BETTER CROPS W

The Pocket Book

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Better Crops WITH PLANT FOOD

July, 1930 10 Cents

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 XV NUMBER ONE

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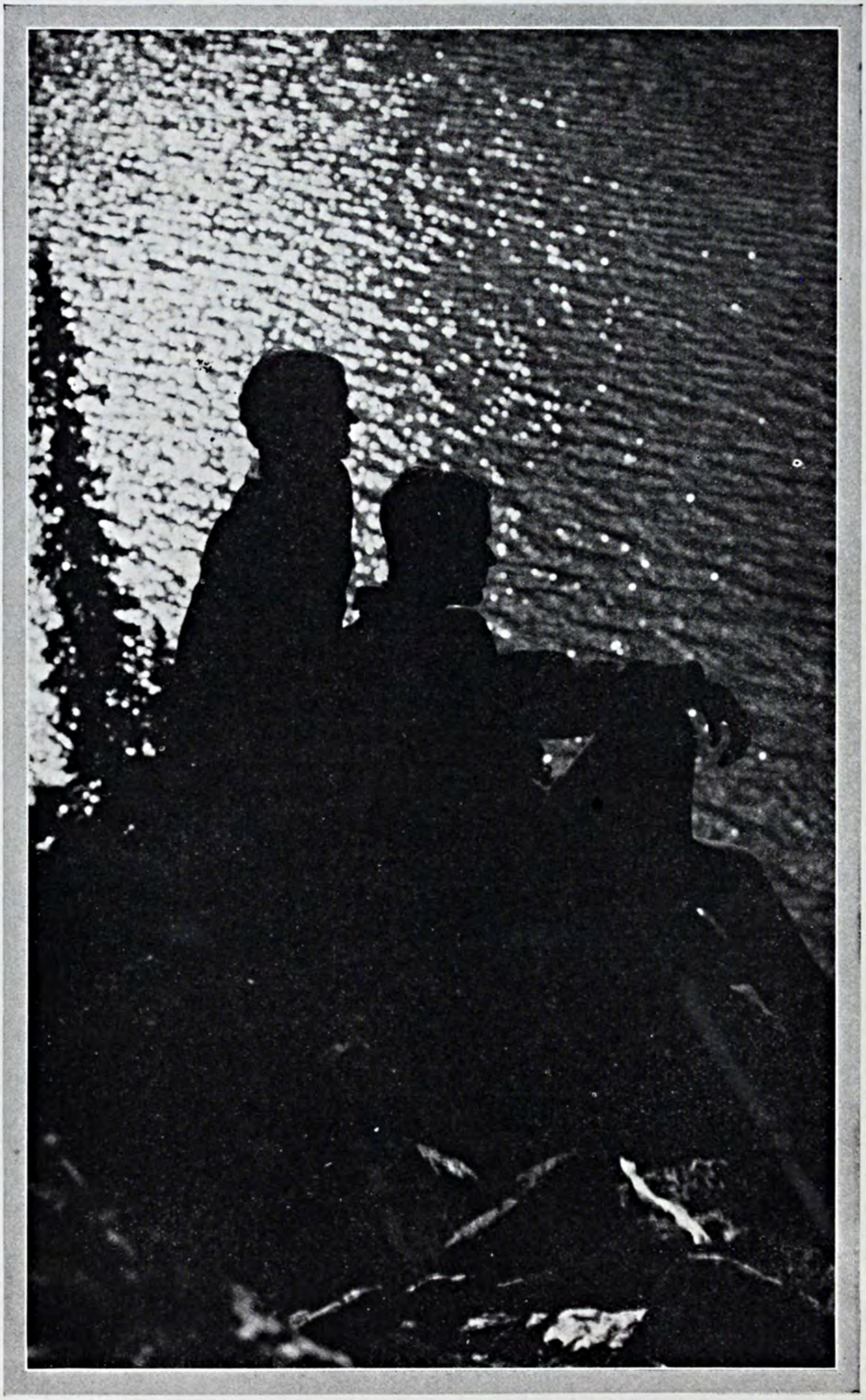

IN THE COOL OF THE EVENING.

Better Crops with PLANT FOOD

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Like "The Brook" they go on forever

WEEDS

By Jeff McDermid

WEEDS are like the weather. There is more said about them than is done about them. Here and there some ambitious and energetic agriculturist tackles the problem of misplaced plant life with a temporary vengeance. He mingles such inflammable weapons as cuss words and sodium chlorate, or tries to smother them with more profanity and tar paper. He never stops to think that Agropyron repens and Cuscuta arvensis did not earn those names for nothing. He begins to have more respect for the so-called "dead languages" when he sees how very much alive the plants with Latin cognomens usually can be.

So we find in surveying the field of weeds that there are at least two kinds of them—widows' weeds and farmers' weeds. They are both mournful enough, I grant you, and both command due respect. The difference lies in the fact that the widow can get rid of hers faster than the farmer.

But the rains of July fall alike upon the just and the unjust, and it's only a question of how you hoe, and what and when and where. Some folks use the hoe as though they were digging post holes, and others scrape the tops off the lamb's quarters and purslane with a technique pleasant to behold. I take keen delight in watching both schools perform, because I admire heroes even though their cause is lost. If perspiration were poisonous to weeds, there would not be very many left in some neighborhoods.

I always like to return to old Adam and original sources for a fresh viewpoint. It seems to me that he and Mrs. Eve faced a dilemma. They found a snake in Paradise and a riot of weeds when they got the gate. Then when Adam began his hopeless scrap with quack grass and bindweed he made himself some applejack—and lo and behold, he saw that snake again! Yet if I were choosing between snakes and weeds, I, too, would leave the Promised Land. The only trouble is that some of us have inherited both, along with boils and an amortized mortgage. You can doctor the boils, scotch the snakes (which means starve them), and dole off part of the mortgage, but the weeds go on forever.

IN the light of modern evidence, I am convinced that weeds and not blisters were the cause of Job's lamentations, that weeds drove the Hebrews through the Red Sea to Manhattan Island, and that they inspired Patrick Henry's oratory. I am also convinced that weeds discouraged the American Indians from becoming farmers, caused several Irish potato rebellions, and blasted the hopes of the farmer-labor party in 1924.

I am likewise persuaded that weeds held back the crop surplus and agricultural marketing act several decades, and maybe had some bearing on the failure of the debenture. Likewise I know positively that if it had not been for weeds we should have bathtubs and radio sets in every farm home.

Lastly, if it wasn't for weed invasions many an extension worker would have to consult the research department for more new material. Thus you see that such humble examples of the marvels of photosynthesis and carbohydrate production can hog up a big share of the economic picture.

Strange to say, weeds always come from the adjoining farm. They are like measles and the itch—somebody always gets them before we do and is responsible for spreading them. The item of personal responsibility is not clung to in weed matters like personal liberty is with liquor rights. Blame the wind, the cows, stray birds, and your neighbor's cussedness, but never admit that you tested too late. Here, too, we inherit something from Adam and maybe a little from Eve. Human nature likes to admit its virtues and deny its discrepancies.

There be three officials upon whom public scorn is heaped, saith the litany. Number One is the Volstead sleuth, Number Two is the poundmaster, and Number Three is the weed commissioner. Those who keep us dry are in league with those who take up strays and fine us for not cutting thistles. Verily, the government is sticking its nose too deeply into the affairs of private citizens, says my bucolic friend. Inasmuch as weed commissioners are usually our neighbors, and neighbors dislike to be vehement and drastic about toadflax and corn cockle, the anti-weed campaign drags a dreary leg.

ONE of my county agent friends, bent upon solving this age-old barrier to weed scything, contrived to have his county weed inspectors nonresidents. This system, plus a carload of rough-on-rats in handy shakers, appears to have reduced the weeds to one ton an acre. I hope to have pictures of his plots in the next issue if I can get a tripod tall enough to reach above the wild sunflowers. He will go on the land in the spring with a spring-tooth and let it go fallow in the fall. Then he will sow hemp and

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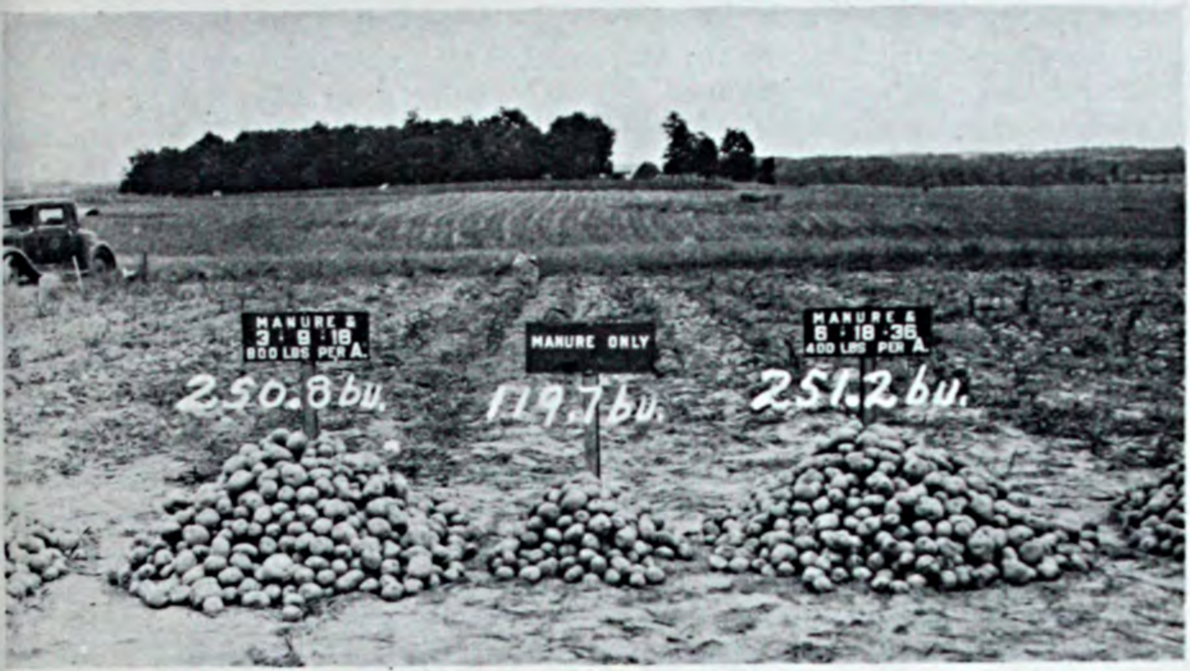

A well balanced complete fertilizer supplementing manure, more than doubled the potato yield. Double strength fertilizer at half the quantity produced about the same as single strength.

Potato Profits

By F. L. Musbach

Branch Experiment Station, Marshfield, Wis.

"WE certainly hesitated to make any change in the kind of fertilizer used until we were convinced that the recommendations had been proven out," said one of the large Langlade county potato growers in commenting on the results of plot tests conducted in that county. "But," he continued, "there is no longer any doubt that our soil responds to fertilizer with a higher potash content." Langlade county, it might be stated, represents a part of the newer potato-growing districts in the northeastern part of Wisconsin where commercial fertilizers are depended upon to assist in securing high acre yields.

Considerable advancement in the use of fertilizer had been made in this county because growers were alert and utilized all the best information available bearing on the subject of producing not only large, but profitable crops. Quite naturally Aroostook county, Maine, was referred to as a place where high yields were secured through the use of the right kinds and amounts of fertilizers. These eastern practices therefore, were responsible, in a measure at least, for the fertilizer program followed before the inauguration of the test plots.

Because of variations in soil, in climatic conditions, and in systems of farming engaged in, fertilizer plots were set up in Langlade county in 1926 in cooperation with County Agent J. Omernik and interested growers. Later the work was also taken up in Barron and Price counties where growers eagerly sought information based upon results secured under their particlar soil conditions.

It would consume more space than is available to go into detail of these various experiments which have resulted in a radical change in the kind of fertilizer now generally used by growers. The 5-8-7 fertilizer used by 90 per cent of the growers in the Aroostook section was also the standard potato fertilizer in northern Wisconsin. While the 5-8-7 or mixtures of similar ratios have proven most profitable in the East, under Wisconsin conditions the fertilizer test plots told a different story.

Considerably less nitrogen is required on the one hand, and a higher proportion of potash, and also of phosphate, is indicated on the other hand. Such fertilizer mixtures as a 3-12-12, 3-10-10, 3-9-18, and 3-20-20 have proven much more satisfactory both from the point of yield and of quality.

The Climate Factor

Undoubtedly the factor of climate is of importance, primarily, as concerns the nitrogen requirement in the two areas. In this connection it might be of interest to compare the temperature and rainfall conditions of Antigo, Wisconson, with those of Presque Isle, Maine, as indicated in the following table:

Table I

	Antigo 36 Yr. Av.		Presque Isle 11 Yr. Av.	
	Temp.	Rainfall	Temp.	Rainfall
May	53.9	3.78	49.4	2.76
June	63.9	4.35	58.7	3.95
July	67.9	4.29	65.9	3.10
Aug.	64.9	3.20	63.2	3.59
Sept.	57.8	3.51	54.9	2.97

The temperature difference is quite marked especially during the early growing season. The warmer, moister months in northern Wisconsin are apparently responsible, in a degree, for the lessened response to the fertilizer relatively high in nitrogen. Then, too, the system of farming engaged in affects fertilizer response. Wisconsin growers under diversified farming practices have manure available, usualy applied on sod land in fairly liberal amounts.

While manure may be considered a potash fertilizer, yet the amount available for the potato crop is insufficient for maximum yields. In connection with the response to various fertilizer formulae the results obtained in 1930 in three different sections may be of interest. Table II

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Pastures for the South

By E. B. Ferris

Jackson, Miss.

ONE of the handicaps to successful farming in the United States, and especially in the South, is the effort to cultivate too much land. We have this land and have known nothing else than to work it in the common farm crops. A valuable lesson might be learned from the German who came to this country and bought 20 acres of land. When asked if he thought he could make a living on it, he replied that if he could not, he would sell half of it, as he was sure he could live comfortably on 10.

It is well enough to own wide acres if each carries its own burden of taxes and interest on invested capital, but there are few farms here where the best acres do not have to carry the burden of as many, or more, unproductive ones. The trouble is, we depend too largely on cultivated crops to return the income, forgetting that lands too hilly or too poorly drained to be cultivated with safety might be profitably utilized for grazing or the growing of timber.

Years ago the students of a class in agriculture at the Mississippi A. & M. College were taken to the farm of a pioneer dairyman and cattle breeder near-by, that he might give to them the accumulated experiences of his many years of work and thought. The advice given by this far-seeing man, who has since come to be looked upon as one of the wisest of his generation, was that we should encourage the growing of grass and the introduction of improved livestock. In fact, he was of the opinion that we should throw away the tools for killing grass, keeping only those that might be used to make it grow more luxuriantly.

It has taken almost half a century for his neighbors to fully appreciate his wisdom, and the fact that his advice was sound is evidenced by the history in recent years of the section where he lived and to which it was supposed to apply. It is now the banner cattle country of an entire State; in fact, of all States that adjoin it, and has reached this point without materially reducing the crops that then were grown almost exclusively, cotton and corn.

Not all the lands in this one State or adjoining ones are so well suited to the growing of grasses and clovers, but many of them are, and we could mention counties by the dozen in Mississippi and its boundary States that might do fully as well if the landowners were only impregnated with the ideas that this wise old gentleman so successfully sold to the people of Oktibbebha county.

Being cotton-minded, we have attached too little importance to other crops often better suited to our peculiar soil and climatic conditions. Almost daily we see being cultivated lands that any reasonable man might know could never be expected to produce the crops being grown at a profit. These same lands, if plowed and sodded to grasses and clovers, would at least remain where they are, rather than be washed to places below, and with a little help in the way of added plant food, might soon become the best revenue producers of the farm.

Almost as often, we see good stands of young timber being destroyed to

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High quality tomatoes pay both the farmer and the canner.

Graded Tomatoes

By F. C. Gaylord

Purdue Agricultural Experiment Station

THE Ten Ton Plus Tomato Club pointed the way to high yields per acre, but the working-out of a method whereby the grower is paid for the tomatoes delivered on the basis of a definite standard of quality places the growing of tomatoes for the cannery upon a sound, equitable, and more profitable basis. At last an incentive in more dollars per ton is placed squarely before the grower. The use of better soil, more liberal applications of commercial fertilizer, and better cultural methods are paid for by higher yield, and what is even more important, higher prices per ton.

The results of buying tomatoes for canning factory use have been so satisfactory both to growers and canners that in the short space of three years the system has grown from a system without a following, until during the 1930 canning season 40 Indiana factories will buy their product solely upon the basis of U. S. Grades. Likewise the entire canning tomato area of the United States is either trying out the system or is interested in it.

In 1927 when the investigations were begun in the Hoosier State to determine if the proposed U. S. Grades could be worked out and a satisfactory mechanical system developed, practically every canner in the State felt that it would never work. However, the investigations concerning the quality of tomatoes being received by the old flat rate method were so startling and conclusive that when the first year's work was published, 10 canners agreed to try the new-fangled system during the 1928 season. Most of them felt that it might help; it couldn't be much worse.

The results have been so gratifying to canners and farmers that a limit of the number that could be handled in 1930 has kept the number "buying on the grade" down to 40, which was the upper limit set for 1930. Among the factories using the system will be found every size from the smallest to the largest.

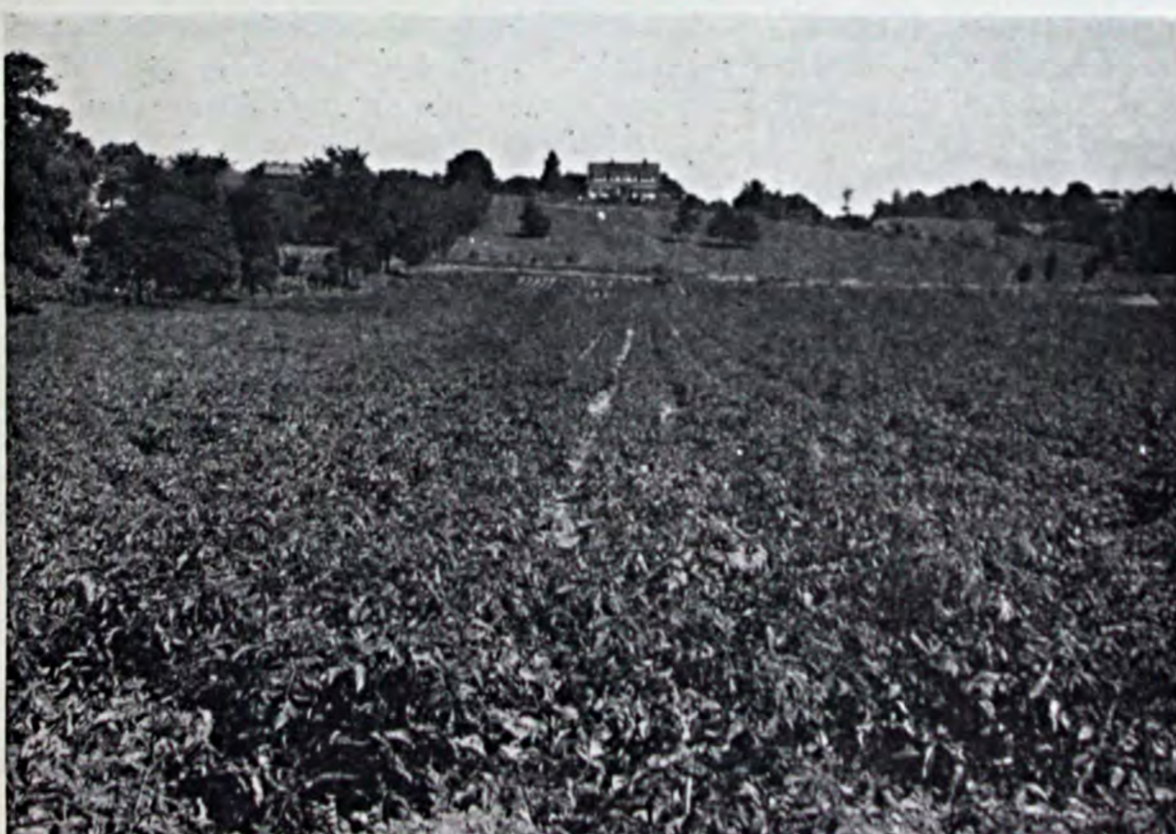
In 1927, 3,265 tons of tomatoes were examined at 13 different factory districts in Indiana in order to learn something about the quality of the raw product being received under the flat rate system. From these grading operations it was found that Indiana canning crop tomatoes were running about 30 per cent No. 1's, 50 per cent No. 2's, and 19 per cent culls. When the facts in regard to the quality of Indiana tomatoes were placed before the canners, 10 factories agreed to contract their acreage on the basis of the U. S. grades as interpreted in Indiana in 1927. Special contracts calling for a definite price for No. 1's and No. 2's, with no pay for culls, were signed between the grower and the canner at these factories.

