given 100 pounds of muriate of potash. The potash additional to superphosphates increased the yield of tobacco 240 pounds and additional to superphosphates on limed ground gave an increased yield of 160 pounds of tobacco to the acre. In another experiment consisting of a four-year rotation, the tobacco plots were split during 1928 and one portion received potash, 100 pounds to the acre in addition to the lime and superphosphates, and another portion received 100 pounds of muriate of potash and 200 pounds of nitrate of soda to the acre in addition to the superphosphates and lime. The average increase for the potash addition was 119 pounds of tobacco to the acre, and for both the potash and nitrogen the increase was 286 pounds of tobacco to the acre.

Princeton, Kentucky: At the Princeton substation, fertilizer-tobacco experiments conducted for the years of 1927-8, using various analyses, showed that on the average it is profitable to use potash on tobacco soils in that area. In fact, generally speaking, those plots treated with all three of the essential plant foods gave the best results. Those plots containing nitrogen and superphosphates but no potash averaged 976 pounds of tobacco to the acre; those with potash averaged 1,055 pounds of tobacco to the acre, thus showing 79 pounds of tobacco more to the acre by using potash. An average of all of the plots, containing all three of the plant food elements (not including manure), was 1,130 pounds of tobacco to the acre.

All of the above results indicate that to obtain maximum yields and maximum profits it is necessary that tobacco be given liberal applications of high-grade, well-balanced, complete fertilizers.

For the production of Burley tobacco giving yield, color, and quality, there should be a preponderance of potash over nitrogen in the fertilizer analysis such as a 3-8-6, 4-8-8, or 6-8-10 (nitrogen-phosphorus-potash). In the case of Dark or Cigar tobacco, the nitrogen and potash should approach a 1-1 ratio, as for example a 4-8-4 or 6-8-6 (nitrogen-phosphorus-potash).

The Strawberry Season

(*From page* 30)

The main factors considered by inspectors are size, degree of ripeness, cleanliness, and the proper filling of the crates. The degree of ripeness at which strawberries are accepted for shipment in carload lots depends upon the period of the shipping season and the weather which prevails at picking time. During cool, dry weather, berries may be accepted in riper condition than during hot damp weather.

Shippers are learning much from these inspectors. After watching the inspectors at work, they often begin to improve their methods of preparing strawberries for market and begin to keep a larger proportion of the poor berries at home, thus saving space in cars and cost of shipping, relieving the markets of the depressing effects of the presence of poor stock, and aiding in providing better berries to consumers everywhere.

The method of loading the cars is important as vitally affecting the condition in which the berries reach the market after being certified at shipping point. After the car is properly loaded, it is imperative that the load be braced securely, particularly if space is left vacant at the doorways. In such cases center bracing is used, until the entire load is made tight. Examination of cars at market terminals shows that considerable damage in transit is incurred through inadequate or carelessly installed bracing. Inadequate bracing to save the expense of lumber is doubtful economy, for poor bracing and resultant breakage, bruising, and waste may undo practically all of the work of the grower in producing and packing a good crop and may cause a great difference between condition of berries when inspected at shipping point and when inspected at market.

Cotton Wilt Control

(*From page* 7)

From the results the work of this particular season where these fertilizer treatments had been followed for a period of five years it appears that where no or little potash was used the per cent of wilted plants was greater and the yields of cotton were comparatively small. The quality of cotton from this plot was relatively poor, since the bolls were smaller, failed to develop normally, did not open fluffy and wide, and consequently were harder to pick. On the other hand where balanced fertilizer was used, that is, one containing ample phosphoric acid, nitrogen, and potash, as in Plots 3, 4, 6, and 7, wilt was re-uced in some of these at least to a inimum, the cotton yields were rger, and a better quality product as obtained.

To develop normally, to resist such seases as wilt and overcome physiogical disturbances during growth rocesses such as may be indicated by ie appearance of "rust," and to maire a bountiful, profitable quality rop, the cotton plant must be given n environment and fed liberally with well-balanced ration, one containing phosphoric acid, nitrogen, and potash. With these elements supplied, it will develop the resistance necessary to overcome unfavorable conditions during the growing season.

While other factors have a bearing upon the prevalence of wilt, undoubtedly the most important among those which the farmer can control is the use of those varieties of cotton that are naturally more resistant, and the application of a well-balanced plant food.

Spraying Potatoes

(*From page* 15)

f the leaves. They sometimes are so lentiful that they fly up in clouds hen disturbed. A quiet examination f the under sides of potato leaves will eveal these tiny insects. They are reenish in color, and are about an ghth of an inch long. They are so ctive that the slightest disturbance sually causes them to hop away.

The potato grower should be ready o spray for these insects as soon as hey appear. Repeated applications at eekly intervals for at least five times a safe rule. Pressure is necessary to o a real spray job. From 300 to 400 ounds pressure on the spray is needed o break the bordeaux mixture into a riving mist which can penetrate the ough leaf surfaces and really cover he leaves on the under sides as well s the upper surfaces. Low pressure prayers are very inefficient and in ome cases are a waste of time and noney.

Every year several samples of fleaeetle injury are sent in for identificaion. When the leaf is held up to the ight it resembles a sieve because there re so many fine small round holes in t.

The insects are usually waiting on he field for the first appearance of he potato leaves. Control depends upon how early the sprays are applied. The safest way is to spray as soon as the potatoes are through the ground. Two pounds of dry arsenate of lead added to each 50 gallons of bordeaux will make the spray control more effective. Pressure is needed here also for the best place to have the arsenic and the bordeaux is on the under sides of the leaves.

Early and late blight foliage diseases are controlled by bordeaux if it is applied correctly. Pressure is the main item in control of these diseases also. The first spray should be put on when the plants are 8 to 10 inches high and repeated every week to 10 days until 4 to 5 applications are made.

Considering the time of applying sprays as a whole greatly simplifies the matter. The grower who begins spraying at the time the rows are first visible and who repeats the operation every seven days as long as the foliage remains green is on the right track.

The bordeaux is made by mixing together 8 gallons of copper sulfate stock solution (containing 8 pounds of copper sulfate or bluestone), 12 gallons of hydrated lime stock solution (containing 12 pounds of special spray lime), and enough water to make 100 gallons of the completed spray.

There is now on the market a special

spray lime which contains a high per cent of calcium oxide and which is so fine that it passes through a 325-mesh screen. Such a lime is far better than the kind usually purchased at a lumber yard and which is made for the building trade. This spray lime is free from sand and grit and is not as wearing on the spray pumps of the ordinary kind. When hydrated lime is used, the grower can well afford to order this special lime.

During the heat of the summer, it is desirable to add a little extra lime to secure a greater shading effect. Four to five pounds of additional lime might be added to each 100 gallons of spray.

The possibilities of spraying potatoes are so great that a real potato grower cannot afford to neglect such work. In this section of the country where a yield of 300 bushels per acre is needed to insure the financial success of the business, the growers find it profitable. At a cost of $10 for six applications, the average increased returns have been about 60 bushels per acre.

Fertilize Your Alfalfa

(From page 26)

of an 0-14-6 on all but the thinnest soils where a 2-12-6 is a better choice. For wheat, when alfalfa is to be seeded, applications of 250-300 pounds of an 0-14-6 on the darker colored soils and 300-400 pounds of a 2-14-4 on the lighter colored soils are suggested. Barley responds better to nitrogen at seeding time than either oats or wheat. When seeding to alfalfa, around 250 pounds per acre of a 2-14-4 are recommended for dark colored soils and 300-350 pounds of a 4-12-4 for light colored soils.

If the nurse crop receives a liberal fertilizer application, it ordinarily should not be necessary to apply any fertilizer to the alfalfa itself during the first year of harvest. If mowed more than the one year, then, moderate amounts of fertilizer applied as yearly top-dressings on the alfalfa may be expected to materially increase the yield of hay and lengthen the life of the stand. On the Experiment Station farm at Wooster we follow the practice of top-dressing the alfalfa immediately after removing the first cutting, putting the fertilizer on through the fertilizer attachment of a common grain drill.

For top-dressing alfalfa the fertilizer ordinarily should be a mixture containing both phosphoric acid and potash. In a three-year test on the Experiment Station farm at Wooster, a fertilizer containing equal amounts of these two constituents, as an 0-12-12, has been considerably more profitable than an 0-14-4 carrying the same amount of phosphoric acid per acre. In this experiment one-half of the land was in Grimm, the other half in common alfalfa, both seeded in the summer of 1925. The soil was a well-drained silt loam, well supplied with lime, and in a fairly high state of fertility, having had liberal applications of manure and fertilizer in the past.

When to Top-dress

Three hundred pounds of a 2-12-2 fertilizer per acre were applied just before seeding the alfalfa. Two top-dressings were made, one after the first cutting in 1926 and the second after the first cutting of 1927. These were made in such a way as to cross the two alfalfa varieties. Altogether there were 12 separate plots for each fertilizer treatment given, six of each variety. For the 0-14-4 the rate of each treatment was 300 pounds per acre. The amounts of straight superphosphate and 0-12-12 applied were adjusted to give the same amount of phosphoric acid per acre.

Three cuttings were made in 1926, hree in 1927 and three in 1928. For he three cuttings made after the first op-dressing in 1926 and before the econd top-dressing in 1927, the yield vas increased eight per cent by the 00 pounds of 0-14-4 and 11 per cent y the corresponding application of -12-12. These rather small increases ndicated that the fertilizer treatment nade at seeding time was nearly suffi- ient to meet the needs of the crop luring the first year of harvest.

For the next three cuttings, follow- ng the top-dressing in 1927, there vas an increase of 16 per cent for the -14-4 and of 32 per cent for the -12-12. For the last two cuttings in he third and last year of the test, ven though the top-dressing was mitted that year, the increase was 37 er cent for the 0-14-4 and 48 per ent for the 0-12-12.

Two rather important conclusions an be drawn from this experiment. irst, although the 0-14-4 more than aid for itself, increasing the potash n the mixture to an 0-12-12 gave a nuch larger net return. Second, the lder the stand the greater was the ifference between the fertilized and unfertilized plots and the larger was the profit from top-dressing. In fact, after mowing three years the unfer- tilized alfalfa had become so reduced in stand and so infested with weeds that it was necessary to discontinue the experiment. On the other hand the plots that had received the 0-12- 12 top-dressings still showed good stands with few weeds. In other words, the fertilizer treatment was effective in materially lengthening the life of the crop.