More No. 1's

During the 1928 season, 8,234 tons of tomatoes from 1,103 growers were received. The seasonal average for all tomatoes delivered was 47.19 per cent No. 1's, 47.42 per cent No. 2's, and 5.39 per cent culls. In 1927 under similar conditions on the flat rate basis, the averages were 30.4 per cent No. 1's, 50.6 per cent No. 2's, and 19 per cent culls. A comparison of the results of factories buying on a graded basis in 1927 and 1928 show that they averaged 16.8 per cent No. 1's with 13.6 per cent less culls in 1928.

In comparing the results of the three years 1927, 1928, and 1929, it is found that as a result of this system, the growers delivered in 1927, 30.4 per cent No. 1's as compared with 47.19 per cent in 1928 and 51 per cent in 1929. They reduced their culls from 19 per cent in 1927 to 5.39 per cent in 1928 and 3.19 per cent in 1929. In the three years of investigation, two of which were done under actual buying and selling of tomatoes under grade contract, the growers have almost doubled their percentage of No. 1's and practically eliminated the green and rotten tomatoes. At two factories where approximately 2,000 tons of tomatoes were received, the average percentage of culls for the entire season was a little over one-half of one per cent.

In cooperation with Dr. John H. MacGillivray of the Purdue Agricul-



Tomato fields such as this, producing high yields of high quality, help build such homes as in the background.

tural Experiment Station, color determinations were made on the No. 1's, 2's, and culls as graded in 1929. In every instance the results showed that the best color was obtained in No. 1 tomatoes and the poorest color in the culls. Under commercial investigation, as well as in the laboratory, the percentage of dry matter was highest in the U. S. No. 1 grade, and correspondingly lower in the culls which were not accepted. Results secured in 1929 definitely show that not only does grading improve the quality but likewise increases the quality of manufactured tomatoes and tomato products that can be secured from a ton of product.

A comparison of the cost of buying on the grade versus the flat rate shows that in 1927 at the factories under investigation the raw product on a $13.00 flat rate cost $16.05 per ton of usable tomatoes. If these tomatoes had been bought on the grade at $10 and $18 tomatoes they were worth $10.18, or $13.33 for a full ton. In 1928 the cost of a full ton on the $13 flat rate was $13.74 per ton. On the basis of $10 and $18 the tomatoes as delivered cost $13.26 per ton, or $14.01 for a full ton of usable tomatoes. In 1929 the cost of a full ton if they had been bought on a flat rate of $13.00 was $13.40. On the basis of $10 and $18 they cost $13.76 per ton as delivered, or $14.18 for a full ton of usable tomatoes. These figures show that the farmer is getting more money because he is delivering better tomatoes, and the canning factory is buying its tomatoes cheaper than it did on the old flat-rate basis.

Many Advantages

The results of three years' investigations show that the graded system of buying tomatoes has many advantages, a few of which may be listed:

1. It's an effective, simple, economical, mechanical method of buying and selling. The cost need not exceed 25 cents per ton.

2. Provides an equitable or fair basis for buying since every grower gets paid for his tomatoes on the basis of the quality he delivers.

3. Enables packer to buy more economically since he contracts to buy a given known quality of product at definite prices.

4. Eliminates culls—green and rotten tomatoes. Three years' results have reduced the culls received from 19 per cent to 3½ per cent.

5. Insures higher percentage of real red-ripe tomatoes. No. 1's have been increased from 30 to 51 per cent for the season average.

6. Enables packer to classify growers and eliminate or educate the poor ones. Many of the poor growers have taken a new interest in tomato growing and have delivered better tomatoes on grade.

7. Enables canner to attract better farmers not interested under the flat rate. Many farmers that were not interested in growing on the flat rate have joined the ranks of quality growers.

8. Cuts down manufacturing cost. Less bad tomatoes to pull out, so can operate at a more rapid rate with better tomatoes.

9. Enables packer to pack higher proportion of high quality products. Since they have more real red-ripe, sound tomatoes the percentage of high-grade pack is increased.

10. Gives packer basis for determining efficiency of manufacturing operations and enables him to check up on factory management.

11. Enables packer to maintain standard or quality year after year. The grades are the same year after year, so they can maintain a given standard.

12. Eliminates worry and trouble of buying raw stock. The inspector grades the tomatoes received and furnishes certificate of grade used in buying load.

13. Places buying of raw stock on definite known standards with neutral, disinterested federal-state inspectors.

(*Turn to page 55*)

The Inquiring Mind *and the* Seeing Eye

By Dr. A. S Alexander

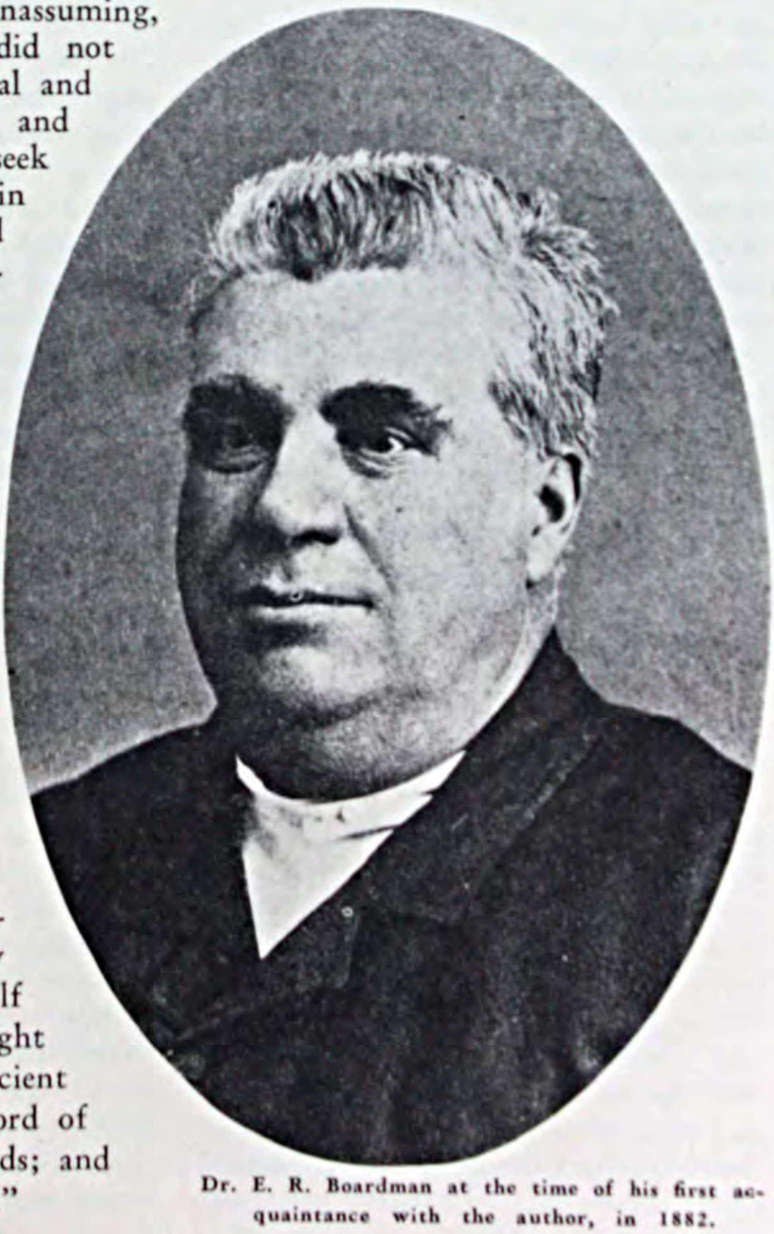
University of Wisconsin

> Statesman, yet friend of truth! Of soul sincere;
> In action faithful, and in honor clear;
> Who broke no promise, served no private end;
> Who gained no title, and who lost no friend.
>
> Pope.

IT was Dr. Edwin Rowland Boardman's request, in life, that his tombstone should not cost over $50; yet he richly deserved a noble monument, for he was considered the wisest man in Stark county, Illinois, and was esteemed and loved by everyone in his home district.

He was so modest and unassuming, however, that his fame did not spread among the influential and noted people of the State and Nation. He did not seek notoriety or applause, but in a quiet way accomplished wonders, mastered the sciences in which he was interested, contributed a wealth of information regarding insects and plants, yet found time for efficient service as a country doctor of the old school and the able administration of many estates and out-of-court adjudication of various local disputes.

He lived and died a comparatively poor man, who did not crave wealth, was too busy to accumulate it, but unquestionably laid up treasures for himself in heaven. Of him it might truly be said, with the ancient writer Wotton, "he was lord of himself, though not of lands; and having nothing, yet had all."



Dr. E. R. Boardman at the time of his first acquaintance with the author, in 1882.

Dr. Boardman was born March 3, 1829, in Luzerne county, Pennsylvania, and at the age of 11 years was taken to Illinois by his parents. After a weary journey of 40 days they arrived at Paw Paw Grove where Shabbona and his friendly tribe of Indians lived. At the age of 16 he began the study of medicine, under the tutelage of Dr. G. S. Hunt, and later studied at the LaPorte, Indiana, Medical College. There were no railroads in those days, therefore, he walked to and from college.

In 1849 he began practice and had a hard struggle before he succeeded and became popular. His entire earnings the first year amounted to but $25.00. In September, 1850, he married Hannah Fuller, of the ninth generation of the Fuller family ancestor who came overseas in the *Mayflower.* They started housekeeping without a cent, in a two-room cabin which the neighbors helped them to build, and in it they used blocks of wood for chairs. Five sons and five daughters were born to them, of whom George D. Boardman, Neponset, Illinois, and a sister survive.

Their home was on a 120-acre farm which originally was timberland, bought 40 acres at a time, and laboriously grubbed and cleared for farming.

Dr. Boardman early became a student of nature, taking up the study of botany before he began the practice of medicine. He walked over the then wild State of Michigan collecting a great herbarium, which later was destroyed by accident. About the year 1868 he became interested in entomology and pursued its study arduously all of his life.

During the Civil War he rendered eminent service as a physician. He made no charges for medical attendance upon soldiers or their families and ministered to the sick and wounded at Palmyra, Missouri, to the survivors of the battle of Stone River, and to others in hospitals at Nashville, Tennessee. His home was ever open to sick and wounded soldiers and many were there nursed back to life and health.

A Happy Religion

His strenuous life came to a sudden and untimely end, from heart failure, on Saturday, July 25, 1891, at his home in Elmira, Illinois.

After his death his great collections of insects, plants, and woods were donated by his widow to the Toulon, Illinois Academy. Later the Academy burned down and the collections were lost. What a tragedy it is that the results of his lifetime's labors were not preserved in the museum of some great Illinois institution of learning for the education and inspiration of young people.

Dr. Boardman was a constituent member of the Osceola Baptist Church. There was daily family worship in his home. The workers on the farm were welcome and there never was a time when some poor, homeless person was not a guest. His son, George, told me that the church contribution and wages for the hired help were laid aside each Saturday evening, and if any money remained it was used to buy things needed for the house; otherwise, they went without.

The good physician was a friend to rich and poor alike, if worthy, and everyone gave him a kindly greeting as he drove about in his buckboard behind the Indian ponies he loved, or walked abroad accompanied by his faithful dog. His was a happy religion. His smile captivated and his wit and humor made his converse the more enjoyable.

The old homestead was sold by a daughter to Mr. Noah Winn. The remaining son, George, lives on the adjoining farm, known as the Uncle Johnny Turnbull place.

At the funeral services, Rev. Frank Ross, of Elmira, said of Dr. Boardman:

"His was such a restful personality that in his presence one felt as does a weary one who sits down in the shade

The Boardman Home near Elmira, Ill., in the early eighties.

of a great tree; and he was as unassuming, as self-reliant, as steadfast, and as beneficent in his influence as the great, spreading tree."

* * *

It was in the latter part of May, 1882, that I became acquainted with the subject of this sketch. I had just come to America from Scotland, and, on the way to Iowa, stopped at Kewaunee, Illinois, to visit Uncle Johnny Rule on his farm near that town. When that prosperous Scot learned that I was what he termed a "bugologist" he told me that their local physician, Dr. E. R. Boardman, was a noted naturalist and remarkable personality whom I should visit.

"Don't expect to meet a swell, dressed-up highbrow," said Uncle Johnny, as he mounted me on one of his bucking bronchos and pointed the way to the naturalist's place near Elmira. "He's just a plain, practical fellow," he added, "but a great man all the same, wi' a wonderfu' brain. *He'll do you a lot of good!*"

The description of the doctor and the estimate of his character were correct in every particular, and he not only "did me a lot of good," but proved an inspiration, the influence of which has lasted through life.

The rugged, genial doctor appeared a very giant as he advanced and gave me a cordial welcome. From under shaggy eyebrows sparkled the keenest eyes I had ever seen, and when he spoke, each word was perfectly intoned and instantly impressed its meaning. One immediately decided that here was wisdom personified. Later, as I sat with him in his plainly furnished study and listened to his discourse on flowers, trees, and insects, his presence seemed indeed like the shadow of a great rock in a thirsty land. He was the most restful, clear, convincing, and appealing talker I had ever heard, fresh as I was from the lecture halls of Scottish institutions of learning. Yet he made no attempt to lecture. He simply poured out the facts and thoughts which filled that wondrous brain of his and welled from a heart overflowing with love for God's marvelous creations.

Around the walls of the study and office were cabinets formed of tier upon tier of shallow drawers, and as we talked of beetles and butterflies, one after another of them was drawn out and exposed thousands upon thousands of finely mounted insects. The butterflies and moths included magnificent specimens from different parts of the Globe, as well as those known to Illinois and the surrounding States. They were beautifully preserved, without damage to their microscopic "feathers and bloom." In those drawers I saw for the first time sections of naphthalin used to prevent moth attacks.

We Go Beetle Hunting

While the doctor exhibited the flowers in his immense herbarium, I learned, incidentally, that he had studied the Scandinavian languages, that he might correspond with the naturalists of Europe, and I have no doubt he had as good a working knowledge of other foreign languages. He mastered the subjects he studied, perfectly organized his facts, and stowed them away in the brain cells of a most marvelous memory.

I soon discovered that he could instantly classify and give the Latin name of every plant and insect he possessed, and was astounded to note the dexterous way in which he handled his specimens and the neat manner in which they had been mounted and preserved. One scarcely would have expected such expertness from a man of Dr. Boardman's colossal build and seemingly phlegmatic temperament; yet, I saw him use his hands as deftly as those of an artist and net butterflies as quickly and surely as might a young athlete.

For hours I sat entranced as we examined his treasures and he gave me practical instructions in the various mysteries of the naturalist's art. When plants and insects had been studied and admired, a complete collection of woods was exhibited, every specimen of which the doctor personally had obtained and prepared. Side by side lay split stems of various native trees, each three inches in diameter and five inches in length. On one side of each specimen was the natural bark, with the inner surface of the wood of one piece beautifully polished, and the other showing the grain in its natural condition. The collection contained a specimen of every tree indigenous to Illinois and many from surrounding States.

The next day Dr. Boardman showed me thriving specimens of live trees planted with his own hands in an orchard nursery and ravine of some 10 acres near the farm house. To the doctor's dictation I listed, with their common and Latin names, 58 different trees native to Illinois, and I have the list today. The ravine was a lovely, quiet, shady spot. I can remember now the sweet scents wafted by the summer breeze from the white pine, red pine, balsam, fir, red cedar, and larch trees clustered near the entrance. I wonder how many of those trees have survived? Some day I purpose going down there to see; but I have been told that the old orchard and nursery are no more.

The day after our chat in the library, Dr. Boardman furnished me with a Mason jar containing a few lumps of potassium cyanide covered with absorbent cotton and blotting paper, as a "killing bottle," and took me beetle hunting along an old rail fence and through the woods and fields. Space will not permit me to recount the wonders of nature he imparted. He was the first to tell me about the ants and their aphid "dairy cows"; to explain how a spider knows, by *feeling*, when a fly is caught in its net; how a 17-year locust (cicada) plays his kettle drums; and how the grasshopper and cricket contribute their notes to the insect orchestration.

As he moistened a finger tip, to pick up a tiny insect, Dr. Boardman said:

"Mind now! The smallest things in nature are sometimes the most important. None must be overlooked. Don't be unduly attracted by the prettily colored, great, and gaudy

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Experimental Study Proves That—

Early Plowing Gets the Weeds

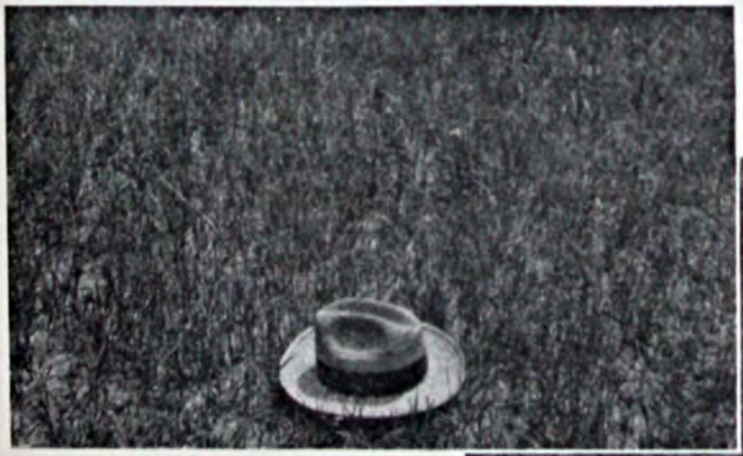
By W. A. Albrecht

University of Missouri

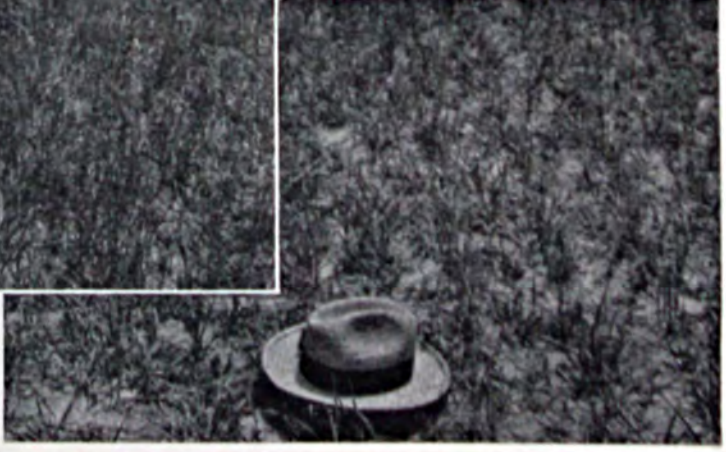
SO much has been said for the value of early plowing as a means of improving the wheat crop that we have not appreciated some of the other benefits attendant upon this phase of early seedbed preparation. Killing weeds, or keeping the land from getting foul, is an important advantage of early plowing.

At the Missouri Experiment Station, where a study was made regarding the influence of early plowing on the nitrate content of the soil, the wheat plot plowed in late July or early August left a stubble almost free of weeds, while that plowed in September was badly infested. This infestation consisted mainly of the bracted plantain at the time of harvest, but increased by other weed varieties, including crab grass, ragweeds, and others. The early plowing turned under the light weed crop, while the delay in plowing left the heavier infestation to go to seed. Plowing in September was then merely a method of replanting the same crop of weeds whose seeds matured in consequence of the delayed plowing date.

It has often been argued that delayed plowing produces this larger weed crop to be turned under as green manure and therefore ought to benefit



Left—Plowed July 15th.



Right—Plowed Sept. 15th.

Early plowing makes better wheat. Plowed July 15th.

the succeeding wheat crop. The fallacy of such reasoning is evident from the fact that the excessive weed growth dries the soil and reduces its supply of soluble nitrogen, both to the detriment of the subsequent wheat.

This reduction of nitrates is of marked significance. The weeds not only reduce the nitrates in the soil before they are plowed under, but also, as a highly carbonacious matter, they hold down the nitrate accumulation after plowing. According to the Missouri results, the nitrate content of the soil in the late plowing was only 1/2 to 2/3 of that in land plowed in July.

The weeds are a big factor in disturbing the soil processes producing nitrates. Instead of allowing the soil to accumulate nitrate, they convert the already low supply of soluble nitrogen into the insoluble form beyond the reach of the wheat crop. Removing the weeds as a nitrate disturbing factor is proving as important an effect as tilling the soil to save its moisture or to establish a firm seedbed.