It is my opinion, based upon the results of this and similar experiments and upon the experience of alfalfa growers in Ohio, that after one year's mowing yearly top-dressings of from 200 to 300 pounds per acre of an 0- 12-12 or similar analysis are apt to return an excellent profit on the in- vestment.

I wish to point out, however, that the recommendations given are based on our Ohio experience. Variations in soil and climate often have an influ- ence on the returns from fertilizers. Farmers in other states should consult their own soils and crop specialists be- fore adopting the suggestions I have given.

Why Cultivate

(From page 27)

nd shallow cultivation. In most ases the shallow cultivation is prefer- ble because there is less damage to the rowing crop. In sections where deep ultivation is practiced, it is not an ncommon sight to see wilted corn here the field has been cultivated.

Many growers commonly ask the uestion, "How many times should orn be cultivated?" This is best an- wered by saying that corn needs no nore cultivation than it requires to ill the weeds in the field. Many ex- ellent crops of corn have been pro- uced without any cultivation. This particularly true on "breaking" here the ground is usually very free of weeds the first season. Often, in the prairie states, the sod is plowed and planted to corn and a good crop grown without additional working.

The cost and labor of cultivation may be reduced greatly by using large implements in the first cultivation. The ordinary spike-toothed harrow is a very satisfactory implement for making the first cultivation of corn. The harrow may be used until the corn is 4 or 5 inches high without damage to the crop, and many small weeds are killed. This is a cheap but effective way of getting over the ground.

Practically all of the larger corn

growers in the corn belt are now turning to two-row cultivators. They are using these for all cultivations, including the first. Formerly, it was thought that the first cultivation could not be made with a two-row cultivator because the corn was so small and easily covered. With better implements, however, all the cultivations are being carried on with a two-row cultivator. Where one man could cultivate seven acres the third time over with a one-row riding cultivator, he can now cover 13 acres with a two-row cultivator. The two-row cultivator will become the common cultivation implement on all of the larger corn belt farms.

Weeds or Crops

(*From page 25*)

Wherever they are allowed to go to seed, the Canada and perennial sow thistles are being spread over wide areas by the wind. Their seeds are carried from farm to farm by threshing machines and other farm tools. They are also carried in the seeds of the crops raised on the infested fields, and on top of all this they are slowly spreading on every infested farm through their underground parts.

The ultimate result of this is plain to see. There are many farmers who can clearly remember when Canada thistles, perennial sow thistles, and quack grass were practically unknown in localities where now they are taking possession of the farms. The growth of the infested areas has been rapid, but the old tradition that weed destruction was unimportant has blinded many to the real facts. Every influence which can be brought to bear must be exerted to arouse the farmers to this danger.

While loss from weeds cannot be measured as can that from tuberculosis, hog cholera, rust, or smut, it is no less great and no less real. The idea that it can be ignored has persisted too long. It is time a funeral was held over it. This is a case where without sorrow the spirit can be consigned to everlasting perdition with a hope that it may never be resurrected. The coming generation must be taught to view its inheritance from a different angle or agriculture will also find itself upon the funeral pyre.

While it may be true that the production of maximum crops is not now necessary, let us not leave to future generations a heritage of useless land areas made useless because we failed to do our duty by them. Increasing population requires increasing production. How can production be increased on noxious-weed infested land? Our descendants must not be allowed to curse us for criminal carelessness in a matter so vital to their welfare. Their inheritance must be a "mess of pottage" not a "mess of weeds."

These thistles got their start in a small hillside pasture. The place is now a source of dangerous infection to the entire surrounding country.

Agriculture Today

(*From page* 22)

ıg become established since that time. 'his pest is more destructive than the otton boll-weevil, and Government ıspectors are stationed at eight Mexi-an border ports to prevent additional ntries of the insect. Fumigation ouses in which from four to twenty freight cars may be disinfected at one time have been established at five border ports, all cars originating in infested districts of Mexico being fumigated immediately upon crossing the international boundary.

Plowing in India

(*From page* 44)

ım a prize for compensation, and ıances are you have a loquacious con-ert. We are using this method with reat success.

In planning a plowing competition, e provide five or six plows and ar-nge with some friendly farmer to al-w us to use his fields. Each com-titor is urged to bring his own pair cattle. The field is laid out in rips about 50 yards long by 20 yards ide. At least 10 competitors must ıter.

Treasure Prizes

In a contest the winner, Devanbu, as a young Christian lad 18 years of e who had never seen an iron plow fore. His pair of bullocks were customed to the wooden plow, but d never tried their strength on such ı innovation from the West. He owed like a veteran, turning a splen-d furrow.

The prizes were provided by the gricultural Department. For first ize a plow was given; for second ize a sack of improved paddy (rice) ed; and for third, a liberal quantity green manure seed. The winner of e second prize, one of our agricultural school graduates, was very much disappointed not to get the plow as his prize. I suggested that possibly the boy who had won the first place would prefer the seed grain, the value of which he could appreciate, to his unknown quantity, the plow, and that an even trade might be a possibility. The unschooled village lad was not slow in replying, "No sir! I'm going to take this home to my village and show my friends what I have earned." He appreciated the iron plow's superiority over the old wooden stick. He had expressed his personality in that strip of plowing. He went home with the iron plow on his shoulder and his head high in the air. He had caught a new vision. He was a transformed youth.

So progress comes gradually but surely even in conservative rural India and through so humble a tool as the old walking plow that in its day blazed the trail with the covered wagon in the Mississippi and Missouri valleys. A plowing competition with the walking plow possibly would be as great a novelty in America today as in India. However, in the one it would be a relic of the past; in the other a prospect of the future.

Flax

(*From page* 23)

Montana; and normally these four states grow over 90 per cent of the United States acreage. The Canadian production is found directly north of the region in the United States. Aside from the North American flax area composed of the regions in the United States and Canada, there are three important centers of production: the Argentine region, which is mostly the lowland bordering on the Parana River, and India and Europe.

The U. S. Imports Flax

Flax is grown on a wide range of soils, but it seems to prefer well-drained land which retains moisture well. It seems to thrive under a wide variety of climatic conditions. The crop is sown in spring after small grains are seeded, and is harvested and threshed in a manner very much like wheat. Flax has been grown almost universally on new land, the disease problem on old land being serious. Furthermore, it does not compete well with weeds.

Almost the entire American production goes into oil manufacture, the oil being used in the making of paints, linoleums, and other important commercial products. Highly important by-products are oil meal and oil cake, which are an important source of protein for livestock.

The United States normally imports a considerable part of the flax consumed in this country, most of it coming from the Argentine Republic and Canada. It has been proposed many times that the American farmer should increase his flax acreage because of his favorable home market, but in spite of this the production is not expanding.

The production of flax fiber for the manufacture of linens is almost entirely a foreign industry, the United States importaing practically all of the flax fiber that it consumes. Most of these imports come from Russia, the United Kingdom, and the northern European countries, particularly Esthonia. Very little seed is grown in the regions of fiber production. The labor requirement of fiber production is so high that it is unlikely to advance rapidly under American conditions provided the foreign supply remains available.

Tennessee

(*From page* 14)

Plot or field experiments have been carried out on the major types of soil throughout the State and it has been found that phosphorus, nitrogen, and lime constitute the principal need but that there are wide variations in the requirements of different soils. The greatest recent advance along this line is the separation of West Tennessee into two large divisions. The soils of one have no special need of phosphate, so that superphosphate can rarely be used profitably either by itself or in mixtures with nitrogen and potash.

This division covers, roughly the western two-thirds of West Tennessee and includes most of the truck growing areas where fertilizers have long been used.

The experimental evidence indicates that the good results obtained from the use of fertilizers on truck crops come largely from the nitrogen, and to a less extent from the potash of the commercial mixtures used, and that the phosphate has probably been used at a loss in many, if not most, cases. In connection with the low response to phosphate on western Tennessee soils, it is of interest to note that these soils do not analyze high in phosphoric acid, containing in the neighborhood of only one-tenth of one per cent. Another interesting fact is that the soils at the West Tennessee station, although unresponsive to phosphating, respond unusually well to liming. This is contrary to a well-supported claim from authoritative sources that acid soils are responsive to phosphating.

In contrast with soil needs of the western area, the eastern third of West Tennessee seems to be highly responsive to phosphate, superphosphate by itself being one of the most profitable fertilizers for general farm crops. Need of phosphate has also been found to be very pronounced on the Highland Rim soils of the type found in Middle Tennessee and in general throughout East Tennessee. Duplex basic phosphate has proved to be especially well suited to the Plateau soils, and on freshly cleared land may be used by itself to much advantage, especially as it partly supplies the soil's immediate need of lime.

On Other Soils

With the exception of minor areas of gray "crawfishy" land, the soils at the West Tennessee station were found to be well supplied with potash, but poor in both nitrogen and lime. Wheat, for example, was decidedly benefited by both nitrating and liming, but there was no increase from phosphate even where the trial was continued for a score of years and all the crops were removed from the land.

In 10 years of experimental work at the Crossville substation on the Cumberland Plateau chiefly with three-year rotations of corn, potatoes, oats and clover and grass, phosphate has been found a first requisite for all crops, the response of the soil being very pronounced. Potash has been found profitable but much less so than phosphate.

Nine years of continuous experiments in a five-year rotation of corn-cotton, soybeans, wheat and clover, and grass (2 years), under a variety of fertilizer and liming conditions on the farm of the Middle Tennessee State Teacher's College at Murfreesboro, show profitable returns from the use of phosphate but not of potash on any crop. Nitrogenous fertilizers have given little or no profit. Liming, though not essential to most crops on the soils of this section, including red clover, was found necessary in the production of alfalfa and sweet clover.

Results obtained at the West Tennessee station with nitrate of soda in experiments continued from three to eight years show the increase that may be expected from various amounts of nitrate. The average increase from the light application of 40 pounds per acre was 80 pounds of seed cotton, from 120 pounds of nitrate 150 pounds, from 160 pounds of nitrate 225 pounds, and from 200 pounds 230 pounds of seed cotton. These experiments were made on land in a fairly good state of productivity. On much poorer lands considerably larger increases were obtained, as might be expected because as the crop increases the moisture supply becomes more and more the limiting factor.

The gray-colored, so-called "crawfish" soils, not only of West Tennessee, but in scattered areas throughout the State have been found to be deficient in potash to an appreciably greater extent than the surrounding soils of different character. Such land on the West Tennessee Station Farm has given marked response to potash for such crops as cotton and various hay crops but has not been found profitable for any of the grain crops. A study of these gray-colored spots, which in the aggregate cover considerable area in the State and are not looked upon with favor by the farmers, promises information of much practical value. Tests indicate that when the special needs of this soil are supplied it is by no means as unpromising as its general reputation indicates.