Early plowing for wheat is a wise practice in that it pays double dividends, one in the form of more wheat and the other in the form of less weeds. So far as the weeds are concerned, it is a prevention, and consequently recognized as worth many times more than the cure.

This wheat was treated the same as the above wheat, except that the ground was plowed 2 months later.

Complete Fertilizers for Apple Trees

By Fred W. Hof Mann

Virginia Agricultural Experiment Station

ON the whole, it is not difficult to show more pronounced and outstanding growth and yield responses in apple trees when nitrogen fertilizers alone are applied to Virginia soils than when phosphatic and potassic fertilizers are also added. Marked responses do not show up with phosphatic and potassic applications. It is quite natural, then, that nitrogen applications by themselves are considered the more important in Virginia for the growing of apples. In the light of some recent experimental evidence acquired at the Virginia Agricultural Experiment Station, we should not, however, altogether ignore the value of phosphatic and potassic materials supplementing nitrogen fertilizers.

The value of all of these materials applied to Virginia soils for apple growing seems to show up with the increasing age of the trees. It is very likely that with the increasing needs of the apple tree certain deficiencies in the soil are liable to develop and that the chances of growth and yield declines could be offset sooner and more effectively with certain applications of fertilizers containing all three of these essential plant food elements.

It should be reasonable to ask whether it would be more advisable to wait until phosphatic and potassic deficiencies actually manifest themselves or would it be safer to take no chances at all against any possible malnutritional effects, but from the very outset and right along keep all three of these essential elements amply provided. At any rate nitrogen applications supplemented in reasonable amounts with phosphatic and potassic fertilizers will do no harm outside of the expense involved. Furthermore such applications should be valuable to provide an ample reserve for the possible increasing needs of the apple tree.

The applications of phosphatic and potassic material along with nitrogen even in the earlier period of the apple tree may be of great value ultimately. It may, therefore, be more profitable in the end to apply fertilizers containing all three elements from the very outset even if no need is clearly apparent.

Most of our apple soils in Virginia show adequate amounts of available phosphatic and potassic materials to produce profitable crops for some time. The amounts of these materials may continue to increase with further disintegration of soil and rock particles. To what extent such additions may be offset by mechanical and chemical fixation is hardly clear. Neither is it settled just how long average growths and yields for apple trees will be maintained without the addition of the necessary plant nutrients and how close the limit may be approached without the danger of allowing growths and yields to be impaired.

In most Virginia orchards it is quite likely that in time the soil will be so occupied by the roots of the apple trees that it will be completely root bound. The chances for such root binding is relatively greater in Virginia with its heavy clay subsoil. The roots of apple trees can hardly penetrate these stiff sticky areas, with the result that exploitations for food materials are confined to relatively shallow limits.

Very little available fertility will be left in such soils to maintain vigorous growths and high yields. Very likely such apple trees will be more appreciably benefitted with proper applications of nitrogen fertilizers supplemented with phosphorus and potash. Although the possibility of lowered fertility of all three elements in these soils may be presumed and explained upon this basis, just when and to what extent deficiency occurs is still under considerable conjecture. These points can perhaps be best answered from observations based upon trial and error procedure. Observations in such trials with other crops have led to some convincing conclusions.

Complete Fertilizer Best

Definite increase responses with such crops as corn and timothy have shown up when nitrogen is supplemented with phosphatic and potassic applications. In a 10-year experiment at this station with corn, a continued application of 333 pounds of dried blood per acre gave a yield of 24.37 bushels per acre, while applications of 333 pounds of dried blood, 438 pounds of 16 per cent superphosphate, and 200 pounds of muriate of potash per acre gave a yield of 53.87 bushels.

In a 10-year experiment with timothy carried on by the Ohio Agricultural Experiment Station and the United States Department of Agriculture, the results of the increases of several fertilizer applications are shown. These results are brought out in Table 1. An increase of 1,306 pounds of dry hay per acre was produced when 120 pounds of sodium nitrate, 240 pounds of 16 per cent superphosphate, and 80 pounds of potash to the acre were used as against a 793 pound increase for 120 pounds of sodium nitrate to the acre and a 891 pound gain when 5 tons of farm manure to the acre were applied.

These trial and error results with such crops as corn and timothy as well as those of other crops should be of value in indicating the possible ultimate response of apple trees when they likewise are treated with all three elements. Since apple trees have root systems capable of extending into much larger soil areas, a longer period will be necessary to show the results of these applications. Where timothy and corn may show the benefits of nitrogen, phosphorus, and potash treatments in some 10 years, a longer period very likely will be necessary for apple trees.

Experiments with apples carried on by the Virginia Agricultural Experiment Station since 1911 to study the role of fertilizers and moisture in tree growth and fruit bud formation indicate some interesting responses where nitrogen applications have been supplemented with either or both phosphorus and potash. These results are brought out in Tables 2, 3, 4, 5, 6, and 7.

Although nitrogen applications by themselves show the pronounced and outstanding gains as compared to the non-treated plats, the highest yields and gains generally prevail when either phosphorus or potash or when both have been applied with nitrogen. When yields for the same year and treatment were averaged from several experimental orchards of New York, Pennsylvania, West Virginia, and Virginia and differences secured for each of these years, conclusive responses in growth and yield show up in favor of some combination of nitrogen with either phosphorus or potash or with both. The combinations supplementing nitrogen show the higher responses.

On the whole, from the results that have been secured through this Sta-

The clean cultivated experimental apple orchard of the Virginia Agricultural Experiment Station at Blacksburg in the spring of 1930.

tion, a complete fertilizer combination of nitrogen, phosphorus, and potash is the better application to use in most Virginia apple orchards for higher yields.

Just to what extent supplemental applications of phosphatic and potassic material pay in Virginia apple orchard management depends upon the prevailing cost of these elements where the expense of fertilizers alone is considered as against the price that can be received for apples. The value of taking precautions against possible decline in growth and yields by keeping an ample reserve of all three essential elements provided is not so easy to determine. Trial and error observations of much longer duration will very likely have to be maintained to help determine this value.

Just what the amounts and proportions of these three elements should be for the most economical responses in apple yields also is still to be solved. In the solution of this problem, statistical analysis of trial and error observations for some time will very likely continue to be the more reliable method. Nevertheless, as a guide or basis for application, the amounts and proportions of these three essential food elements found in the different parts of the apple tree and its fruit need not be discarded altogether. At least, it is certain that these elements are present in the apple tree and its fruit even when no applications have been made.

It is obvious that these elements are removed from the soil and although they may be found to vary in their amounts and proportions with different kinds of fertilizer applications, independent analyses show them to be present in not greatly varying proportions. Furthermore, control experiments show conclusively that all three elements must be present to maintain growth in apple trees.

Chemical Analyses

The amounts and proportion of these three elements found in chemical analysis, may not be just exactly the correct amounts and proportion to apply to the soil for the greater growth and yield gains. Nevertheless, such analysis indicates what has been removed and serves in measure to show what may be restored to maintain the original fertility or perhaps even to enhance it. These chemical analyses may, therefore, have some limited value in measuring fertilizer application in so far as nitrogen, phosphorus, and potash are concerned.

R. C. Thompson in the Arkansas Agricultural Experiment Station Bul-

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Why, Sweet Clover?

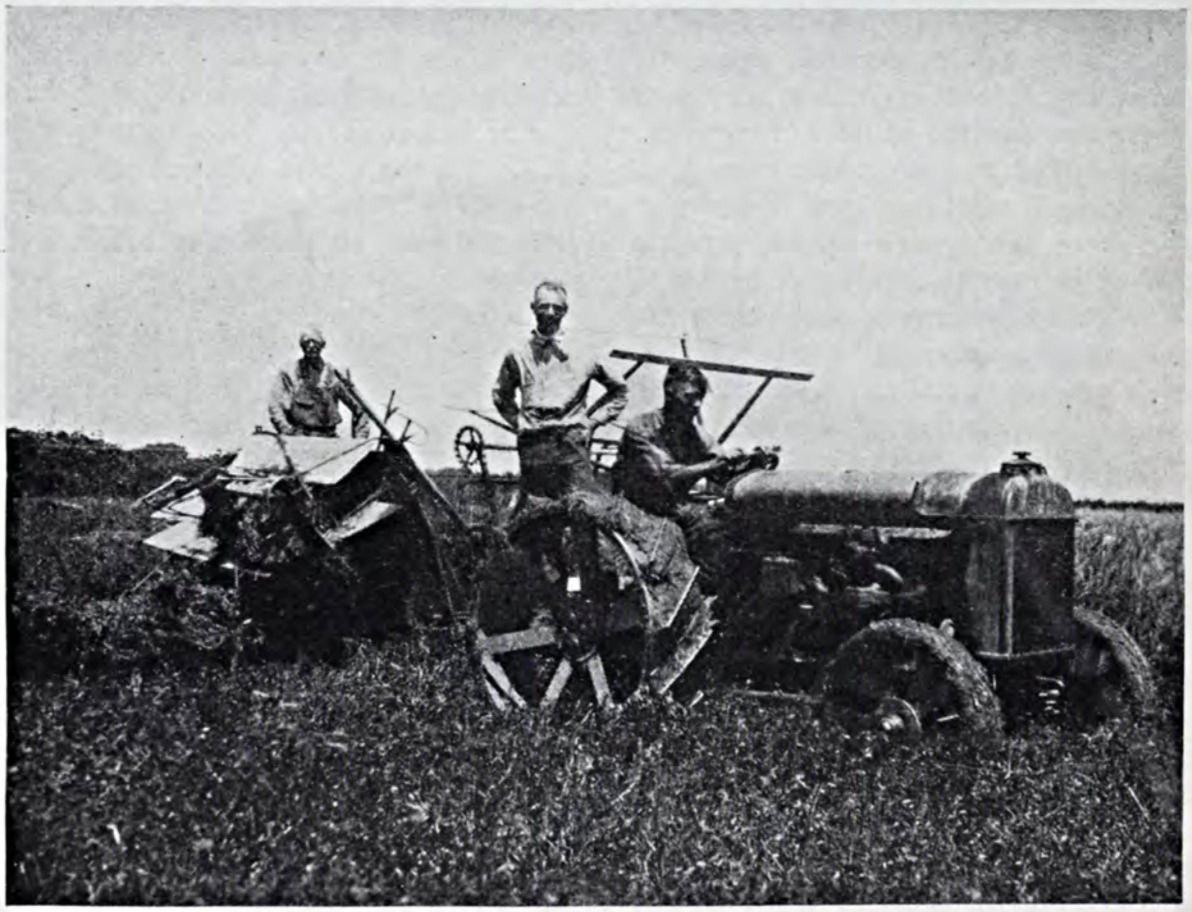
By L. R. Combs

Iowa State College

KNEE deep in sweet clover at the time of the wheat harvest is the song western Iowa farmers will soon be singing. In the past few years western Iowa farmers have turned to sweet clover as the choice of clovers, grasses, and alfalfa. They have not done this because they could not get stands of alfalfa or other clovers, but because they have found in sweet clover an almost universal answer to their particular needs, just as farmers in certain other sections of Iowa, Kansas and surrounding states have found sweet clover a very valuable crop.

In the Missouri river bottoms and in the hilly sections along the Missouri and Big Sioux, farmers have developed their own methods of sweet clover production. Many of these practices have been based on recommendations of the Iowa State College, while others have been learned in the school of 15 years' experience.

These farmers have found that sweet clover makes a heavy growth which, when plowed under, is a valuable green manure crop. It makes valuable late summer and fall pasture after the wheat or oats are off the ground. When not used as pasture, a hay crop of one to two and one-half



A harvesting scene on a western Iowa farm. Note the height of the sweet clover on the front wheels of the tractor and the relative height of the wheat in the background. The man on the binder is P. J. Quist, owner of the farm, while J. A. Price is standing up in the center of the picture and R. L. Quist is operating the tractor.

Knee deep in clover at wheat harvesting time. Note the height of the wheat. The men from left to right: R. L. Quist, P. J. Quist (owner of the farm near Missouri Valley), and J. A. Price.

tons may be harvested in late September. In reclaiming waste or run-down soils, sweet clover has few equals. And last but not least, the cost of seed is relatively low.

Fifteen years ago a trip through this section would have revealed about 15 or 20 acres of alfalfa to every one acre of sweet clover. In fact the latter was regarded as a weed; the exponents of it as a soil builder and pasture in many cases gathered their seed along the roadside. Now the reverse is true. Alfalfa is still a popular crop, but the acreage of sweet clover in some areas in western Iowa will surpass the alfalfa acreage thirty to one. Interest in sweet clover has brought the total clover acreage to about equal alfalfa acreage in Iowa as a whole.

Nor has the popularity of sweet clover been because the crop does not have faults. Fifteen years spent in learning to understand the sweet clover before farmers began to recognize its value is the reason for its popularity.

The first problem was difficult in getting a stand with 12 to 15 pounds of clover, while 8 to 10 pounds of alfalfa practically always secured a satisfactory stand. The invention of the scarifier and better knowledge of cultural methods solved that problem.

Two General Practices

In wet seasons sweet clover has often grown so rank that it interfered with the cutting of small grain. Many farmers now wait with the clover seeding until the small grain is up high enough to be seen easily down the drill rows. The clover is then broadcast over the field. Occasionally it is rolled afterwards; more often the covering of the tiny seeds is left to the spring rains.

The usual rate of seeding among these farmers is 8 to 14 pounds of scarified sweet clover seed planted at the time of seeding the small grain. The seeder attachment in front of the grain box is arranged to drop the clover seeds in front of the drill discs. Allowing the tubes of the seeder attachment to direct the clover seeds to the grain tubes, results in the sweet clover being planted too deeply.

With ordinary weather conditions, knee-deep sweet clover is expected at grain harvesting time. Harvesting a 15 to 30-bushel wheat crop or a 45 to 70-bushel oat crop with a rank undergrowth of clover offered another problem to conquer. Of course, if June proves to be a dry month, the clover usually is held in check by the grain crop and does not offer a serious problem.

The river bottom farmers follow two general practices when the clover is too rank. The first thing to do, they will tell you, is to allow the grain to become fully ripe. And the second precaution is never to attempt to run the binder when there is any dampness on the grain or clover. When tractors are used to pull the binders, the plant juice causes plenty of "gumming" on the tractor and binder bull-wheel lugs.

About the only hay crop harvested from sweet clover is that taken off in late September of the year it is seeded. Another value of sweet clover is that the hay is harvested after other work is done. The clover left for the second year is usually for a seed crop or pasture. Often instead of taking off a hay crop the first year, the luxuriant growth is plowed under. Many who have grown the crop and plowed it under the first year will say that the following spring the clover will sprout as volunteer growth and just about take any crop planted. Oftentimes the fall-plowed clover field will have the appearance of a prosperous alfalfa or clover patch about the time the owner wants to plant corn.

When the above condition exists, the bottom farmers as a rule list their corn and follow closely after planting with "go-devils" or weed-cutters. These machines have discs on either side of the furrow which cut off most of the plants left on the ridges. Where corn is to be check-rowed, the practice of plowing up the clover sod late in the spring is followed as the only remedy.

Occasionally a field is found where the sweet clover appears to have taken everything. A few years ago a farmer a few miles west of Missouri Valley was unable to cultivate his corn after planting because of wet weather. The clover appeared to have taken it and he was about to turn the stock into the field. Then he happened to notice that the corn was about as thrifty looking as the clover. In fact, that fall the corn yielded nearly 40 bushels to the acre and had not been cultivated once. The farmer gave as his explanation the fact that the clover kept down the other weeds which would have used more moisture than the clover did.

Soil Building Properties

The sweet clover hay as handled by these farmers causes little trouble to the livestock in the way of bleeding profusely from slight wounds. The farmers are not certain why they have been so successful with it unless it is because of the fact that a strawpile is always available to the stock when on pasture. The hay cut in the fall has either wheat or oats stubble and straw in it and it is thought by many of the farmers that the straw balances up what the clover hay lacks—or provides what is needed to keep the blood of the animals in proper condition.

No story of sweet clover in western Iowa or the Midwest would be complete without some mention of its soil building and reclaiming properties. It has played an important part in reclaiming certain permanent pastures in the rough sections along the Missouri and Big Sioux rivers. Some of these areas have been notoriously unproductive. The best

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Putting "Pep" into Farming

By E. R. Lancashire

Ohio State University

When a county agent gives advice to his farmers, it is as if he gave them signed blank checks. The wise farmer makes his worth a large figure.

FARMING is fast becoming a game in many parts of the country. "Putting Pep into Farming," is one of the major parts played by the extension services of the agricultural colleges and universities of the United States.

The central figure, aside from the farmer, in this extension activity of the schools of agriculture is the county agent. This officer is the local representative of the State agricultural college. He should know practically all the farmers in his county, and when they are willing to cooperate with him, he can usually be of invaluable aid to them in making their business more interesting as well as more profitable.

Some leaders in the business world outside of farming tell their employees that the customer is always right. In farming a low yield or other cause of insufficient return for the amount of time and money invested is often traceable directly to the farm operator. A further comparison of farming with other business reveals that farmers as a whole are more successful than those engaged in other nonprofessional occupations. Statisticians state that there are two successful farmers for every one successful nonfarm business man considering an equal number of each kind.

Farmers who study their business and who are operating their business with sufficient capital usually classify as successful. It is among such men that the county agent finds plenty of the cooperative spirit.

One of the best ways of "Putting Pep into Farming" is that of staging State-wide contests. Clubs covering nearly every branch of agriculture are now in operation in most of the States.

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A Mortgage Company that Leads the Way

By Charles Kilpatrick

Ft. Smith, Arkansas

Below: New house on farm taken over by Pioneer Mortgage Co. built to replace original house, so as to attract a better tenant to rent the farm.

MANY farmers in southeastern Oklahoma, largely due to the "merciless" robbery of their farms by a one-cropping system and because they had allowed the fertility of their soil to wash and leach away to such an extent that they could no longer provide a living for their families, either have moved away or "given up the ghost." They have let their farms go to one of the many farm loan companies operating in that section of the State.

The Pioneer Mortgage Company of Oklahoma City, Oklahoma, inherited their share. It was an encumbrance on their hands, yet they had their money tied up in it and did not want to foreclose on the land.

Mr. Frank T. Blair, manager of the company's interests, had faith in southeast Oklahoma, or he would not have loaned money to the farmers in the beginning. He still has faith and believes that with good cultural methods and a well-balanced system of farming the unfortunately acquired land can be made an asset rather than a liability. He had a vision and saw an opportunity for the company to "come out" if the land was put into the proper state of cultivation and properly managed. For this job he hired Earl Hayes, a young man of unusual executive and leadership ability and a former 4-H state terracing champion, to service and manage the firm's farms in six counties.

Young Hayes faced a most difficult task in securing desirable tenants. Good farmers did not want to move onto abandoned farms, especially as most of the farms were in a deplorable, run-down condition. Houses were unpainted and unscreened; barns had fallen in; weeds in general had taken the place; each farm had a "black eye reputation" in the community, except in a few instances.

The Pioneer Mortgage Company, realizing that proper living conditions were prerequisite to securing the highest type of tenant, set about to tear down, rebuild, paint, or remodel the houses, and install running water. Barns were made over, new fences built and old ones repaired, and a general home beautification program put into effect. In many instances new wells were drilled or the old ones cleaned out and put into sanitary condition.

The company did not stop at providing the best of living conditions, but set about to reclaim and protect the soil fertility. A tractor and three modern terracing machines were purchased, and before the crop season this past year, young Hayes, with three crews which he moved from farm to farm, had completed 20 miles of terracing, embracing over 1,000 acres. The tractor was kept busy every day terracing, plowing under deep the last year's crop residue or fighting Johnson grass that the former owners had allowed to overrun the farm. Cowpeas were planted in alternate rows with corn, and a number of alfalfa fields have been started to restore the organic matter and to give new life to the soil.

The tenants were encouraged to use the best of seed, and believing in fertilizers, this company conducted a number of demonstrations the past year to determine the best grade and proper amounts to use. They particularly tested out the value of potash, varying the potash content from nothing to eight per cent. They were agreeably surprised when they found that the eight per cent potash in the fertilizer mixture gave an increase of 180 pounds seed cotton per acre over where the potash was left out. The Pioneers were unselfish in their farm-developing program, and joined hands with the county extension service and business men in promoting a farmers' educational tour. Seventy-five men saw their fertilizer demonstrations and their many other improved farm and home practices.

Spend Less Than They Earn

The company does not approve of their farmers spending more than they make. They encourage them to have a good garden. A half-acre plot of a uniform fencing is provided for each farm. The cow, sow, and hen program is most heartily endorsed. Each

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Earl Hayes, the Pioneer Mortgage Co., directing work on farm improvement. Fighting Galveston grass that had been allowed to overrun a farm.