Tobacco Experiments

In 1927 the fifth in a series of fertility experiments with tobacco was completed at the Clarksville substation in the dark tobacco section of the State. The data secured were summarized in a report of the director as follows:

The efficiency of different sources of ammonia as shown in the increased production of leaf tobacco is as follows: first, sodium nitrate; second, ammonium nitrate; third, urea; fourth, amo-phos.

Applications of magnesia, either as a sulphate or chloride did not prove profitable, although slightly larger yields were obtained on the plots receiving these salts than on plots where none was used.

Data of the effects of previous cropping on the yield and quality of tobacco were obtained both with and without liming, and are summarized as follows:

1. Winter cover crops of cereals did not prove favorable; the yield and quality of tobacco after bare fallow being superior.
2. Red clover and sweet clover proved better than annual legumes.
3. The limed area appreciably outyielded the unlimed.

The soil was found to be responsive to potash as well as phosphoric acid and nitrogen. The average yields per acre for the five-year period were as follows:

1. 600 pounds of complete fertilizer without potash—909 pounds leaf.
2. 600 pounds of complete fertilizer with 2 per cent potash—968 pounds leaf.
3. 600 pounds of complete fertilizer with 4 per cent potash—980 pounds leaf.
4. 600 pounds of complete fertilizer with 5 per cent potash—984 pounds leaf.

The study of varieties of crops, their relative value and adaptability to Tennessee conditions, and their improvement by selection and breeding have always occupied a prominent place in the Station's work. The comparative ease with which an improved crop variety can be brought into general use to the immediate benefit of the farmer has caused the Station to increase its efforts along this line in recent years. Special attention is being given to corn and cotton but other crops are being worked with, such as tomatoes and garden beans which are grown both for shipping north and for canning plants in various parts of the State.

Cotton Varieties

The Station has given particular attention to seven of the most promising varieties of cotton, and a uniform variety test has been organized and is now under way under the supervision of Professor Essary, station botanist, who has had long experience with this crop. These varieties have been studied in the field in the cotton counties of the State. It was found that they are the most widely grown varieties but it was also found that they vary greatly in different sections, are badly mixed, and lack uniformity as to lint characters, type, and time of maturity. New varieties and strains, as well as new selections made in the work, will be placed in the new strains test which will be continued over a period of years. About 300 crosses have been made between different varieties for the production of new strains.

Trice cotton, one of the best early varieties now grown along the northern border of the cotton-producing area, was improved and introduced to general use by the Station and is recommended by stations in other states because of its adaptability to boll-weevil conditions as well as its suitability to the northern limit of cotton production.

The question of shedding buds and young bolls, selections of strains resistant to diseases of the leaf and boll, cultivation, thinning, and topping are other questions that are being given close attention.

After six years of field tests with all the leading varieties of corn subjected to like conditions as to soil and cultivation, the Station found Neal's Paymaster to be best adapted for general use and the most productive under Tennessee conditions. This variety was accordingly recommended and today is the leading variety in Tennessee, being grown on about one-third of the 3,000,000 acres planted to corn annually. It yields on an average nearly three bushels per acre more than other varieties, which means an increase of about $2,500,000 in the value of the State's corn crop annually.

Wilt-resistant Tomatoes

Inbreeding through self-pollination is being done with 12 commercial varieties of corn including Delta Prolific, Neal's Paymaster, and Jarvis Golden Prolific. Such a breeding method brings out rapidly the defects and the good qualities inherent in the variety. L. S. Mayer, a specialist working in cooperation with the office of cereal crops and diseases of the U. S. Department of Agriculture, is devoting full time to the corn breeding studies with a view to securing superior strains.

The tomato industry which had grown in large proportions in the Humboldt section of West Tennessee was threatened with destruction by a wilt disease. The disease appeared about 25 years ago and gradually grew worse until whole fields were completely destroyed. It was critically studied by Professor Essary, and after a few years of work there was obtained by selection a tomato that is resistant to the disease and that will produce abundantly in fields where the common kinds fail. It was also found that the disease appears under continuous growing of tomatoes on the same land year after year and that crop rotation and seedbed sanitation will help to control it.

Work on the selection of tomatoes resistant to leaf spot is under way. A number of leading varieties used by canneries are being grown for study and selection for disease resistance.

At one time the red clover crop of the State was seriously injured by a fungous disease. By selection of seed from plants that withstood the disease, a resistant strain was developed by Professors Bain and Essary and red clover can now be grown successfully on land where it would ordinarily be a complete failure. A recent publication from the U. S. Department of Agriculture recommends it as the best for southern conditions, and it is being used in the Department's trials as the standard of comparison.

For a number of years comparisons of domestic and foreign strains of red clover have been made in plots. The object has been to show the relative resistance of the Tennessee disease-resistant, produced by the Station a number of years ago, and other strains, to the anthracnose disease of red clover. Very interesting results have been obtained in favor of the Tennessee resistant. Much interest in the Tennessee seed has been aroused by the experiments and a number of growers have undertaken to produce the seed for the market to supply the large demand for it in this and other states where anthracnose is serious.

In 1900 alfalfa was practically unknown in Tennessee. Today largely as result of the Station's advice there are over 12,000 acres producing hay worth a half million dollars annually in addition to its value for pasture and soil improvement.