Fertilizing the KAW VALLEY

By Walter B. Balch

Kansas State Agricultural College

These potatoes show that it also pays to use a correctly balanced fertilizer in Kaw Valley, Kansas.

THERE are three reasons for the use of commercial fertilizers. They are: first, to replace the plant food taken out of the soil by a crop; second, to improve the quality of the crop; and third, to increase the production. It is pretty hard to prove the first two effects of a fertilizer, but very easy to see if the crop is increased or decreased by the use of a given fertilizer. After one has determined the analysis which gives the biggest increase, it is necessary to determine the cost of the fertilizer and see if its application pays a profit.

All that is being tested out in the Kaw valley of Kansas for the benefit of the potato growers. Those interested in the crop and working on the problem are growers of potatoes, county agents, fertilizer salesmen, and various folks from the Kansas Agricultural College.

The idea of fertilizers first was seriously considered about 15 years ago. Tests were run for about five years

TABLE I

POTATO FERTILITY TEST

Conducted by James Trant, Edwardsville, Wyandotte County, Kansas

Plot	Treatment	1922	1923	1924	1925	Average 4 yrs.
		Yield in bushels				
1	Superphosphate 160 lbs.	123	193	145	200	156
2	Check	121	190	166	196	168
3	Sodium nitrate 80 lbs. Superphosphate 160 lbs.	135	193	157	236	180
4	Sodium nitrate 80 lbs. Superphosphate 160 lbs. Potash 50 lbs.	146	202	181	253	195
5	Check	151	190	160	221	180
6	Potash	139	202	194	243	194
7	Barnyard Manure 5 T	158	220	214	270	215
8	Check	142	199	192	177	177
9	Barnyard Manure 5 T Superphosphate 160 lbs.	150	214	203	265	208
10	Green manure	136	172	166	231	176
11	Check	127	183	171	197	169
12	Superphosphate Green manure	128	189	140	205	165

and then dropped without any positive results. Later investigations showed that the failure of the fertilizers to be profitable was due to the small amounts applied, the analyses used, and the broadcasting of the material instead of rowing it in at the time of seeding.

In 1922 a series of fertilizer plots were laid out on the farm of James Trant of Edwardsville. They were conducted for four years and Table I gives the results of this work.

It will be noticed in checking over the averages of Table I that the untreated plots in every case but one gave a smaller crop than did the treated plots. This indicated very clearly that a fertilizer program was desirable.

Various tests and plots were laid out in various counties, but no definite steps were taken for an organized problem until 1928 when two plots were laid out. One was on the farm of Charles Speaker of Wyandotte county and the other on the farm of James Trant, also of Wyandotte county. Here again increases in yields were consistent with the amount of fertilizer used, the best results being obtained with a 5-10-5 fertilizer applied at the rate of 500 pounds to the acre.

The cost of this material was $11.50 while the average increase in the returns was 56 bushels. If the potatoes were worth only fifty cents a bushel net, there would be a good profit on the $11.50 investment for fertilizer. The next best fertilizer was a 4-8-6 applied at the rate of 500 pounds to the acre, which cost an even $11.00 and gave an increased return of 27 bushels per acre.

In 1929, Myron Kelsey, in Shawnee county, and W. R. Stiner, in Douglas county, set out identical plots in triplicate. The idea of the triplication on

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Duncan Wheeler, of West Kingston, R. I., sees the advantage of adding 200 lbs. muriate of potash per acre as a topdresser (left) compared to no potash (right).

Top-dressing Hay Lands

By Thos. H. Blow

Springfield, Mass.

AN application of muriate of potash at 200 pounds per acre practically doubled the hay yield on the farm of Duncan Wheeler, West Kingston, Rhode Island, in 1929.

This was not the first experience of Mr. Wheeler with potash, neither was it the first response he had received from its use. It was a question, however, of whether with existing farming conditions and prices of dairy products, he could afford to use fertilizer on his hay land.

The field treated was in its second year of hay, contained a good sod of red clover and timothy, and was of a light loam nature. The potash was applied early in May as a top-dressing and at the rate of 200 pounds per acre. On June 11 (harvesting time) a very distinct difference could be noticed between treated and untreated areas.

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Left—with 200 lbs. muriate of potash, the yield was 4¾ tons dry hay per acre.

Right—Without potash, the yield was 2½ tons dry hay per acre.

Leaf-cutting Ants

By W. L. Wilkinson

County Agricultural Agent, Kingsville, Texas

THE leaf-cutting ants, sometimes called village ants or night ants, are a pest of constant annoyance in the rolling sandy sections of the Southern States.

They cut off leaves from trees or cut down field crops and carry them into their nests to use in making a pulp or culture medium for a certain species of fungus which they cultivate with great care for their food. If field crops or orchards are planted anywhere near a village of cut-ants, much damage is apt to occur. They have been known to defoliate several trees or to cut down an acre of small cotton or young grain sorghum in a single night.

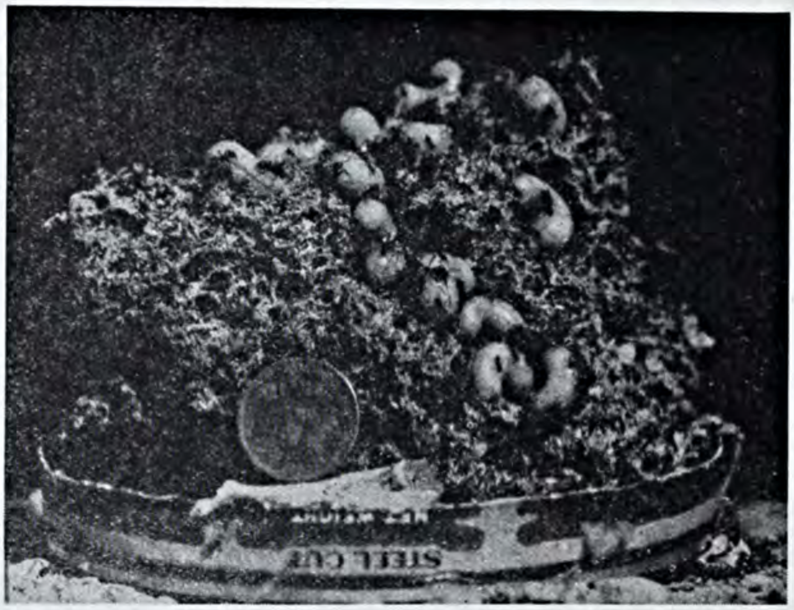
Cut-ants usually build their villages or nests in the woodlands or in uncultivated fields. These villages consist of mounds of dirt 10 or 12 feet across, made from the dirt the ants carry out while building their homes. Many openings in these mounds lead down to small compartments in the ground and finally to the large breeding and feeding chamber of the colony. The main cavities, where the queen of the colony may be found reigning supremely, are usually 12 or 15 feet below the surface of the ground.

From December first until March first is the best time to destroy these villages. The ants are usually pretty well established in their winter-quarters by December first and then can be destroyed easily. If they are allowed to remain unmolested until March first, about the time the queen larvae begin hatching, the opportunity for controlling them is not so good. It is then that the hundreds of new queens scatter out over the surrounding territory for the purpose of starting new villages.

Easily Controlled

Cut-ants may be controlled very easily when the right method is used. However, many farmers spend more time and money than it would take to do the work right in trying to get rid of these ants without doing the necessary manual labor that is required. Some have tried to kill them by pouring kerosene oil in the many holes of the mound. Others pour crude oil or waste engine oil in these holes. Some have even tried to kill them by burning old inner tubes in the nests.

There is only one sure way of destroying a village for good, and that will take about 30 minutes of hard work. The proper method is to get a hole from the surface down to the



This is a picture of the pulp and fungus that is used for food for the cut ants. This was found 12 feet underground on W. S. Trant's farm in Kleberg county. This is found in large quantities in the main cavities of cut ants. There will be as much as a 12 qt. bucket full in one cavity.

main cavity where the queen stays, where the eggs are deposited, and where the many underground tunnels that reach out hundreds of feet in all directions terminate. The most convenient way to get this done is to use a four-inch shallow well augur with extension rods for deep work.

Treat All Villages

Starting in about the center of the mound, one can always tell when the main cavity is reached by the way the augur drops. The augur usually drops into small cavities from six to eight inches in diameter after getting down two or three feet, but when the real cavity is reached there will be a drop of from 16 to 18 inches, and this is not found less than 8 or 10 feet below the surface.

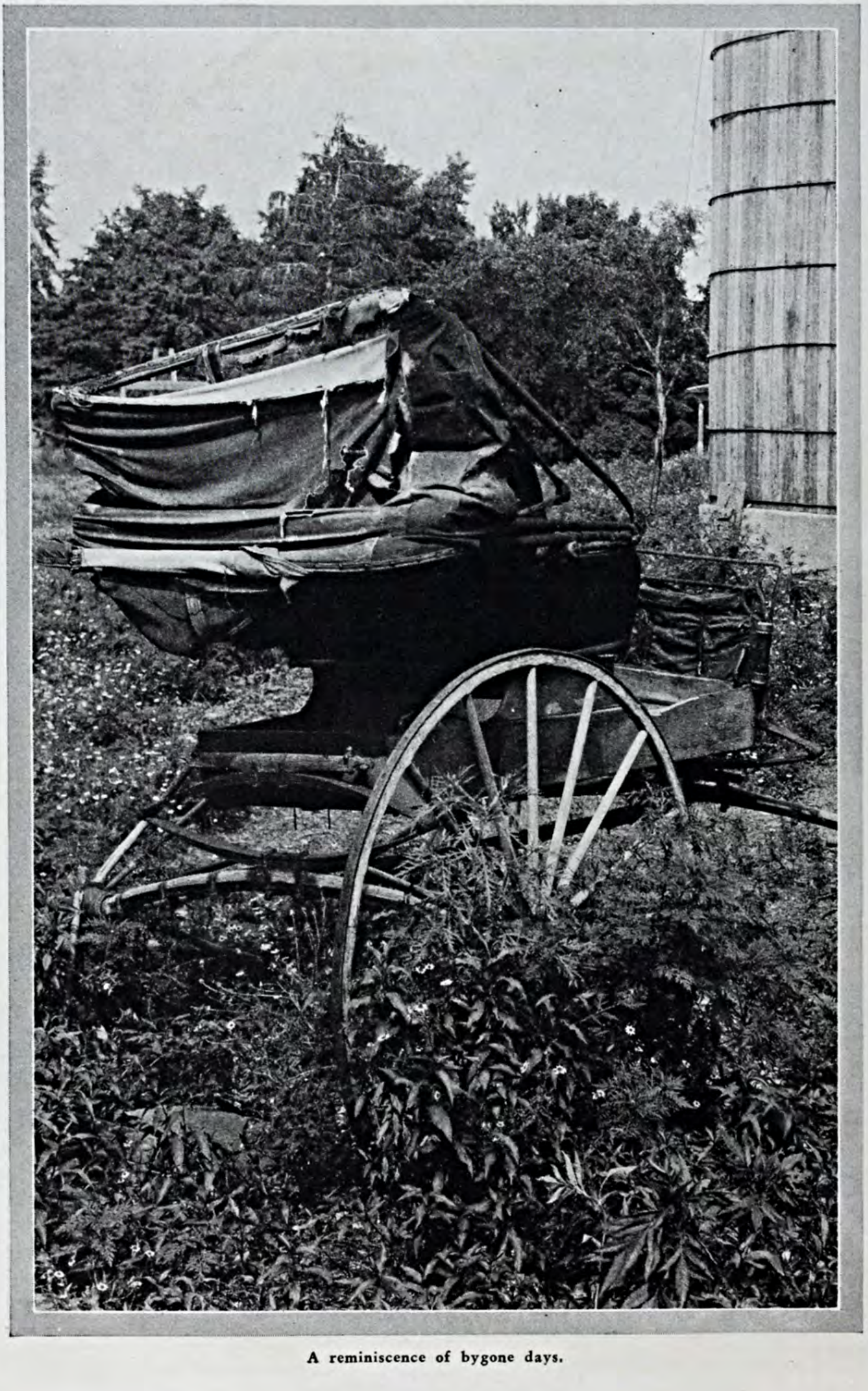
When the main cavity is reached, dig a hole about a foot deep by the side of the four-inch hole. This hole should be large enough so that a shallaw can about two inches deep and six inches in diameter can be placed in it. This can will then be about eight inches below the surface of the ground. Pour a pint of carbon disulphid in this can, place a board over this and the main hole, and after placing a paper over this board so as to keep the dirt from falling through, cover this board with about a foot of dirt, packing it down with a shovel so as to make it as nearly air-tight as possible. The fumes from the carbon disulphid, being heavier than air, will go down the four-inch hole to the main cavity and penetrate the tunnels and kill the ants that are at work with the food and eggs, also killing the queen and her attendants. If left for several days, the fumes will kill all the workers as they come in from the fields, thus destroying the entire colony.

One should never throw a lighted match into the can of carbon disulphid as this is dangerous and besides this will destroy all the fumes. Although it will kill most of the ants present, it will fail to destroy those out in the fields, and these ants will come in, raise another queen from the eggs, and start a new colony. One should treat all the villages on the farm, and get his neighbors to do likewise, for one untreated village will soon infest the entire farm.

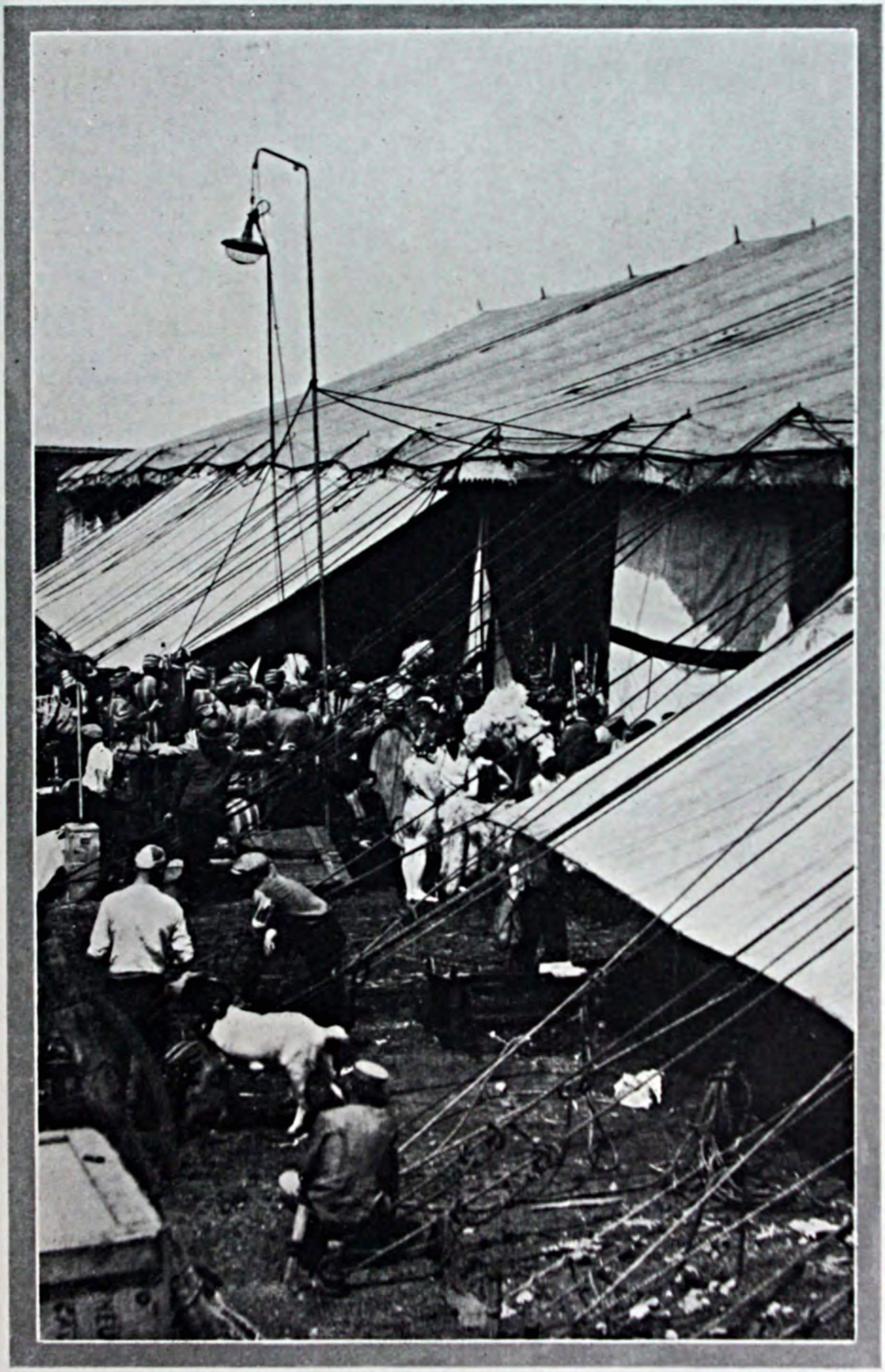
Ready for a dip—with the latest style bathing suit.

100% Americans—Squaw and Papoose of the Blackfeet Tribe.

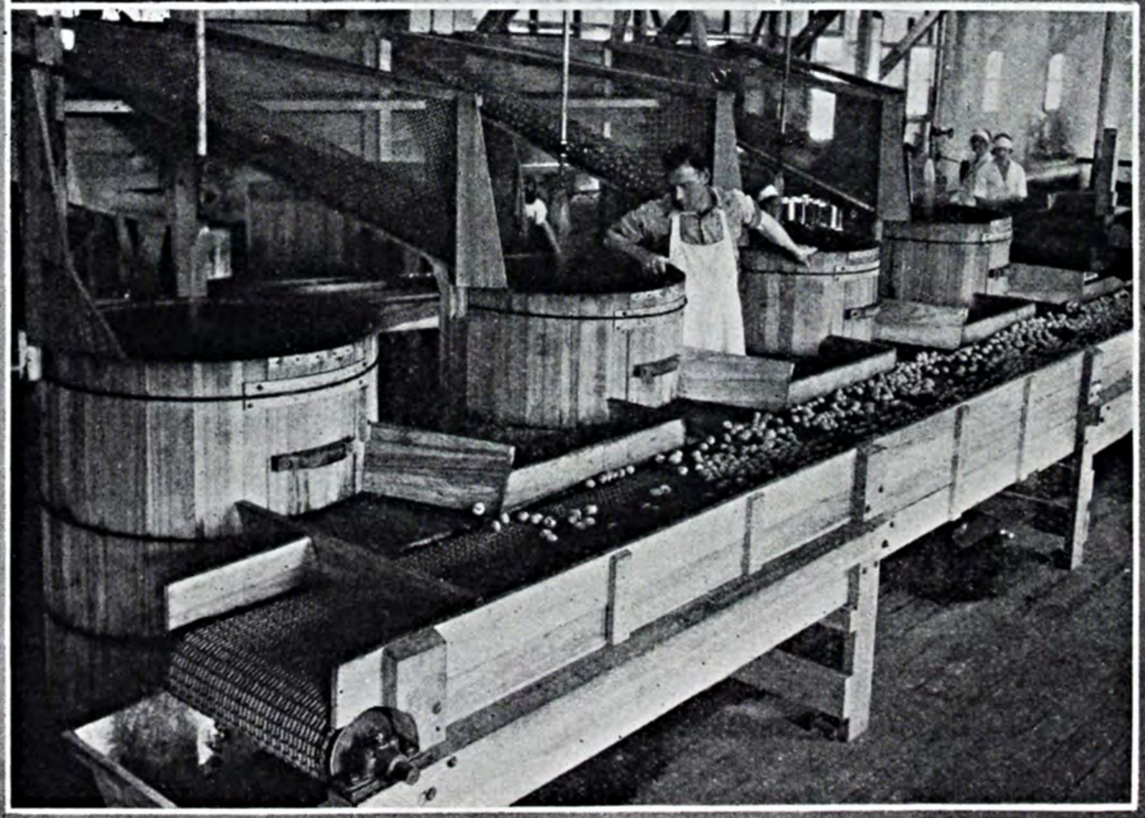
A Chief of the Sioux Tribe.



A reminiscence of bygone days.



Circus Day! Ready to give us the scenes and thrills we never tire of.



Summer time is preserving time, both at home and in the cannery.

The Editors Talk

What Does Your Food Cost?

A farm family of four with a five-year old boy and a two-year old girl would spend about $525 a year for food, according to Janet W. Bump in a recent issue of "Farm Economics." At the prices they would pay at the store, they could easily save $150 a year by using home-produced milk, eggs, and some of their fruit, vegetables, and meat.

This ties up with the Ohio State University's idea that farmers spend too high a proportion of their income for food. It is not an accusation that farm folks eat too much, but rather that they do not produce enough of what they eat on their own farms.

With the present price level on all things which the farmer buys higher than on the things which he sells, it does not take much effort to figure the economy in raising as much of the family's food as possible. Dairy farmers have an excellent chance to use milk more freely. It is their cheapest and most helpful food. Gardens are a source of food throughout the year, for with modern canning methods and a little foresight on the part of the home manager, cellars can be filled with supplies to last until the garden comes on the next year. The same principle applies to the farm families who can raise fruit and their own meats.

In the matter of food, the farm family has a distinct advantage over the city family. It can have better food than is available in any city and at considerably less cost.

The War Is On!

We are in the midst of the annual battle with insect pests. Just what it costs farmers to wage this war never has been and probably never could be estimated with any accuracy. It is certain, however, that they take a greater toll of the earnings of mankind than any other group of tax collectors.

Broadly speaking, insects can be divided into two main groups, those pests harmful to humanity and those which destroy the crops upon which man depends for his livelihood. Of the first group probably the most destructive is the Tsetse fly, estimated to have killed more than 2,000,000 people in the past 10 years. The tick, the mosquito, the house fly, and the flea are other insects in this group.

It would be difficult to rank the Mediterranean Fruit Fly, the Boll Weevil, the Codling Moth, the European Corn Borer, the Gypsy Moth, the Hessian Fly, and the San Jose Scale according to their destructiveness to our major crops. Each takes its share of the great toll.

And so in the midst of another growing season we are again in the midst of the annual battle. Like in any other warfare, new means of attack are constantly being discovered. There will be some this year and the results will be anxiously awaited.

The Americas Will Discuss Farming

North America will meet Latin America in Washington next September for a broad discussion and examination of the problems of agriculture that affect or are common to the two continents. The conference has been called for September 8 to 20 and special attention will be given to agricultural problems of an economic and scientific nature.

Called in accordance with the resolution of the Sixth International Conference of American States at Havana in February, 1928, the coming assembly will be the first Pan American gathering to deal exclusively with questions related to agriculture. Officials in charge believe it promises to be at least as important as any previous gathering for any other purpose in which the two continents have joined forces.

Problems of intercontinental concern will be discussed in their broadest scope and with a view to formulating plans for effective continental cooperation in the development of the agricultural industries. Both governmental agencies and private organizations will participate, and the conference will endeavor to promote cooperation between governments and private citizens in the study of the problems presented.

The conference will consider broadly the problems of research in agriculture and forest development and methods of preventing and eradicating diseases and pests affecting plants and animals. Sponsors of the conference also anticipate that in discussing agricultural economics the members will explore the problems of competition now beginning to bear heavily on the nations in the tropical and subtropical regions of this hemisphere. Tropical countries of other continents offer growing competition in production of rubber, coffee, sugar, cacao, cotton and other vegetable fibers, tobacco, and citrus fruits. In many of these products the New World formerly enjoyed practical freedom from competition.

The conference will also consider plans looking toward a coordination of research by groups of the American nations acting in harmony to improve and develop the crops in which they have common interests. It will study the latest scientific methods for both the growing and the marketing of agricultural products.

This is a broad step in the right direction. From it should come understandings of definite value to our American agriculture.

The Farmer's Position

General business depression has had its effect on agriculture, yet the farmer today is potentially and actually in better position than the city man. This conclusion is drawn after a survey of the agricultural situation by the Corn Belt Farm Dailies during the latter part of May.

The farmer is never out of a job, the report goes on to say. The worst that can happen to him, outside of actual bankruptcy, is reduced income through lower prices. He is fortified to meet that situation. He always has a home for his family, and in case of necessity can draw on the resources of his own farm for food.

While the level of farm prices is much below a year ago, the decline has not been as great as in the case of commodity prices in general. Thus the farmer's relative position is actually improved. Another point in this connection is that the heavy end of the farmer's marketing of last season's production came before the big break in prices last fall. As evidence of the significance of this statement is a report from the Iowa State College on the 1929 incomes of a group of Iowa farms. "Four hundred and fifty farms, or 69 per cent of the 650, showed a profit in 1929, while 250, or 31 per cent, showed a loss. In 1928, 65 per cent of the farms showed profits." The 1929 returns were some better than the 1928 returns, and 1928 was counted a good year.

Even now farmers are not complaining so much of low prices as they are of "lack of money," this meaning merely lack of credit, a situation aggravated in some communities by banking weakness. As a result of general depression this weakness is coming to the surface, and being wiped out through failures having their inception years ago. The result will be a more healthful condition.

The Pasture Awakening

Centuries of pasturing with no return of fertilizer elements other than deposits of liquid and solid manure by grazing animals have resulted in a state of soil fertility depletion that seriously threatens the stability of the stock-raising industry.

The seriousness of this situation was first sensed in Europe by far-sighted scientists, and definite steps have been taken to effect a desirable change. European farmers today quite generally accept the findings of these investigators and are rapidly bringing themselves to a realization of the fundamental value of rotative grazing. Recently there has been developed in Europe a system of pasture management known as the Hohenheim system. This system involves both rotative grazing and the replacement of minerals by application of commercial fertilizers.

Farmers in the United States are rapidly awakening to the need for pasture improvement. This new interest is probably largely the result of economic conditions and to some extent to the activities of research workers in the scientific field as well as in industry.

Among the outstanding contributions in the industrial field during recent months are a bulletin by the National Fertilizer Association entitled, "Pasture Top-dressing with Fertilizer and Lime in the Hay and Pasture Belt," and another bulletin by the Agricultural Service Bureau of the American Agricultural Chemical Company entitled, "Facts About Pasture Fertilization and Mineral Deficiency." The author of the latter bulletin, Dr. H. J. Wheeler, formerly Director of the Rhode Island Experiment Station, presents in a most interesting manner the high lights of the problems of pasture management for a large part of the civilized world. He lays special emphasis on the role that research has played and must continue to play in pasture investigations if our animal population is to keep pace with that of man with his ever-increasing need for animal products.

Speaking of the ills of inadequate fertilzation, whether on pasture or other crops, Dr. Wheeler says: "One-sided fertilization of pastures with single elements is likely to have the same unfortunate result in the end as in orchards. By the use of nitrogen alone, the various elements are removed from the soil by the larger grass crops at a far greater rate than before. This naturally hastens the time when one-sided mineral exhaustion will not only begin to have its effect on the yield of milk and beef, but also on the ability of the animals to bear vigorous offspring or even to reproduce at all. The orchard parallel is seen by the fact that the orchardists of Arkansas, for example, who have practiced one-sided fertilization with nitrogen are beginning to observe like orchardists in Delaware, New Jersey, Pennsylvania, and elsewhere, serious effects on the health and bearing quality of their trees."

The pasture-orchard parallel with regard to mineral plant food deficiencies serves admirably to emphasize the importance of having a sound soil fertility program. It is hoped that the awakening interest in pastures evidenced on every hand will not only bring abundant prosperity to the livestock industry, but that it will give impetus to a similar awakening in other branches of agriculture.

Publicity

One of the essential factors of the general life of any modern community that directly or indirectly affects industry is publicity.

Thirty to fifty per cent of any modern newspaper's space is devoted to news on industrial affairs in all their phases. A long course of circumstances has produced this intensiveness in public interest in industry and what industry is doing. There has thus resulted a unique intimacy between industrial life and the general life of the nation. This is a fundamental phenomenon, especially peculiar to the industrial progress in the United States.

Publicity in its best sense, therefore, means a widespread public intimacy and sympathy with the workings of industry.

This modern development imposes a special duty both on industry and on the public; on industry, that it works in the public view, that it gives the facts, and that it works ultimately for the good of society as well as for its own profits.

It imposes a duty on the public that they demand the facts and not politics, that they will demand to know every side from the best sources, and above all it imposes a growing economic, moral obligation on every group of the public press, that they endeavor to represent to the public, facts and all the facts regarding industry.

Balance

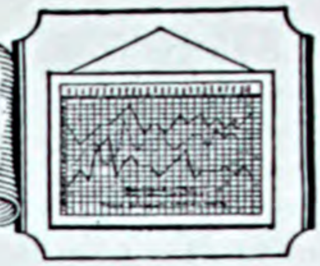
There were 500 New York State farmers involved in a recent economic survey. Out of the 500, 250 had better than average crop yields. Out of the 250, half of them had better than average milk production per cow. Out of the 125, 62 had better than average volume of business. Half of that number had better than average farm equipment. About 30 were making money whether times were good or bad.

The reason that these 30 were making money was because of a balanced program in which ALL activities were better than average.

Out of 500 business firms, 250 have better than average advertising. Out of the 250, half may have better than average financing. Out of the 125, half may have better than average systems of distribution. Of this number, half may have better than average staff efficiency. About 30 will be making money whether times are good or bad.

Neither nature nor modern business has any use for the single track mind. The essentials for success, whether it be the success of an organization or the success of an individual, depend upon balance.

AGRICULTURAL DEVELOPMENTS



By L. C. Farle

"LANDING FIELDS" FOR BIRDS

The establishment of five bird sanctuaries and one public shooting ground in important wild-fowl areas of four Canadian Provinces within the past year indicates that Canada is fulfilling her obligations under the migratory-bird treaty, which protects birds migrating between that country and the United States, according to Paul G. Redington, chief of the Biological Survey of the United States Department of Agriculture, who has written the commissioner of the national parks of Canada, congratulating him upon the progress made by Canada "along this most important line of conservation."

The United States has already set aside a number of similar refuges, or "landing fields," for migratory waterfowl, and, in accordance with the migratory bird conservation act of February 18, 1929, will purchase lands for other sanctuaries, it is anticipated, when funds appropriated become available after the 1st of July.

LOCUST OF OLD WORLD SAME AS GRASSHOPPER

The locust of Egypt and Palestine, whose present-day devastations have been mentioned frequently this spring in newspapers, is really a grasshopper, the United States Department of Agriculture says, and is very similar to the kind of grasshoppers expected in damaging numbers in the Dakotas and Montana this summer. But the periodical Cicada, often erroneously called the "13-year" or "17-year locust," a distinctly different insect, will also appear on the scene this year. In the more nothern localities each brood of this insect appears every 17 years, but in the South the broods appear every 13 years.

A general swarm of "17-year locusts" (Brood IV) is due this summer in southwestern Iowa, western Missouri, eastern Kansas, northwestern Oklahoma, and a few in northeastern Texas and perhaps Arkansas.

A few individuals of "13-year locusts" (Brood XXIX) will appear this summer in upper South Carolina, northern Georgia, and Oklahoma, and a few next year in Missouri and Louisiana.

The periodical Cicada, or "locust," lives only a few weeks in its adult winged stage, during which it seldom takes food, and, in general, does no damage except in puncturing tree twigs and laying eggs in them. This causes a natural "pruning" of the punctured twig ends. Young trees, however, are sometimes killed by the punctures, so it is best not to set out young orchards during the spring of "locust years" and not to prune the trees, especially the young trees, heavily the winter before.

BARBED QUILLS PROTECT PORCUPINE FROM FOES

A mouthful of porcupine quills is anything but a savory dish for any enemy of this self-confident animal.

Misguided and overzealous attackers, such as coyotes, often lose their appetites and even starve after collecting some of the tenacious and finely barbed quills in their noses or mouths, or in their tongues or cheeks. Frequently at water holes in forests range cattle will sniff at a porcupine and, in return, receive a noseful of quills from a flip of the heavily barbed tail. The sharp quills imbed themselves more deeply with each attempt to remove them, causing intense suffering and sometimes death.

Thus protected the porcupine usually goes its way unhindered, and in its quest for food it may destroy young fruit and forest trees, or vegetable crops, or wallow down alfalfa. According to Leaflet 60-L, Porcupine Control in the Western States, by Ira N. Gabrielson and E. E. Horn, of the Biological Survey, issued recently by the United States Department of Agriculture, the porcupine in many areas has branded itself as a pest that must be controlled. But in many parts of its extensive range it does no serious harm and is tolerated because of the interest that attaches to a native wild animal.

Porcupines in the Northwest winter in the cliffs and lava rims of the mountains. In the Southwest they go to the lower forests for the winter. This makes it possible to find them close to their dens when snow is on the ground and to shoot them, often in sufficient numbers to effect satisfactory control. In summer it is easy to locate their winter dens by the girdled trees. Taking advantage of the porcupine's fondness for salt, foresters, ranchers, and rodent-control workers of the Biological Survey bait them near their dens with a half-and-half mixture of salt and powdered strychnine.

DESTROY "BAD" EGGS

To lessen the possibility of American housewives finding a bad egg, the Pennsylvania Department of Agriculture is asking the 700 hatcheries in the State of Pennsylvania to cooperate in destroying inedible eggs. The Department estimates that out of approximately 75 million egg set in the 700 commercial hatcheries in the State annually, 10 million prove infertile and that an additional 25 million fail to incubate. Recent investigations have disclosed that some "incubator reject eggs" of very doubtful composition are finding their way into food products. The State laws prohibit the sale for food purposes of inedible eggs which have been held in incubators for a time and then rejected for failure to incubate. The hatcheries are being asked to cooperate in enforcing the law by denaturing inedible eggs, especially all eggs which fail to incubate after having been held in incubators for 15 and 18 days or longer.

DIET AND THE PRICE OF WHEAT

The "boyish" figure is to a large extent responsible for the low price of wheat, according to Professor James E. Boyle of Cornell University. The fact that the United States is consuming 20 per cent less bread than it did a few years ago is given for one reason why the world's short wheat crop is selling cheaply. Statistics show that people are eating less bread and more buttermilk and cheese. Meat consumption has fallen off and the use of fresh fruits and vegetables of all kinds has increased. More oranges, grapefruit, pineapples, lettuce, tomatoes, and cantaloupes are being eaten by people who wish to remain thin. An interesting fact in this connection is that the French, the largest bread eaters of the world, are still among the slenderest of the nationalities.

Professor Boyle considers that all these changes in consumers' food habits must be reckoned as market developments, for the consumer is the most important factor in marketing farm produce.

Foreign and International Agriculture

In Czechoslovakia

By Otakar Horak

Iowa State College

WHEN 12 years ago Czechoslovakia became an independent country on the northern and northeastern territory of the former Austria-Hungary, the first leaders of the country planned many radical reforms in order to give to their country the most up-to-date organization. Some new social legislation was enacted, particularly that regarding the 8-hour working day, and one of the greatest undertakings for the improvement of the conditions of the farming population was the land reform.

As a consequence of the World War the value of the agricultural class became more appreciated in all countries of Europe. Cultivators of land in various countries organized themselves into a powerful class of citizens. As such an organization, they influenced the laws of their countries. In the countries with a great number of tenants on the large estates, this class demanded legisla-

tion which would enable tenants to acquire land.

Such legislation was enacted in Rumania in 1917. In Yugoslavia the preparation of the land reform was begun in 1919, and in Bulgaria in 1921. Poland and Lithuania passed similar legislation.

One of the most remarkable enterprises of this kind was the Land Reform in Czechoslovakia. An idea about the conditions among agricultural population previously to the reform can be obtained from the following facts. More than one-fourth of land in Bohemia (western part of the country) was owned by less than two per cent of the landowners. Nearly one-third of the land in Moravia was owned by less than one per cent of the landowners. In Slovakia about three-tenths of one per cent of the number of holdings covered 40 per cent of the whole area, while 21.5 per cent of the number of holdings were less than one acre in size.

The largest estates need comparatively few people for the cultivation of a unit area. This was one of the reasons for an extensive emigration of dissatisfied peasantry. The number of Czechoslovaks living abroad had been estimated at 2,300,000. Under these conditions the land reform obviously was considered an economic betterment for the people.

Lands Confiscated

Another reason for the reform was that after the battle of the White Mountain, in 1620, most of the great estates belonging to native nobility were confiscated and given to aliens, military, and political supporters of the emperor Ferdinand.

When the constituent National Assembly of the Republic was formed in 1918, one of the first things discussed was the unhealthy economic condition resulting from the existing division of the land in the country. A bill for the distribution of great estates to the peasants was submitted. There was a disagreement among the major political parties of the National Assembly, as to the execution of the land reform.

The Social Democratic Party proposed to convert the expropriated estates into socialistic enterprises, since the representatives of the party believed that only large areas could be utilized fully and rationally. The Agrarian Party proposed the division of the large estates into middle-sized farms and giving them into ownership of the cultivators hungry for land. Finally the Assembly agreed on the expropriation of the estates, the creating of the Land Office, and of a committee for the solution of all questions dealing with land reform.

In the first law of April 16, 1919, regarding the land reform, and providing for the expropriation of land, the estates are defined as units comprising more than 370 acres of arable land, or 620 acres of various kinds of land. These figures represent the amount which an owner of an expropriated estate may retain. In no case should he be allowed to keep more than 1,200 acres. The first law was only a framework and it provided for supplementary laws.

The reform was from the very first a national as well as a social and economic question. In the beginning the idea of colonization was especially considered. It was assumed that great numbers of Czechoslovaks living abroad would wish to come back and would colonize the expropriated land. The increased number of small owners was expected to enlarge the conservative rural element and thus strengthen the new state.

The law of June 11, 1919, provided that the Land Office should be responsible to the Cabinet and should have at its head a president and two vice-presidents appointed by the president of the Republic. One of the duties of the Land Office was to determine what estates fall under the law providing for expropriation, and

(*Turn to page 58*)

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

"Some Effects of Potassium Deficiency on the Histological Structure and Nitrogenous and Carbohydrate Constituents of Plants" is the title of a new bulletin, No. 499 from the New Jersey Agricultural Experiment Station. The authors, G. T. Nightingale, L. G. Schermerhorn, and W. R. Robbins, have reviewed published data of several scientists in this country and abroad and have presented results of their own rather extensive laboratory experiments with tomatoes, beets, carrots, parsnips, and narcissus. They summarize these data as follows:

1. Potassium appears to be directly or indirectly essential for carbon dioxide assimilation, and therefore the concentration of carbohydrates may be low in potassium-deficient plants.

2. Carbohydrates frequently accumulate in potassium-deficient plants, apparently because the rate of nitrate assimilation is retarded.

3. Translocation of sugars and digestion of starch can take place freely in plants extremely low in potassium.

4. Cell wall thickness and development of mechanical tissue are intimately associated with the carbohydrate content of the plant and apparently only indirectly with potassium.

5. Potassium appears to be directly or indirectly essential for the initial stages in nitrate reduction in the plant.

6. Potassium is directly or indirectly essential for cell division and probably for synthesis of proteins of meristematic tissue.

7. By inference it would appear that potassium is not directly essential for the later stages in synthesis of "storage" proteins, as the percentage of total protein may be comparatively high in potassium-deficient plants whereas the proportion of meristematic tissue is invariably low.

8. Most of the potassium in the plant is water soluble and, when present in limited amount, is translocated freely from older tissue to regions of cell division.

9. Prolonged activity of cambium in older tissue is therefore inhibited under conditions of potassim deficiency. Accordingly stems or storage roots of low-potassium plants increase very little in diameter, but, as the meristem of stem or root tip contains most of the potassium in the plant and is active, there may be considerable increase in length.

10. Lack of potassium likewise will limit the development of cork cambium or the initial embryonic layer of the abscission zone.

11. Potassium-deficient plants die prematurely if fruit is present, because most of the potassium in the plant is eventually translocated to the fruit, as a result of which the stem tip dies and ultimately the entire plant.

"The Extension Service Method of Fertilizing Crops," Univ. of Ark., Fayetteville, Ark., Ext. Cir. 273, Jan., 1930, D. J. Burleson.

"Selection and Mixing of Tobacco Fertilizers," Agr. Exp. Sta., Storrs, Conn., Bul.

143, *Jan.*, 1930, *J. S. Owens and P. J. Anderson.*

"Standard Ratio Fertilizers in Massachusetts or The New England Nine," Agr. Exp. Sta., Amherst, Mass., Ext. Leaflet 74, *Revised Jan.*, 1930, *A. B. Beaumont.*

"The Influence of Lime in Vegetable Growing," Agr. Exp. Sta., New Brunswick, N. J., Bul. 498, *March*, 1930, *A. W. Blair and A. L. Prince.*

"Official Report on Feed Stuffs, Commercial Fertilizers, and Agricultural Lime and Limestones", for the fall, 1929, *Dept. of Agr., Columbus, Ohio.*

"Sulphate of Ammonia and Nitrate of Soda in a Sod Orchard", Agr. Exp. Sta., State College, Pa., Bul. 249, *March*, 1930, *R. D. Anthony.*

"Commercial Fertilizers—1929," Dept. of Agr., Madison, Wis., Bul. 106, *Jan.*, 1930, *W. B. Griem.*

Soils

"Some General Field and Laboratory Experiments in Soils," Calif. State Dept. of Education, Sacramento, Calif., Alfred Smith and Fred W. Flint.