A distinct strain of lespedeza, or Japan clover, has been developed from the common variety which was once thought to be worthless. This new strain is more vigorous and productive than the common variety and has a more upright habit of growth so that it is especially suitable for hay. It is now beginning to be grown widely and will add hundreds of thousands of dollars to the value of the State's annual hay crop.

Tennessee's Pride

By hybridization and selection the only beardless variety of winter barley that is hardy enough to go through the winter in Tennessee has been developed. This new barley, which is valuable for both hay and grain and which is recognized by the U. S. Department of Agriculture as the best of its type, is being extensively grown in Tennessee and is gaining in popularity in other Southern states.

From Culberson winter oats, an improved strain, which matures two weeks earlier than the Grey Turf commonly grown, has been obtained and found to be especially suited to rich land, where it stands up better and yields more than any other oats.

A selection from the Tokio soybean, which produces 20 per cent more hay than other varieties commonly grown and which would increase the value of the soybean hay crop in the State by $2,000,000 when the mass of the farmers adopt it, is recommended by the Station after a long series of tests with over 100 different varieties.

Insect pests damage Tennessee crops to the tune of $20,000,000 annually. The Station maintains a staff of trained men who study these insects and methods for their control. The value of sodium fluosilicate for control of the Mexican bean beetle and other insects as demonstrated by S. Marcovitch, the Station's entomologist, is one of the outstanding discoveries. The fluosilicates promise to displace paris green and other arsenicals now in common use because of both cheapness and efficiency. Also the fluosilicates will kill certain insects, such as the striped cucumber beetle and the blister beetle which are not killed by arsenicals and which were previously practically beyond control.

Tennessee is the leading livestock State of the South. The industry is valued at $100,000,000. There are many problems in connection with the industry which must be determined experimentally. The Station is at work on a number of these problems and its efforts are influencing the development and improvement of the industry. The pasture work of the Middle Tennessee Station is outstanding in this connection.

In the study of plant diseases, Dr. C. D. Sherbokaff has discovered new and improved methods for the sterilization of corn and of cottonseed, thus ridding the seed of disease germs which might later injure the crop. He has also recently determined the exact nature of a cotton disease which has in years past produced heavy losses along the Mississippi river both in Tennessee and in other states.

Dr. Margaret B. McDonald, biochemist, has discovered how to rid milk of onion odor and flavor. The method is highly satisfactory and is beginning to be used by dairymen and by at least one cheese factory in the State which now never refuses "oniony milk."

And so again it can be stated that the wealth realized by the State of Tennessee from the work of its Experiment Station runs into the millions of dollars. Furthermore, much of the research work done by agricultural scientists of the "Volunteer" State has spread beyond its boundaries to be adopted by other states in the improvement of their agriculture. Thus, Tennessee justifies and is proud of its Experiment Station.

Romance

(*From page* 4)

anniversary may not only be pleasing his wife but impressing his children as well. However, if he is a bear the rest of the year it won't do much good to "say it with flowers."

The greatest romantic stabilizer begins where charity does—at home. Those who depend upon libraries for it may become a trifle too liberal.

Romance that is lasting is more spiritual than biological, some library references to the contrary notwithstanding. A life-long romance partakes of a compromise more than a temporary convenience. Therefore, I think a little old-fashioned reading of Idylls of the Kings, Shelly, Keats, and the Songs of Solomon should be more generally encouraged. Youngsters don't have to believe it all, but neither should they take everything as literal in the pathological philanderings of our book-a-month scriveners. You see, romance is like some valuable commodity represented on the stock exchange. It may be kited higher than its real earning power or dropped lower than its stability warrants. The commodity itself is all right, but somebody has gambled with it one way or another.

Romance itself is a pretty solid commodity on which most of our families are founded, yet when the speculators start to tinker with it somebody is due for a bump.

I wish to stick pretty close in this theme to what I shall call *non-speculative* romance quoted at *par value,* without wildcat promotion or bucket-shop hazards. In doing so I may be ignoring some folks who are *blase* on the whole subject, but presumably they have quit reading before getting thus far anyhow.

I presume that the hearts of school boys and pioneers hold the finest native examples of romance in its virile and unsophisticated state. Masculine readers will join me in memories of some young and fondly worshipped classmate back in the days of freckles and patched trousers. Romance is put to its hardest test, after all, when the growing boy first becomes willing to wash his neck and ears. He is the butt of jokes and innuendo, if he openly caters to some feminine friend. If he hides his sentiment and pays his devotion in silent admiration, it places his romance on a par with Carlyle's heroes and hero worshippers.

The pioneer made reality of romance and romance of reality. He chose a wife early and loaded her and her dower into an ox-cart bound for uncharted empires. Our western states were built by men and women who staked their all on high endeavor tinged and ripened with romance. There was sentiment, but it was the sentiment of sacrifice and substance combined. Courting was more restricted in those days to young people of the immediate neighborhood. In this connection it is interesting to suggest some research work for psychologists on the relation of individual transportation systems to the widening of marriage horizons.

Prehistoric man walked or harnessed the dinosaur, perhaps. Finally he got to using the donkey as a symbol and a means of following his romantic bent. About the time that Baalam had trouble with a balky one, swains turned to the Arabian horse for fleet and more successful elopements. As horses were high priced, most of the pioneers in America took to the ox-team, which may not have slowed down courtship but it narrowed its boundaries. With oxen the early choice of the heart had to be right to begin with, for bridal journeys were tedious and fraught with peril to hasty natures who wanted their own way about things. Then, later when I was in Milne's "very young" stage, the amorous couples used to pedal by our doors on "tandems built for two" with songs to match their Victorian simplicity. The only modern survival of those tandems is the side-car that catches the dust beside motor cycles.