Crops

One of the most interesting of the crop bulletins received during the month is one on "Sugar Beet Production in Northwestern Ohio" which is being released as Bulletin 102 of the Ohio State University. Representatives of four departments pooled their data to make this bulletin full of valuable and complete information on the culture of this crop. Regarding plant food, the bulletin states that in comparison with other crops, sugar beets use relatively more potash than nitrogen and phosphoric acid. In considering the rotation as a whole, and for Ohio soil conditions, there is not yet sufficient evidence that an application of fertilizer containing a greater percentage of potash than phosphoric acid would be the most economic in the growing of sugar beets. There is, however, sufficient experimental evidence to justify the use of a larger total amount of potash than is now commonly applied to the beet crop. Under certain conditions, potash may so stimulate the growth of the beet plant that beet root is less liable to be affected by diseases. The potash may also materially increase the sugar storage.

"Berry Thinning of Grapes," Agr. Exp. Sta., Berkeley, Calif., Bul. 492, *April*, 1930, *A. J. Winkler.*

"Irrigation Water Requirement Studies of Citrus and Avocado Trees in San Diego County, California, 1926 *and* 1927*," Agr. Exp. Sta., Berkeley, Calif., Bul.* 489, *April*, 1930, *S. H. Beckett, Harry F. Blaney, and Colin A. Taylor.*

"Yield, Stand, and Volume Tables for Douglas Fir in California," Agr. Exp. Sta., Berkeley, Calif., Bul. 491, *April*, 1930, *Francis X. Schumacher.*

"The Forty-second Annual Report of The Colorado Agricultural Experiment Station," for the year 1929, *Fort Collins, Colo.*

"Pastures for Spring and Fall Grazing in Mountains of Colorado," Agr. Exp. Sta., Fort Collins, Colo., Bul. 360, *March*, 1930, *Herbert C. Hanson.*

"Produce Potatoes Profitably," Agr. Exp. Sta., Storrs, Conn., Ext. Bul. 144, *Feb.*, 1930, *A. E. Wilkinson.*

"Annual Report of the President, Georgia State College of Agriculture and the Mechanic Arts 1929-1930*," Ga. State College, Athens, Ga., Vol. XVIII, Bul.* 386, *June*, 1930.

"Lawns," Agr. Exp. Sta., Lexington, Ky., Cir. 229, *Jan.*, 1930, *A. J. Olney.*

"The Production of White Burley Tobacco," Agr. Exp. Sta., Lexington, Ky., Cir. 230, *Feb.*, 1930, *E. J. Kinney.*

"Report of the Agricultural Experiment Stations for the Years 1928-1929*," Agr. Exp. Sta., Baton Rouge, La., C. T. Dowell.*

"Cotton Varieties for Louisiana," Agr. Exp. Sta., Baton Rouge, La., La. Bul. 207, *Feb.*, 1930, *H. B. Brown.*

"Management of Farm Woodlands in Louisiana," Agr. Exp. Sta., Baton Rouge, La., La. Bul. 209, *April*, 1930, *Gordon D. Marckworth and Robert Moore.*

"Suggestions for Increasing Corn Yields in Louisiana," La. State Univ. & A. & M. College, Baton Rouge, La., Ext. Cir. 138, *March*, 1930, *R. A. Wasson.*

"The Culture of Peas for Canning," Agr. Exp. Sta., College Park, Md., Cir. 79, *March*, 1930, *L. M. Goodwin.*

"The Corn Crop in Massachusetts," Agr. Exp., Sta., Amherst, Mass., Ext. Leaflet 1, *April*, 1930, *M. H. Cubbon.*

"The Small Grains in Massachusetts," Agr. Exp. Sta., Amherst, Mass., Ext. Leaflet 2, *April*, 1930, *M. H. Cubbon.*

"Oat Tests at the Michigan Experiment Station," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 197, *April*, 1930, *E. E. Down, H. M. Brown, and F. H. Clark.*

"American Potato Journal," The Potato Association of America, East Lansing, Mich., Vol. VII, No. 5, *May*, 1930.

"The Quarterly Bulletin," Agr. Exp. Sta.,

East Lansing, Mich., Vol. XII, No. 4, May, 1930.

"Establishment and Management of the Vineyard," Agr. Exp. Sta., Columbia, Mo., Cir. 236, Dec., 1929, H. G. Swartwout.

"The Use of Alfalfa Pasture for Fattening Cattle," Agr. Exp. Sta., Lincoln, Nebr., Bul. 239, Mar., 1930, W. P. Snyder.

"Fiftieth Annual Report of the New Jersey State Agricultural Experiment Station and the Forty-second Annual Report of the New Jersey Agricultural College Experiment Station for The Year Ending June 30, 1929," Agr. Exp. Sta., New Brunswick, N. J.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, O., No. 144, May-June, 1930.

"Sorghum Crops on the High Plains of Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Exp. Sta. Bul. 191, June, 1929, H. H. Finnell.

"Filberts," Agr. Exp. Sta., Corvallis, Ore., Ext. Bul. 417, Jan., 1930, C. E. Schuster.

"The Corn Contest—1929," Agr. Exp. Sta., Clemson College, S. C., Cir. 102, Mar., 1930, S. L. Jeffords.

"The Sweet Potato Contest—1929," Agr. Exp. Sta., Clemson College, S. C., Cir. 103, Mar., 1930, R. A. McGinty.

"Better Pastures for East Texas," Agr. Exp. Sta., College Station, Tex., C-73, Dec., 1929, E. A. Miller.

"Onion Culture," U. S. D. A., Washington, D. C., Farmers' Bul. 354, Revised April, 1930, W. R. Beattie.

"The Production of Peas for Canning," U. S. D. A., Washington, D. C., Farmers' Bul., 1255, Revised March, 1930, Chester J. Hunn.

"Muskmelons," U. S. D. A., Washington, D. C., Farmers' Bul. 1468, Revised April, 1930, W. R. Beattie.

"Variety Tests of Sugarcanes in Louisiana During the Crop Year 1927-1928," U. S. D. A., Washington, D. C., Cir. 88, Nov., 1929, George Arceneaux and F. D. Stevens.

"Department of Agriculture and Immigration of Virginia," Richmond, Va., Bul. 270, June, 1930.

Economics

Since corn is the major agricultural crop in the United States, many people will be interested in the new Statistical Bulletin No. 28, "Corn Statistics," prepared by the Bureau of Agricultural Economics of the United States Department of Agriculture. The bulletin gives comparable data on production, distribution, and prices of corn. It is one of a series of statistical bulletins prepared by the Division of Statistical and Historical Research, which series is especially valuable in making economic studies of our major agricultural products.

"The Agricultural Credit Situation in Louisiana," Agr. Exp. Sta., Baton Rouge, La., La. Bul. 208, Jan., 1930, R. L. Thompson.

"The Cost of Caring For a Bearing Apple Orchard," Agr. Exp. Sta., Columbia, Mo., Cir. 242, Mar., 1930, H. W. Guengerich and D. C. Wood.

"Types-of-Farming in Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Exp. Sta. Bul. 181, June, 1929, J. O. Ellsworth and F. F. Elliott.

"Successful Farm Management in Kittitas County," State College of Washington, Pullman, Wash., W. O. Passmore.

"Considerations in Evaluating Illinois Farm Lands," Agr. Exp. Sta., Urbana, Ill., Cir. 356, Nov., 1929.

Diseases

"Apple Scab and Its Control," Univ. of Mo. College of Agr., Columbia, Mo., Cir. 243, March, 1930, T. J. Talbert.

"Spraying Fruits," Univ. of Mo. College of Agr., Columbia, Mo., Cir. 245, Mar., 1930, T. J. Talbert.

"Controlling Potato Diseases," Univ. of Mo. College of Agr., Columbia, Mo., Cir. 246, Mar., 1930, J. T. Quinn.

"Alfalfa Wilt in Nebraska," Agr. Exp. Sta., Lincoln, Nebr., Bul. 240, April, 1930, George L. Peltier and James H. Jensen.

"A Control for Sweet Potato Wilt or Stem Rot," Agr. Exp. Sta., State College Station, Raleigh, N. C., Bul. 273, May, 1930, R. F. Poole.

"A Control for Sweet Potato Scurf," Agr. Exp. Sta., State College Station, Raleigh, N. C., Bul. 274, May, 1930, R. F. Poole.

"Potato Diseases in Montana," Agr. Exp. Sta., Bozeman, Mont., Bul. 227, March, 1930, H. E. Morris and P. A. Young.

Insects

"Ecological Studies of the Mexican Bean Beetle," Agr. Exp. Sta., Amherst, Mass., Bul. 261, Feb., 1930, Harvey L. Sweetman and H. T. Fernald.

"Control of Root-knot Nematode in Greenhouses," Agr. Exp. Sta., Wooster, Ohio, Bul. 451, April, 1930, A. G. Newhall.

"Boll Weevil Control," Agr. Exp. Sta., Clemson College, S. C., Cir. 104, April, 1930, M. H. Brunson.

"She's a very nicely-reared girl, don't you think?"

"Yeah. She don't look so bad from in front, either."

A Mortgage Company Leads the Way

(*From page 25*)

farm must pay its own way, including all improvements. The tenants, after proving their worth, are given an opportunity to buy, on very easy terms, the farm on which they have been living.

The Pioneer Mortgage Company loaned money in southeast Oklahoma and lost, but the loss is only temporary, for after five years of their farm servicing program, their inherited holdings are beginning to pay desirable dividends. Several other mortgage companies are inaugurating this system. Farmers of this section, through observation, are following better farm and home practices. Southeast Oklahoma is to see a better day.

Top-dressing Hay Lands

(*From page 28*)

Where potash had been applied, the clover was thicker and practically on a par with the other grasses present. The untreated area was just the opposite, the plants being patchy in growth and not showing the "stretch" and vitality.

Representative areas were selected in each plot and weights made. On the dry weight basis, using Henry & Morrison figures as a standard, the treated area gave a yield of 4¾ tons as compared with 2½ tons per acre on the untreated.

After summing up the test, Mr. Wheeler felt that he could have well afforded to treat all his hay land and received the extra tonnage which spelled the difference between a sufficient and non-sufficient supply of roughage for winter feeding.

It should not be taken for granted that similar results could be obtained on every Rhode Island farm. However, on the lighter soils where the clover does not have the desired vitality or signs of potash starvation are evident, similar tests undoubtedly would prove of value to the farmer.

Fertilizing the Kaw Valley

(*From page 27*)

each farm was to take care of variations in the soil of the individual farms.

Table II shows the results of this work. In every case the fertilizers increased the yields. The various analyses acted as they had in previous tests in other years and though these records are for only one year, they bear out the results of the preliminary work done in the past three years so one can rely pretty well on them.

In each case the fertilizer was added at the rate of 500 pounds per acre. Best results were obtained from a 4-8-6 fertilizer. One very interesting thing to note in this table is the fact that the better land, that is, the land that gave the larger yield without fertilizer, gave a bigger increase when fertilizers were used. This bears out the statement expressed by agricultural college men for a number of years: that land whose fertility has been maintained by the use of cover crops and barnyard manure responds better to fertilizers, or, to put it another way, one can't let a piece of land run down and then expect to bring it back immediately by the use of commercial fertilizers. The commercial fertilizers are the high compression gasoline and unless the motor is a high type of motor and in good condition, there is no use in putting in the higher priced gas.

TABLE II

POTATO FERTILITY TESTS

Conducted by Myron Kelsey, Shawnee county
and
W. R. Stiner, Douglas county, Kansas

Fertilizer	Cost	No. 1	Culls	Total	Profit
Myron Kelsey, Topeka (sandy soil)					
5-10-5	$11.50	28.17	30.11	78.28	$13.75
4- 8-6	11.00	58.88	27.44	86.32	21.79
No	—.—	44.16	20.37	64.53	—.—
0-14-8	9.00	48.83	26.76	72.59	8.06
0-16-0	6.75	58.64	18.74	77.38	12.85
W. R. Stiner, Lawrence (sandy silt loam soil)					
5-10-5	11.50	207.02	56.48	263.50	105.03
4- 8-6	11.00	301.13	69.74	370.87	212.40
No	—.—	120.99	37.48	158.47	—.—
0-14-8	9.00	147.88	78.34	226.22	67.75
0-16-0	6.75	185.52	97.49	283.01	124.54

All potatoes dug July 9, 1929

Why Sweet Clover?

(*From page* 22)

seeding mixture, according to many farmers, is one containing sweet clover, red clover, alfalfa, and brome grass. Sweet clover planted on rough land aids greatly in stopping erosion.

Certain swamp lands, especially some in Monona county, have been reclaimed by the use of sweet clover. This reclamation project has been going on for two decades. Sweet clover roots penetrate the soil to a depth of four or five feet and go through hardpan which has held water for years.

Complete Fertilizers for Apple Trees

(*From page* 19)

letin Number 123, 1916, pages 10 and 11, shows that the foliage and wood of 40 apple trees take up .08 pound of nitrogen, .02 pound of phosphoric acid, and .06 pound of potash the first year after setting out in the orchard; 11.85 pounds of nitrogen, 5.74 pounds of phosphoric acid, and 14.22 pounds of potash the ninth year after setting; and 28.10 pounds of nitrogen, 9.26 pounds of phosphoric acid, and 27.22 pounds of potash for the entire nine years.

Thompson also states that in these nine years 12.84 pounds of nitrogen, 2.53 pounds of phosphoric acid, and 12.97 pounds of potash are returned to the soil by the foliage, leaving a net removal of 15.26 pounds of nitrogen, 6.73 pounds of phosphoric acid and 14.25 pounds of potash. Upon this basis, it is very likely that there is sufficient fertility in Virginia soils of the Hagerstown and Cecil series, to take care of the phosphatic and potassic needs for normal wood and foliage development in apples.

If the original fertility of these soils is such as to just more than satisfy the needs for wood and foliage development, it might be best to consider only the depletion from the fruit removal and in this way simplify the calculations at least in part. The results of C. A. Brown, secured independently, and his citations of the results of other independent investigations brought out in the Pennsylvania Report of the Department of Agriculture, Part I, 1899, pages 547 and 548 indicate that for every 100 pounds of apples, .059 pound of nitrogen, .027 pound phosphoric acid, and .16 pound potash had been removed from the soil.

Safest Guide Is Actual Trials

To maintain in some degree the original soil fertility for the wood and foliage needs of the apple along with a fertility that is more likely to be capable of maintaining the higher crop yields in so far as nitrogenous, phosphatic, and potassic needs alone are concerned, the analysis of the fruit might be considered. Let us take the amounts and proportions of these elements removed, for example, in 1,000 pounds of fruit. For every 1,000 pounds of fruit removed, .06 pound nitrogen, .16 pound phosphoric acid, and .48 pound potash may be restored. This is in the ratio of 7-2-5 approximately, of ammonia, phosphoric acid, and potash.

An application measured upon this basis should be profitable at least from the standpoint of maintaining available plant food at about the rate that it is removed. This also affords a basis to figure the expense of a definite quantity of fertilizer intended to insure the needs of a definite yield of apples. This suggested ratio should, of course, be modified to meet special conditions. It may be desirable to provide also against the elements tied up in the wood, for removal in pruned wood, and for special cover crop needs.

To provide for such needs also, figured on an ammonia percentage for nitrogen, a 7-6-5 for soils not planted to legumes or low in nitrogen, and a

Table 1.—Timothy hay: Average yield and increase per acre from the use of fertilizer or manure, for the 10-year period, 1918 to 1927*

Treatment	Amount	Frequency	AIR-DRY HAY PER ACRE	
			Yield	Increase from treatment
			Pounds	*Pounds*
Nitrate of soda	120 pounds	Annually	3180	793
Superphosphate, 16 per cent	240 pounds	Annually	2916	571
Nitrate of soda Superphosphate, 16 per cent	60 pounds 120 pounds	Annually	3227	861
Nitrate of soda Superphosphate, 16 per cent	120 pounds 240 pounds	Annually	3559	1091
Nitrate of soda Superphosphate, 16 per cent Muriate of potash	120 pounds 240 pounds 80 pounds	Annually	3731	1306
Farm manure	5 tons	Annually	3264	891
Farm manure	5 tons	Biennially	3005	617
Farm manure	10 tons	Biennially	3093	604

* Evans, Morgan W., Fertilizing Timothy Meadows with Nitrate of Soda. Bimonthly Bulletin, Ohio Agricultural Experiment Station. Page 45, March-April, 1930.

4-8-5 formula for those planted to legumes, or richer in nitrogen, may be suggested.

While applications based upon the removal and probable depletion of elements may appear to be logical, it is still generally conceded that the safest guide is one based upon actual trials. The individual apple grower will, therefore, do best to rely on trial and error procedure.

On the whole, however, for higher yields and for better quality fruit, applications of phosphoric acid and potash in correct balance with nitrogen must not be overlooked even though applications of nitrogen generally show the more pronounced gains.

Table 2.—Yield of fruit per tree in orchard at Blacksburg, 1918-1928, inclusive. Cultivated—Series I and II, combined—Treated plats compared with nearest checks

Variety	Plat number	Treatment*	Average yield treated plats	Average yield check plats	Gain	Number of years compared	Student's odds to 1
			Pounds	*Pounds*	*Pounds*		
Stayman	2	N	199.3	129.0	70.7	8	52.36
	6	NP	150.4	83.8	80.4	7	19.50
	7	NK	200.9	83.8	117.1	7	20.86
	8	NPK	212.1	83.8	142.1	8	46.24
Grimes	2	N	123.1	103.8	19.3	6	7.90
	6	NP	134.3	105.2	29.1	5	12.90
	7	NK	178.7	105.2	73.5	6	16.10
	8	NPK	149.8	105.2	44.6	6	11.16
York	2	N	178.6	188.0	−9.4	7	1.52
	6	NP	190.1	156.0	34.1	8	3.01
	7	NK	197.1	156.0	41.1	8	7.49
	8	NPK	208.7	156.0	52.7	8	7.49

* N = Nitrogen; P = Phosphoric acid; K = Potash.

Table 3.—Yields of fruit per tree in orchard at Blacksburg, 1918-1928, inclusive. (Sod)—Series III—Treated plats compared with nearest check

Variety	Plat number	Treatment*	Average yield treated plats	Average yield check plats	Gain	Number of years compared	Student's odds to 1
			Pounds	*Pounds*	*Pounds*		
Stayman	2	N	116.8	21.9	94.9	6	66.10
	3	P	69.2	21.9	47.3	5	8.55
	4	K	38.2	63.0	−24.8	7	33.76
	6	NP	92.7	63.0	29.7	7	63.50
	7	NK	98.9	63.0	35.9	8	7.80
	8	NPK	141.2	63.0	78.2	8	47.80
Grimes	2	N	107.1	3.9	103.2	3	15.60
	3	P	46.4	3.9	42.5	4	11.00
	4	K	61.3	49.3	12.0	6	2.32
	6	NP	79.3	49.3	30.0	5	12.06
	7	NK	134.6	49.3	85.3	7	63.50
	8	NPK	142.3	49.3	93.0	6	85.20
York	2	N	136.7	41.2	95.5	6	18.90
	3	P	49.3	41.2	8.1	7	3.68
	4	K	36.6	56.2	−19.6	7	39.20
	6	NP	72.6	56.2	16.4	7	7.72
	7	NK	131.9	56.2	75.7	7	14.56
	8	NPK	191.3	56.2	135.1	8	40.00

* N = Nitrogen; P = Phosphoric acid; K = Potash.

Table 4.—Yield of fruit per tree in orchard at Crozet, 1919-1924, inclusive. (Cultivated)—Series I and II, combined—Treated plats compared with nearest checks

Variety	Plat number	Treatment*	Average yield treated plats	Average yield check plats	Gain	Number of years compared	Student's odds to 1
			Pounds	*Pounds*	*Pounds*		
Winesap	2	N	102	22	80	5	16.20
	6	NP	134	38	96	5	21.98
	7	NK	97	40	57	5	7.15
	8	NPK	140	38	102	5	17.00
York	2	N	82	52	30	5	6.94
	6	NP	83	50	33	5	13.30
	7	NK	85	50	35	5	9.82
	8	NPK	74	50	24	5	6.38
Stayman	2	N	102	47	55	5	4.47
	6	NP	106	54	52	5	4.47
	7	NK	103	37	66	5	7.55
	8	NPK	133	54	79	5	7.95

* N = Nitrogen; P = Phosphoric acid; K = Potash.