But now the scene changes once more. Our sophisticated automobile sparkers are longing to dash away on the wings of a petrol Pegasus far off in the clouds to meet some enamorata beyond the borders of Mexico or Peru. If this does not end the international squabbles by the simple expedient of intermarriage, then the invention of the airplane is not Wright but wrong.

In due time we may set up our justices of the peace in shanties by the side of the aerodrome, so that quick justice may be meted out to those who flutter down with their lunches and licenses. I witnessed a wedding in an airship at a state fair last year, and I have since wondered how long it took them to return to earth and get their feet on the ground.

NEVERTHELESS, there is some thought in the expansion of courting range which progress has evolved; which means that the chances of neighboring boys and girls marrying each other is less than before. Doting mammas are thus shorn of their erstwhile power of persuasion, as the knots are tied by machinery more than by conspiracy. So the romance of invention and discovery has a double meaning, and possibly therein lies some hope for eugenics yet.

In the old days the girls who waited longest for partners were called "wall flowers," whereas nowadays the shy and quiet ones are known as "flat tires" or "covered wagons."

Cynical ones who believe that all youth is either flaming or burned out have decided that sentiment and romance are no more, and that it is either money or mania that feeds the marriage mill. It is only the externalist, the sophomoric guesser, who is responsible for such prevalent ideas. The folks who know their humanities are better informed and not so easily dismayed.

Puritanism of a violent type left an imprint of Comstockian mock morality on American life. Their crusades were crude because they made the very things attractive which they wished to banish and crush. They could not keep their blue law tentacles off romance either, and made of it something either farcical and hopeless or entirely taboo. The only element of strength in our lives that kept a decent respect for romance in us was the idealistic home-and-mother type of American woman. The heart of American society worth while is formed of that same innocence and romance, which she nurtured through a whole century and a half against blundering interference.

Look up the definitions of "romance" they put in the dictionaries and see what a bungle they made of it out of their own perverted conceptions. The dictionary says that romance is either something "chivalrous" and cloyingly "gallant" or else it is defined as "fantastic and fictitious." How mother ever made it real and human to us when she had all those bookish denials to face is beyond me!

If romance has had a reaction from those long-faced periods of sanctified repression, perhaps it is not wholly bad after all.

If Puritanism had a hand in this

business of romance bungling, so did Prosperity and Pragmatism. Prosperous and pragmatic men began looking for "class and caste" in marriage instead of moonlight dreams and affection. The girls had to meet the current demand and dress and act accordingly. They had to match the upholstery of a limousine and know how to swing a golf-stick as well as a lip-stick. The livery stables went out of business, sleigh rides were forgotten, and father sits up alone with the radio, instead of winding the clock as a hint to the lovelorn.

ROMANCE may have begun in mythology, but it didn't end there. You and I recall the times when we struggled with the names and doings of the big bugs on Olympus and their earthly devotees. The list of Grecian notables in romance is a hefty one. There are Admetus and Alcestis, true to the death; Ulysses and Penelope, who learned that absence makes the heart grow fonder; Orpheus and his beloved Eurydice, whom he sought in Stygian realms; Diana's love for the shepherd boy, Endymion; Aurora who made Tithonus immortal but forgot to make his youth lasting; Hector and Andromache, the faithful Trojans; and that ancient triangle case of Paris of Troy and Helen and Menelaus of Sparta. I would give you some others bearing names suitable for cigars or new auto models, but such is enough.

These were symbolical of moral, religious, and philosophical fervor, or legends touching the powers of nature and the wonders of earth and the seasons. Please note that chiefly the nicest ones have survived. Those others of allegorical horror, such as Vishnu and Siva of the Hindus, the Juggernaut of Calcutta, Osiris and Isis of Egypt, have mostly vanished from our literature with the gorgons, hydras, and the basilisk.

The Hebrew contribution to romance is closely woven with religion and cult, and such characters as Isaac and Rebecca, Ruth and Boaz, David and Rachel are the patriarchal precursors of the work of monks and paladins who delved in crusades for the Holy Grail and orthodox imagery.

The original adoption of the love romance must be blamed on the people of southern France, or the Provencals. Their soft and easy civilization and polished and settled government gave rise to troubadors, whose dialogues in verse eulogized the fine points of love's casuistry.

On the contrary, the Norman French and the northern nations went in for adventure and the strong right arm encased in hardware. Their tales of chivalry and flowering knighthood were retailed by bards and harpists, called trouveneurs, who sought examples of piety and courage in Arthur and Charlemagne.

So we see that some folks in history liked love romance, others preferred fighting romance with a little swashbuckling to boot, while another group pledged their loyalty to religion with equally fervent romantic expression. I do not know which kind you descend from, nor do I care, but my situation takes in all three more or less. It all depends on the advertising and the price of seats.

At any rate, we have inherited it all and must live with it somehow. There is love romance, religion romance, and adventure romance—each a potent force behind us and taught in our churches, schools, and everyday lives. I shall add one more.