Table 5.—Yield of fruit per tree in orchard at Crozet, 1919-1924, inclusive. (Sod)—Series III—Treated plats compared with nearest checks

Variety	Plat number	Treatment*	Average yield treated plats	Average yield check plats	Gain	Number of years compared	Student's odds to 1
			Pounds	*Pounds*	*Pounds*		
Winesap	2	N	61	5	56	5	14.60
	3	P	5	19	−14	5	80.54
	4	K	1	5	−4	5	2499.00
	6	NP	98	19	79	5	15.40
	7	NK	77	19	58	5	14.20
	8	NPK	68	19	49	5	17.00
York	2	N	48	9	39	5	7.75
	3	P	8	6	2	4	3.69
	4	K	23	9	14	5	8.55
	6	NP	118	6	112	4	12.10
	7	NK	39	6	33	5	7.95
	8	NPK	50	6	44	5	25.30
Stayman	2	N	52	29	23	3	5.99
	3	P	10	5	5	5	4.47
	4	K	11	29	−18	4	8.71
	6	NP	116	5	111	5	9.06
	7	NK	61	5	56	5	8.80
	8	NPK	60	5	55	5	15.80

* N = Nitrogen; P = Phosphoric acid; K = Potash.

Table 6.—Yield of fruit per tree, Melvin Green apple orchard, 1914-1920, inclusive. Cultivated treated plats compared with check plats

Variety	Treatment*	Average yield treated	Average yield check	Gain	Number of years compared	Student's odds to 1
		Pounds	*Pounds*	*Pounds*		
York	N	494	496	−2.0	6	0.00
	NP	636	496	140.0	6	8.62
	NK	674	496	178.0	6	5.54
	NPK	654	496	158.0	6	8.38

* N = Nitrogen; P = Phosphoric acid; K = Potash.

Table 7.—Combined yields of apple trees in cultivation—treated plats compared with untreated plats

*Fertilizer combination compared	Average yield in pounds for treatment	Average yield in pounds for check	Gain in pounds for treatment	Number of years compared	Student's odds to 1
YORK—From Blacksburg, Crozet, and Green Orchards, Virginia; Sleepy Creek Experiment, West Virginia; and Projects 215 and 216, Pennsylvania					
N with C	222	238	−16	20	3.56
NP with C	218	214	4	20	4.4
NK with C	259	223	36	21	102.3
NPK with C	267	173	94	21	9999.0
GRIMES—From Blacksburg, Virginia, and Sleepy Creek Experiment, West Virginia					
N with C	124	102	22	12	93.44
NP with C	108	101	7	12	2.06
NK with C	117	101	16	12	3.48
NPK with C	115	101	14	12	2.84
STAYMAN—From Blacksburg and Crozet, Virginia, and Projects 215 and 216, Pennsylvania					
N with C	192	137	55	20	54.58
NP with C	181	183	−2	19	0.0
NK with C	246	152	94	18	195.0
NPK with C	240	167	73	19	28.0
WINESAP—From Blacksburg and Crozet, Virginia					
N with C	111	45	66	10	13.06
NP with C	137	49	88	10	29.8
NK with C	162	49	113	9	31.58
NPK with C	160	49	111	10	81.0
BEN DAVIS—From Sleepy Creek Experiment, West Virginia, and Round Hill Orchard, Virginia					
N with C	201	134	67	15	21.78
NP with C	109	59	50	11	44.22
NK with C	124	50	74	11	138.0
NPK with C	147	50	97	11	527.2
ROME BEAUTY—From New York Experiment Station, New York, and from St. Mary's Experiment, West Virginia					
NPK with C	413	343	70	24	Infinity
BALDWIN—From New York and Pennsylvania					
NPK with C	552	573	−21	10	1.7
YORK, GRIMES, STAYMAN, WINESAP and BEN DAVIS—From Blacksburg, Crozet, and Round Hill, Virginia; and Pennsylvania					
N with C	170	141	29	21	39.66
NP with C	157	143	14	20	4.08
NK with C	195	135	60	20	752.4
NPK with C	184	124	60	20	311.6
YORK, GRIMES, STAYMAN, WINESAP, BEN DAVIS, ROME BEAUTY, BALDWIN and JONATHAN—From Virginia, West Virginia, Pennsylvania, and New York					
N with C	261	214	47	21	1356.4
NP with C	236	197	39	21	67.4
NK with C	232	168	64	21	1356.4
NPK with C	275	215	60	25	Infinity

* N = Nitrogen; P = Phosphoric acid; K = Potash; C = Check or untreated

In dealing with data, it is important to consider the probable effects of factors other than the one introduced. The effects of these uncontrollable factors are referred to as chance variations, and as such, introduce the probability of error which must be taken into account to interpret differences between two groups of measurements. Statistically, the true difference between two groups of data cannot be correctly interpreted without allowing for the chance variation in each group. Averages or means in themselves are not sufficient to establish clear cut differences. A computation known as the standard deviation which expresses the absolute degree of variation must also be calculated. With the standard deviation known, the true difference between two groups of observations may be ascertained inasmuch as the odds against chance or random variation as probably causing this difference can then be determined.

Student's method may be used to compute such odds. In this method the mean differences between each pair of items in two groups are secured. This mean of the differences is divided by the standard deviation of the mean difference. This quotient referred to as Z in Student's tables gives the odds against chance variation. Odds of 30 to 1 are generally accepted as significant or that the difference secured is against chance variations and, therefore, can be attributed to the treatment introduced. Under conditions of perfect control it would be fairly easy to determine the difference between a pair of items when both are absolutely identical except for the treatment introduced. Such a condition of control is not always possible. If, however, the items of a pair are fairly alike even though the conditions of each pair are not altogether similar, the difference between each pair of items in each of the different situations can still be used to secure a mean or average difference. In this investigation the difference between two items was secured by pairing over a period of several years.

Putting "Pep" into Farming

(*From page* 23)

Some of these contests staged between the leading farmers of a State have been unusually productive of results. A study of the tabulations made of the methods used by the men who make a success of any one of the clubs is perhaps the best source of information any farmer can find on the particular phase of agriculture covered by the contest.

For example nearly every State has a 300 or a 400-bushel potato club. While the potato production of any particular State may be 100 bushels per acre, the men who succeed in such a contest often secure average yields of 350 and in some cases much larger average returns. The things these men did are matters of record open to every farmer. If he is interested, he can learn how it should be done. A yield of 500 bushels per acre is not an accident, for the same man repeats year after year with crops averaging far above the ordinary yield for his section of the State.

A potato producer in Colorado found a part of his commercial planting producing at the rate of 1,047.4 bushels per acre. The field had received no special care except that given to his entire acreage. Yet the measured acre produced 1,047.4 bushels per acre. A Pennsylvania grower has an official yield of about 700 bushels per acre.

Another very successful contest for farmers is staged annually by Purdue University. The State of Indiana produces thousands of acres of tomatoes for the canning factory. State average yields vary widely. Some seasons the figure is three and one-half tons per acre. In good years it is four, and in real good years it may go higher. A ten-ton yield is very unusual, and so the club is called "The Ten Ton Plus Tomato Club."

In 1925 twenty-nine men produced ten tons or more per acre on a three-acre field. There were 223 men who tried that year. In the canning factory districts represented, six of the clubs produced average yields double those of the non-club growers. Year after year the club members have an average tonnage per acre far in excess of the State average for the season. One hundred per cent gains are very common.

These contests carry with them the possibility of being recognized as the champion grower of some particular crop for the entire State. Prizes of various kinds are awarded. In Ohio the 400-bushel Potato Club men are recognized by the gold watch charms they receive. The tomato men of Indiana wear medals bearing a tomato in relief.

In addition to the medal, the leaders of this Indiana club receive gold watches. And so through the office of the county agent, the farmer learns of the possibility of becoming the potato king or the champion corn grower of his particular State. Competition in farming as in other business, leads to improved practices which in farming means bigger yields with lower costs per unit. It is a constant struggle, and this spirit of play helps make the game of working the soil more attractive.

The Inquiring Mind

(*From page* 14)

bugs. The true naturalist studies all impartially, treasures all alike, and discovers wonders in the lowliest forms. Yes, Lad, the closer I look into the little things and the better I become acquainted with the intricate mechanism and structure of microscopic objects, the nearer I get to the God of the universe and a full appreciation of the Divine origin and control of everything in Nature."

Under the good Doctor's direction I collected, classified, and named 42 different beetles that morning, and today I have the note-book in which their Latin names were jotted down. But it is not the finding of those insects, or the particulars I learned about each, that I treasure in memory. It is the *man* I remember best—the inspiration he was to me, the clearness and cleanness of his discourse, his leadership and belief and faith in the omniscience and omnipotence of the Supreme Being.

Would that there were today more scientists of his caliber and character to guide and inspire our students!

Graded Tomatoes

(*From page* 10)

14. Eliminates some factory equipment. Some of the old, rough types of machinery whose chief function was to shake out the rotten tomatoes is not needed.

15. Provides an incentive for good growers to do better as they get paid for the better tomatoes delivered.

16. Provides a cause for better production methods. Since growers can get their own price depending on quality produced, they can afford to use better cultural methods in producing the crop.

17. Over a period of years with definite quality raw stock canners can determine what can be packed from No. 1's, 2's, and cost, so he will be able to sell with more knowledge. A study of the differential in price to be paid between No .1's and No. 2's will enable canner to establish an equitable price.

18. Gives individual packer and canners as a whole a selling and advertising point worth while. To have the government standing back of quality put into the can is good advertising point to place before consumers.

A few testimonials from users might be of value in indicating what canners think of the grading system:

"When buying tomatoes on a graded system was first talked of, we were dead against it. We followed it and studied it. In 1929 we used it, and one year has convinced us of its merits—of its fairness to both grower and canner. We now are as radically for it as we were against it."

"We expect to use it at all of our factories next year (1930)."

"We have been with the grading system of buying raw stock since its inception and are firmly of the opinion that it is the only equitable way to purchase tomatoes. We will use it at all of our factories in 1930."

"The grading system works more successfully than we ever dreamed of. We expect to use it at all of our plants in 1930. Our tomatoes were delivered better, with less culls, and more red-ripe tomatoes than ever before."

"Last year was our first experience with the graded system of buying. We didn't have a single dissatisfied farmer in the whole bunch. We will buy on the graded basis in 1930."

"We were very well pleased with the grading system at our factory. We believe it is the only honest way to buy tomatoes as the grower is paid for just the quality of tomatoes he delivers. It is not like buying on the flat rate where the fellow that brings in bad tomatoes gets as much as the one bringing in good ones. We're using the grading method in 1930."

"We would not want to go back to the old way of buying tomatoes."

Canners, it would seem, are enthusiastic about it. The growers, too, are for it. Canners report that 90 per cent of their farmers are in favor of it and that contracting on the basis of the grade is easier than on the old flat rate. With the buying on the grade firmly being fixed in Indiana and its spread to other tomato sections, growers must strive to grow higher yields and obtain a higher percentage of No. 1's. This can only be brought about by the use of better soil, more liberal applications of high-grade complete fertilizers, and careful culture throughout the growing and harvesting period.

Pastures for the South

(*From page 7*)

make room for cotton fields that will likely meet a similar fate, little realizing that in the course of years, after the native forests have been so rapidly and ruthlessly destroyed, timber will make more net income than we have reason to expect from cotton or any other cultivated crop.

The sooner we learn with the German that it is not the broad acres that count, but the utilization of each acre in the way that nature and the peculiar environment suggests, the sooner will we cease to be miners of soils and come to be manufacturers of farm crops. The German's definition of a good soil is a good place to put fertilizers, and very few acres are so poor that they may not be made, with fertilizers, to produce profitably. This is predicated, however, on the assumption that the fertilizers so placed remain to feed the crops and are not washed down near-by streams.

The secret of the German's success no doubt lies in the fact that he does use fertilizers liberally, for the experiment stations are telling us that money so invested returns itself many times each season. Certainly, the secret of the success of those who have intelligently utilized their lands for pasture and livestock is closely connected with the fact that under such a system they have kept the natural fertility of the soil intact, at least adding to it the plant food contained in the feeds used to supplement such pastures, granting they have applied no fertilizer at all.

It is fast being realized that fertilizer used on pastures pays as well as that applied to cultivated crops. A study of the permanent pastures of England reveals the fact that some of them are 200 to 300 years old, and that they are fertilized as liberally as the best of our cotton lands, though in a little different way. There the fertilizers are applied every three years, rather than annually as with us, and the custom is to add triennially 1,200 pounds of basic slag and 1,000 pounds of kainit, with manure at any time it is available, and light applications of sulphate of ammonia annually. The prevailing grasses are rye grass, fescues, and clover, and they carry an average of from one-half to three and one-half cows per acre.

Certainly, if the owners of the high-priced lands of England can afford for all these years to grow only grass, we might with greater profit do the same on the much cheaper lands of the South. One wonders if the agricultural history of England may not have had its influence on the gentleman above referred to. He was a Princeton graduate and quite capable of being guided by a very broad perspective.

Potato Profits

(*From page 6*)

gives the average total yield and the increases due to fertilizer over plots receiving manure only.

than the old standard potato fertilizer represented by such mixtures as 5-8-7 and 4-8-6.

Table II

	Total Yield	% No. 1's	Increase No. 1's over manure
Manure only	202.25 Bu.	85.2%	
Manure 800 lbs. 5-8-7	286.13 "	86.7%	76.10
" 400 lbs. 10-16-14	280.11 "	87.2%	72.60
Manure 800 lbs. 3-12-12	300.20 "	88.4%	92.80
" 400 lbs. 6-24-24	307.26 "	88.7%	100.40
Manure 800 lbs. 3-9-18	306.06 "	89.6%	101.70
" 400 lbs. 6-18-36	307.13 "	90.6%	106.30
Manure 800 lbs. 3-20-20	329.03 "	89.9%	123.30

All the plots received approximately 10 tons of manure either directly for the potatoes, or on the hay crop the year previously. Each of the treatments produced profitable increases over the "manure only" treatment. The margin of profit was especially good since the crop was marketed at prices ranging from \$1.75 to \$2.00 per cwt., for U. S. No. 1's. The season, also, was a favorable one for good yields. Even with an average price for potatoes, investment in fertilizer would have proven profitable.

The results in 1929 confirm those obtained in past years in that mixtures containing about 3 per cent of nitrogen and 12-20 per cent of potash have not only given the higher yields, but also better quality of potatoes

In this connection it might be interesting also to refer to results obtained on the sandy section representing the oldest, and largest producing area in Wisconsin. In the April issue of BETTER CROPS WITH PLANT FOOD Mr. H. G. Frost reported the work with the use of fertilizers on sandy soils. His data also indicated that mixtures similar to a 3-10-20 were found to be most satisfactory.

The trend during the last few years is distinctly in the direction of higher potash and lower nitrogen fertilizers. In 1929 approximately 20 per cent of the total fertilizer tonnage, or about 8,000 tons, were used on the potato crop. Roughly two-thirds of it consist of the higher potash-phosphate mixtures similar to those referred to in Table II.

Wisconsin growers have made advances in another direction that affects not only economy in fertilizer costs, but also economy in labor of handling. That is through the use of higher concentrated mixtures. The productions of synthetic nitrogen products, treble superphosphate, and high analysis potash have made it possible to double and even treble the concentration of ordinary strength fertilizers. The tests conducted in three different sections have shown that equally good yields may be obtained with the high concentrations as compared to the ordinary fertilizing material where identical amounts of plant food are applied.

By referring to Table II again, it will be noted that three fertilizers, the 5-8-7, the 3-12-12, and the 3-9-18, were used at the rate of 800 lbs. per acre applied in the row and 400 lbs. per acre where the double strength mixtures were employed. These double strength goods gave a good account of themselves. In the case of the 10-16-14 the year's results were somewhat below that secured with the single strength materials while with the other two mixtures somewhat higher yields resulted with the double as compared with the single strength materials. In no case, however, are the differences very significant.

These results were obtained on silt loam soil, and the fertilizers were applied in such a manner as to insure good distribution in the soil. In experimental work fertilizers must necessarily be applied by hand in order to insure accuracy as to amounts used. In this connection, however, it might be stated that one of the large growers in Langlade county fertilized a considerable acreage with a double 3-9-18 using a modern make of planter. Uniformly good results were obtained. In none of the test plots was any germination injury due to the use of high concentrations noted at any time.

Good distribution in the soil is important, and it is gratifying to note that implement manufacturers are improving the distributing apparatus so that uniform application and fairly accurate calibration are possible. On the heavy silt loam soils the danger of germination injury appears relatively small where the fertilizer is distributed uniformly in the soil. On the lighter soil type, especially in dry seasons, the matter of distribution is of more importance.

Potato growers are interested in these high concentrations for two reasons, first, the unit cost of plant food is less, and second, the labor of trucking and handling fertilizers is reduced about 50 per cent. These are factors that are considered by the fertilizer industry as of vital importance. In fact manufacturers anticipate the more general use of high analysis mixtures. In Wisconsin four companies are licensing goods some of which are one and one-half or double the concentration of the usual grade listed in past years. A few of these selected at random are, as follows: 6-24-24, 6-18-35, 8-16-14, 4-24-12, 4-30-8.

Some one in jest has referred to these high analysis fertilizers as "left-handed" mixtures. Farmers, however, will think of them as "right-handed" materials in raising tubers more profitably.

In Czechoslovakia

(*From page* 43)

what portions might be retained by the owner. It also had to supervise the management of the estates which would be expropriated but had not yet been taken over.

The Land Office was to decide

about a particular request on the part of an estate owner to be allowed to transfer, rent, mortgage, or divide his land. It was to determine the price to be paid for the land, on the basis of principles to be laid down by a special law. It was to distribute the expropriated land, and to decide to whom the land should be given in lease, and to draft the necessary legal documents.

The Land Office also was to provide the necessary equipment and stock for the portions distributed. It arranged the terms of credit for those who received the portions. Its work was to be supervised by the committee of twelve chosen by the National Assembly for a period of three years. The land might be given either to individuals or to cooperative societies. Expropriated industrial plants might be given to associations whose prime object was the carrying on of rural industries.

One of the most difficult questions to settle was the question of compensation to be paid for the expropriated land. It was demanded by the owners of the large estates that the price should be equal to the price of land on the open market. On the other hand, those who expected to receive the land on a long-term credit would have to pay for it in a distant future when the value of the currency would probably rise near to or to its normal level. It was even proposed that some of the land should be expropriated without any compensation since it was land originally confiscated from the native nobility without any compensation. Moreover, a large part of the land at the time of its expropriation belonged to the people hostile to the Republic. Finally it was decided that a compensation should be paid for all the expropriated land. The amount to be paid was based on the average price in the open market in the years 1913-15. The area of the land to be expropriated was estimated at around 10,000,000 acres.

One of the aims of the land reform was to bring a larger number of population back to agriculture. It was known that small farming establishments employ two or three-times as many persons per unit area as large establishments. Agricultural production was expected to increase, due to more intensive cultivation of soil on smaller farms. This was accomplished to a certain extent. According to the data compiled by Dr. A. Prokes, and published in the Annals of American Academy in March 1929, the production of winter wheat per acre increased 52 per cent between 1920 and 1928, that of spring wheat 48 per cent, of rye 65, barley 54, oats 58, potatoes 59, and sugar beets 21 per cent for the same period. The increase in the number of livestock for the same period was largest in hogs, in this case being 24 per cent. Increase in the number of horses was 20 per cent, and in the number of cattle seven per cent, between 1920 and 1928.

Stimulated Interest

The land reform greatly stimulated the interest of farmers in the improvement of their methods. The fields of each of the small farms, which had been divided into narrow strips, each farmer owning as many as 15 of them, were not practical to take care of. They made particularly difficult the use of labor-saving machinery.

In order to remedy this condition, many communities conducted a survey of all their land and divided it into a smaller number of larger fields better adapted to an efficient cultivation. By this arrangement each farmer could obtain all his land in three or four lots. This adjustment was called commassation. The advantages of it are that it increases the area of productive soil and makes possible its improvement. It also facilitates the use of machinery, thus saving time and labor connected with the cultivation of soil.

In Czechoslovakia, the barns and homes are usually close together as shown by this typical farmstead on a large farm. The house is on the right, barn on the left.

The land reform is closely connected with the program of rural education. The need of raising the standard of education was felt particularly in the eastern territory which had been taken over from the former Hungary. In 1910 Austria had 16.5 per cent and Hungary 25.4 per cent illiterates. The Czechoslovak territory had 7.9 per cent. According to the statistics of 1921 the Czechoslovak territory had only 7.02 per cent illiterates. Among various nationalities of the country, Czechs had 2.27 per cent, Germans 2.46 per cent, Poles 6.1 per cent, Magyars 10.64 per cent, Slovaks 16.01 per cent, and Russians 60.97 per cent illiterates.

The country has a law providing that every community has a public library which should be equipped according to the size and wealth of the community. "Sokol," a national organization for physical development of its members has members in every community. In every community where there is a sufficient membership, a local unit is formed, including both men and women. A systematic physical training is carried on in a gymnasium provided for that purpose from the dues of local members and by some support of the national.