IF we puzzle over the changes in youth toward love romance, may we not also find some changes in the aspects of religion romance and adventure romance; not that we are less susceptible to tenderness or refinement, but we have had to transform our customs with the tremendous growth of that *fourth* branch of romance—the romance of knowledge, science, and invention.

Look over the books on the subject of the romance of progress. Just a few show the meaning, such as Daguerre and the photograph; Faraday and the dynamo; James Watt and the engine; Roentgen and the medical rays; Edison and the electric light and phonograph; Wright Brothers and the airplane; Laws and Gilbert and the soil; Pasteur and biologics; De Forest and the radio—and on without end. Just one or two of those headliners in the myriad of such workers would outshine the flashes of Jove's lightning and outtrick the legerdemain of Olympus and the Round Table. Yea, verily there is more romance in one Tin Lizzie than in all the chariots of the gods!

Romance began, remember, and found encouragement when even princes and noblemen could not read or write. Nowadays romance has a far stiffer grade to climb when education is universal and critics and cynics are eager to defame and belittle things. Thus in reality, instead of having less romance today, we have vastly *more* of it.

And as for the ethical portion of romance, it will not suffer by comparison with the ignorant days of old when men were thrown to the lions for sport's sake and endured torture for a Roman holiday.

Romance today must be real he-man romance, the kind that stands the gaff and fills the bill. No more dodging or fairy tales to explain something unknown or to be avoided. The cards are all on the table now, and even the kids know a royal flush.

I crave no pardon for quoting Tennyson instead of the votaries of modern *verse libre,* as follows; the part where Vivien croons to Merlin:

"In Love, if Love be Love, if
Love be ours,
Faith and unfaith can ne'er be equal
powers;
Unfaith in *aught* is want of faith in
all:
It is the little rift within the lute
That by and by will make the music mute,
And ever widening, slowly silence
all."

So it matters not whether you are married to the romance of service, the romance of knowledge, or the romance of home-making, there is bound to be plenty of adventure in all, and, of course (if your heart is in it) plenty of love.

And when all forms of love and adventure are gone from the timepiece of life, then, regardless of how many jewels the case contains, the main spring is busted!

ORIGIN OF HARUM-SCARUM

A sultan at odds with his harem
Thought of a way he could scare 'em;
He caught him a mouse
Which he freed in the house,
Thus starting the first harum-scarum.

Banker (telephoning) — "Mr. Cohen, do you know your account is overdrawn $17?"

Mr. Cohen—"Say, Mr. Banker, look up a month ago. How did I stand then? I'll hold the phone."

Banker (returning to the phone)—"You had a balance of $400."

Mr. Cohen—"Vell, did I call you up?"

Bernard like other small boys of his age generally found himself in trouble of some kind. Finding that words had but little effect upon his offspring, the father resorted to sterner measures.

A neighbor watching him chastise the boy, noticed with admiration that Bernard gave no outward indication of the pain he was suffering.

"Don't you ever cry when you're beaten, Bernard?" he asked.

"What's the use," retorted the boy. "The old man's deaf!"

NEEDS PRACTICE

First Stout Girl: "Madge lost ten pounds in two weeks by worrying."

Second Ditto: "I tried that, but I couldn't keep my mind on it."

A LOONY COUPLE

"They say Boggs is crazy on the subject of golf and his wife is equally crazy over auction sales."

"Yes, and the funny part of it is they both talk in their sleep. The other night a lodger in the next flat heard Boggs shout 'Fore' and immediately Mrs. Boggs yelled 'Four and a quarter'."—*Wall Street Journal.*

Bessie came running to her grandmother, holding a dry, pressed leaf, obviously the relic of a day long gone by.

"I found it in the big Bible, Grandma," she said, round-eyed. "Do you suppose it belonged to Eve?"

Just one last word of caution—keep an eye on the melon patch! Your neighbor's boy is no better than you were, and he's a half brother to the rabbits anyhow.

WHY NOT?

Mrs. Prim: "I didn't see your husband in church this morning."

Mrs. Glim: "No, he doesn't dare go now."

Mrs. Prim (shocked): "Doesn't dare go? Why?"

Mrs. Glim: "Last Sunday the pastor prayed for the loose livers of the parish. After the service my husband asked him if he wouldn't slip in just a few words about his floating kidney—and the minister threw a hymn book at him!"

Plenty *of* Potash *in your* Fertilizer?

THE results of 30 fertilizer demonstrations in Tennessee, Mississippi, Arkansas, Louisiana, and Texas show that increasing the potash content of the fertilizer from 0% to 8% increased yields of seed cotton an average of 242 pounds per acre. Three fertilizers were compared in each demonstration—8-6-0, 8-6-4 and 8-6-8. Here are the average yields:

FERTILIZER PER ACRE	SEED COTTON PER ACRE
600 pounds 8-6-0	850 pounds
600 pounds 8-6-4	990 pounds
600 pounds 8-6-8	1,092 pounds

Note that $1.20 worth of potash in the 8-6-4 returned $9.80 in extra seed cotton per acre. The $2.40 worth of potash in the 8-6-8 returned $7.14 in extra seed cotton over the 8-6-4, or $16.94 more than the 8-6-0.

Make sure that your fertilizer contains plenty of potash, as indicated by the last figure in the analysis. Extra potash pays extra cash. It keeps your cotton on the job.

Write our nearest office for free information on how hundreds of farmers got extra cash from cotton.

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