This organization has a particularly strong influence upon the growing generation. It is one of the organization's aims to direct the interest of its members to the ideals of universal brotherhood and social usefulness.

The main purpose of the land reform in Czechoslovakia was to give the land into ownership of the people who cultivated it. This meant an increase of the relatively conservative rural class. It also meant an additional employment for a large number of people who would become unemployed industrial workers should the large estates remain to be cultivated on a large scale, more extensively, and with the utmost use of labor-saving machinery.

The division of the land brought about a more intensive farming which is suitable rather to small than to large farms. It increased the yield per acre of land, and the area of land devoted to crops which bring a high monetary return but require a large amount of human labor. The increased yield per acre was particularly appreciated during the years of food shortage following the World War, when the country aimed for self-sufficiency in food supply.

In the last few years, however, the farmers of that country have had to face the keen competition of the countries of a more decidedly agricultural type. The increasing imports of cheap foodstuffs from abroad threaten to lower prices to the level where farming on a small scale becomes unprofitable. The value of the land gradually decreases and a farmer is more and more in danger of being unable to leave the occupation which means to him heavy work with small return.

Weeds

(From page 4)

let the weeds hang themselves.

How nice and comfortable it is to sit down and listen to a weed lecture in winter. Those charts make everything so simple and convincing. You forget that the underground rootstocks and the horny little seeds out in the ground are able to withstand more zero weather than Admiral Byrd and not grow whiskers either. I have seen more plausible arguments against weeds accepted in January and forgotten in June than there are sow thistles in Minnesota.

Here again we face the old Adam in all of us—ready to applaud and adopt resolutions in the easy chair and slow to push them with the plow. Yet I would not for the world deter a single minister of weed salvation from churching us regularly on the topic. We need it. So do the weeds.

They begin by telling us that the first trench battle line is to learn to know the weeds. We can't possibly exterminate anything until we determine it, identify it, and classify it. I have found it a rare help to be able to know my plant boarders by name and catch their looks of gratitude as I spread them around by raking and mowing.

Few ordinary untaught scribes are better versed in the nomenclature of weedology than I am, as I have sat through many lectures and scanned many nature leaflets. Yet it is a rude jar when I find a farmer friend of mine who does not know Amaranthus retroflexus from Plantago lanceolata, and still harvests forty-five bushels of plump wheat an acre without dockage.

Sometimes they try to hang it on the seedsmen. Often they deserve it when they peddle screenings under bargain prices, so that unsuspecting customers jump to the bait and think they have a sinecure when they sow three acres of alfalfa seed purchased for five dollars and ten cents.

But out in my state of Illisconsin only fifteen per cent of all the field seeds put into the crop land come from reliable sources. The bulk of it is bought or traded with neighbors. This is not a reflection on neighbors, because a good neighbor usually donates all of the best he has and neither expects questions nor answers them. This should teach us the fallacy of trying to find the soundness of a gift horse by looking into his mouth. Better go around behind and see how swift he can kick.

Fanning mills are probably no more popular muscle developers than grindstones, which is one reason for so many bright yellow grain fields. Besides, farmers prefer working in the fresh air behind the cultivator to a stuffy indoor job with the sieves and shakers. Then again it's real nice to have your landscape assume the shade of an oriental rug.

By the way, one of the best accidental rock gardens I ever saw was where Neighbor Smithers upset his wagon-box full of grain near a gravel pit. The painstaking art of man in floriculture becomes a feeble gesture beside the natural vigor of untamed plant life. Whenever animate life of any kind is chased by foes and harassed by enemies there seems to spring up within it a silent reservoir of power, a will to live and multiply. Hence our weed neighbors have gained power through being pariahs. (Some folks are like that.)

One of the ingenious definitions of agriculture seen lately was the phrase of the Bishop of Newcastle, who stated that agriculture was a "controversy with weeds." Agricultural science has taken great pains to scour the earth and breed up specimens of the most abundant strains of grain and corn. Nobody has done much to pedigree the weeds or lend them a hand in the struggle, but somehow they seem to lay hold of the survival of the fittest doctrine and each year sees a more vigorous and determined species of arrogant invaders. The ragged old buffalo and the gaunt timber wolf are hardier and tougher than the best kept cattle and the handfed dog.

If farmers were to strike for a couple of seasons, science would have to get busy and make human food out of weeds and wild roots. The fear of weeds on abandoned farms has saved the skins of many farmers with delinquent mortgages, especially where the banks held the title. The banks say "better keep a losing farmer on the land than accept a weed ridden liability."

Negative virtues, however, do not endear one to weeds. 'Tis true also that weeds may sometimes help to retain nitrates in the soil on land that runs fallow, and weeds are useful as green manure for plowing under. Possibly their best advantage, if it might be called such, lies in the fact that weeds make good tillage methods necessary. They drive mankind to invent and apply tools and implements with which to uproot the undesirables, and they sometimes keep him so busy that he forgets to worry about himself.

I would not spend so much time analyzing the virtues and advantages of weeds were it not for the belief that we must prepare to live with them for some time to come, willynilly. Just as we try to hunt the best spots in our neighbor's folly, so must we take our weed companions with a plentiful pinch of philosophy—along with the pitchfork.

TAKE a glance at our new-found boon companion of the hay field and pasture—sweet clover. When I was a stub-toed kid, this plant was just a tramp along roadsides and railroad banks. Farmers prized their timothy and Johnson grass, but chortled if anyone mentioned possible values in sweet clover. But that was before the county agents raved about what my German friend calls "noodles" on the legume root hairs. That was prior to nitrogen fixation, and bacteria cultures had not gained credence.

Other instances might be recorded had we the space. Spurrey, a common weed, is used as a fodder crop in Belgium. You and I have gleaned thousands of dandelion plants for greens and other more ulterior purposes. Chicory, that blazing star flowered plant of blue, has been used as a coffee substitute. They tell me, and I accept it among other amazing things, that quack grass roots are cooked for food in Italy. Possibly the vermicelli crop has run short there. If Mussolini likes quack root salad I could contract with his steward for all he needs. When I take on this assignment you won't be bothered with further essays.

Bees treat the flowering weeds just as impartially as the rain treats

them, using no agricultural judgment whatever. They like fire-weed, and I like the nectar they get from it. Grandmother's old-fashioned garden held many posies that became aristocrats from lowly lineage. Cornflowers, poppies, asters, and the scarlet pimpernel testify to the truth that even a member of the weed tribe can make its inherent beauty so keenly appreciated that its naughty habits are overlooked.

Cooking herbs and medicinal plants have played no small part in the "humanics" of America. Tansy, pennyroyal, sage, lavender, coriander, marjoram, savory, and balm. They haunt us from old rafters and shake their dust at us from old attics. Old gentlemen with excellent memories acquire boyish agility again at mention of certain brews and nostrums, so they may run fast and far to escape their potency.

So apparently a weed is after all a plant out of its proper place, but who is to know with absolute truth what *is* its proper place? True, we know for a certainty where it should *not* be if its presence interferes with plans we have hatched the winter before.

There is a direct relationship between oxygen-using man and carbon-using plants, and they tell me that we belong to the same brotherhood of living things depending upon the sun and the earth for our existence. I have no doubt that a farm covered with plants which we list as weeds might indeed contribute just as successfully to that part of the scheme as almost any agricultural growth.

But man has decided that he must eat flesh of livestock, and livestock prefer agricultural plants to most weeds. If we were vegetarians entirely, I believe the most of us would reject alfalfa for some of the plants we carry on the black list.

I would fain correct a false term used by many of us in our summer campaigns. We talk glibly of weed "eradication." This should be somewhat qualified. The term should be weed "limitation." Handling weeds is no job for the amateur. A chap who manages to snipe a few pests out of his lawn cannot afford to drive countryward and sneer at the embattled farmer. While he is snickering and deriding, the sparrows are toting more chickweed seeds onto his unprotected greensward. He who laughs last on the weed question is wiser, but he who never laughs is wisest of all.

THERE are as many copper-riveted and automatic, self-adjusted plans proposed for weed control as there are policies advanced to settle the prohibition question. Let a writer who wants to tackle a controversial subject come to me for a tip. I would spread out a time-worn and time-tried list for him to select. Liquor regulation, raising babies, more service for less taxes, farm relief, and weed control—these five would uncover more prejudice and personal opinion than one writer could handle in a month of Sundays.

It would be hopeless. He would

find radicals willing to declare that we need and demand liquor, babies, taxes, farm relief, and weeds as well. Others would exterminate them all, and no two would agree either on how to raise them best or how to kill them off the quickest. So it all depends on the point of view, and as we are gaining population and viewpoints equally fast here in America, I do not wish to add my mite to the multitude.

As long as a thing is active enough to get talked about so much, it surely must command respect for its virility at any rate. So weeds cannot escape a lasting niche in our hall of fame, if for no other reason than they give us something to do and something to wrangle about.

For this reason my own personal experiences in trying to subdue the encroaching plant enemies of my beets and cucumbers need not concern you. Neither shall I foist upon you any recommendations in categorical order, gleaned from the studies of any experimental farm. Your own library will prove how unworkable some of them are anyhow.

BUT this outstanding truth I *do* know. Weed control is best accomplished through community action, just like any other reform that man feels is justified. One lorn farmer attempting to push back the weed lines in a lousy neighborhood deserves credit for idealism, but he hoes and hopes in vain.

Where weeds spell reduced cash crop returns or the presence of foreign matter lowers the grain income, it is simpler to get a few planks nailed into an anti-weed platform; but where the weeds merely go into a hay and forage crop or into feed grain, the job of arousing action is difficult.

Of course some farmers dislike weedy fields just as their wives hate dirty floors, and it does not require a cash balance sheet to open their eyes to community action. But as a rule such zealous souls die young because of their crusading labors, leaving the land once more to the mercy of the Huns of herbage.

In closing out my monthly stock this time, I would mention the relation between misplaced plants and misfits in human endeavor. While both are somewhat similar in character, they differ much. A man out of place is like a fish out of water. A plant out of place seems to grow fully as well as in its ordained spot. A man seldom grows in personality or stamina when out of his rightful place. A plant will wax and grow fat in spots not intended for it, so long as the soil favors it.

Therein lies another truth. Foundations for both man and plant begin with the soil and the environment. When we make better a community in which all humanity lives and thrives to best advantage, we favor the growth of the best that is in mankind. Of course, we likewise give scope to the man with weak instincts or bad intentions. We take it for granted that the better environment we provide will encourage the best that lies in man's soul and spirit. We do not hesitate to provide that better environment just because a few misfits or morons also may take advantage of it.

So it is with plants. Your complete formula of drilled fertilizer or stable manure will benefit the mustard and the dodder while it is invigorating the wheat and the clover. Yet he who would withhold any nutrient from the land simply for that reason is mistaken—unless his crop is *mostly* trash.

Hence it appears that our best line of attack against tares in man or land is to use the best seed of the cleanest kind to start with, plus a high degree of environment and fertility. This system may save us a lot of sweat and swear words. But neither seed, environment, nor fertility will save us from work. **So let's get back to it!**

A Few Whinnies

A LITTLE MISTAKE

"As I was crossing the bridge the other day," said an Irishman, "I met Pat O'Brien. 'O'Brien,' says I, 'how are you?' 'Pretty well, thank you, Brady,' says he. 'Brady,' says I, 'that's not my name.' 'Faith,' says he, 'and mine's not O'Brien.'

"With that we again looked at each other, an' sure enough it was nayther of us."

Smith: "My wife used to play the piano and sing a great deal before the children came."

Brown: "Children are such a comfort."

St. Peter's: "Who's there?"

Voice Outside: "It is I."

St. Peter (peeved): "Get outta here; we don't want any more school teachers."—*Arizona Kitty-Kat.*

TAKING NO CHANCES

Negro Undertaker (over telephone): "Rastus, your mother-in-law just died."

Rastus: "Is you sure 'bout dat?"

N. U.: "Shall I bury her or embalm her?"

Rastus: "Don't let's take no chances, brother. Cremate her!"

—*V. P. I. Skipper.*

Passenger: "Have I time to say goodbye to my wife?"

Conductor: "I don't know, sir, how long have you been married?"

POOR KID

Papoose: "Baw-w-w-w, I wanna drink."

Eskimo Mother: "Shut up, it's only six months till morning."

—*Illinois Siren.*

A good story is told in which an Englishman asked an American what was done, in the United States, with the surplus of the tomato crop. The American replied, "We eat what we can and we can what we can't." The reply pleased the Englishman so much that on his arrival home he availed himself of the first opportunity to repeat it, but in telling the story wound up with "We eat what we can and what we can't we tin!"

You can never tell. Probably a fish goes home and lies about the size of the bait he stole.

A young bride walked into a drug store and approached a clerk timidly.

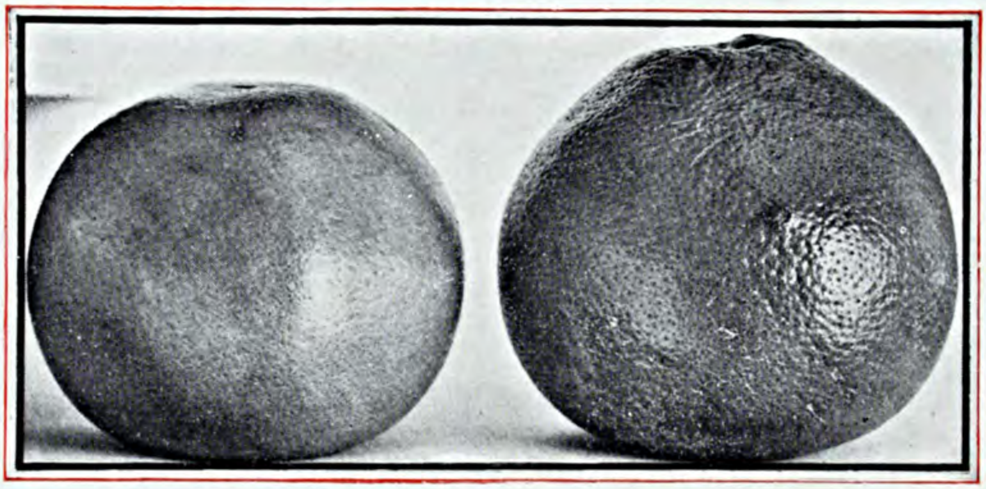
"The baby tonic you advertise—" she began—"does it really make babies bigger and stronger?"

"We sell a lot of it," replied the druggist, "and we've never had a complaint."

"Well, I'll take a bottle," said the bride after a moment, and went out.

In five minutes she was back. She got the druggist into a corner and whispered into his ear—

"I forget to ask about this baby tonic," she said under her breath. "Who takes it—me or my husband?"



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Better Crops WITH PLANT FOOD

August 1930 10 Cents

The Pocket Book of Agriculture

Better Crops with PLANT FOOD

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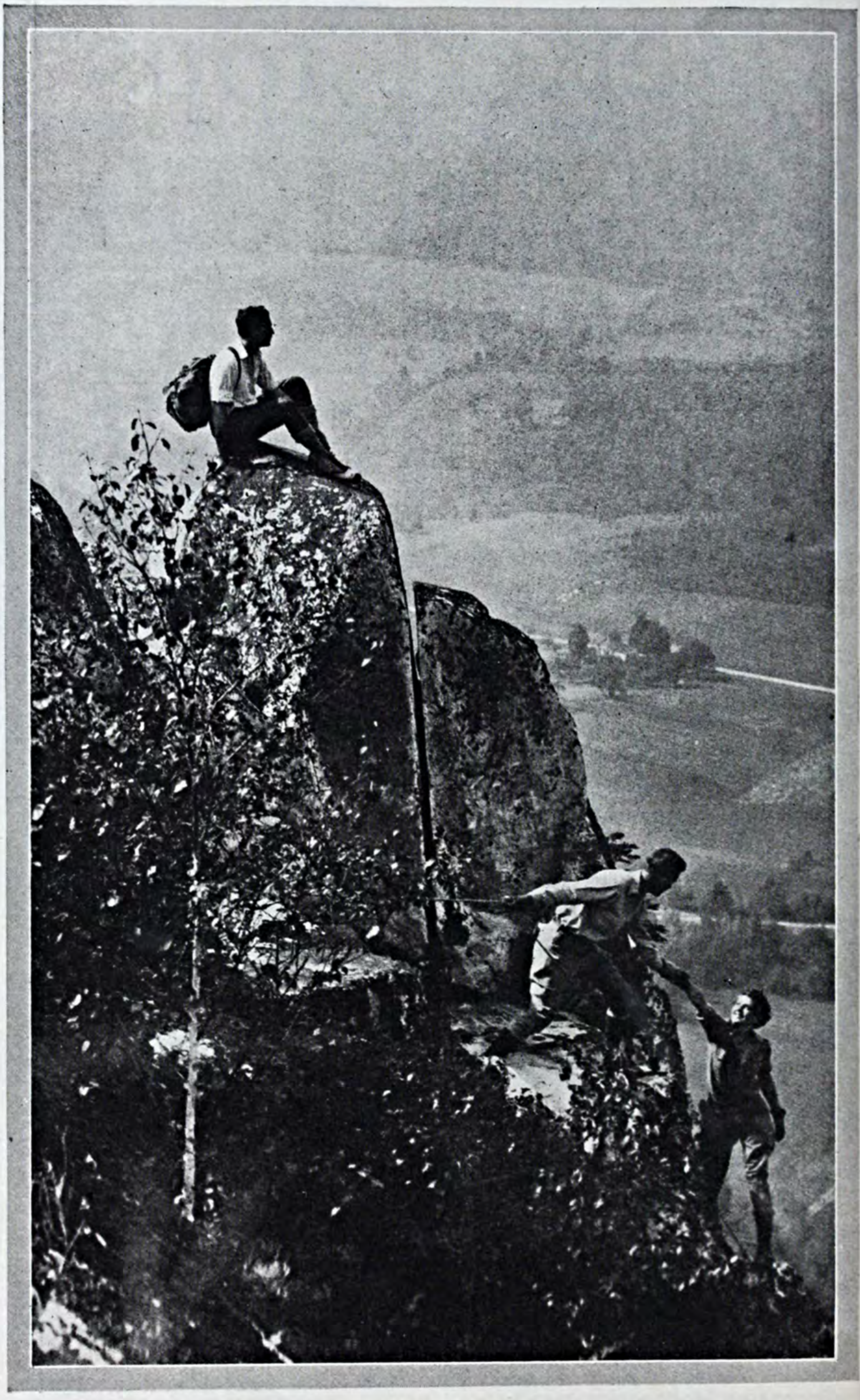

ON TOP!

Better Crops with PLANT FOOD

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VOL. XV NEW YORK, AUGUST, 1930 No. 2

Summer is the open season for—

Picnics

By Jeff McDermid

"I'LL pack a picnic lunch; meet us at the zoo," phones my wife. I am strong for the former but lukewarm over the latter. With a clamoring family of youngsters and myself included, I cannot see why we need to go away from home to see monkeys and a bear. But all I am required to do is to bring my appetite and the price of a few cones.

I understand the origin of the word "picnic" is rather uncertain. It comes partly from the French, "picque-neque," but we can be thankful it is shorter in this country. The official definition of it says it is a "pleasure party" in which the members partake of food provided in common and usually eaten in the open air. If I had written the dictionary I might have put in a few more qualifying phrases close to the "pleasure" commentary, but on the whole I have only mild thoughts for this popular diversion.

I have a friend who is a statistician and comes from Baltimore. There are two things he hates—mathematical errors and picnics. He enjoys Lady Baltimore cake and lobster patties, but prefers his dessert on a linen-covered table and his sea-food in solitude. Just to get him excited I have taken the side of the picnic in various altercations. I have even invited him to dinner and laid the cloth out in our herbarium in the back yard. In fact I have flaunted his pet aversion on every chance opportunity. Finally I made him admit that he patronized the Lexington Street Market in his glorious Maryland city—and that is one gigantic outdoor food festival if there ever was one. But he answered that when dirt is visible and its volume can be estimated and tabulated, one can buy in inverse ratio and not be dissappointed with local color and such things. But when one expects a perfectly fine home-made meal and gets there a few minutes after the ice has melted and the ants have expired in it, he says the effect is harmful in hot weather to men of temperament.

GRANTING that my friend represents a vast body of the anti-picnic party in America, it behooves me to limit the true definition of a picnic to "food partaken in the open air." The word "pleasure" must perforce be left out if we are to reach a common agreement. Probably it would be just as unfair to tack "pleasure" on a definition of cigarettes or chewing tobacco, despite the fact that a goodly portion of our fair sex have discriminated enough to adopt the former. I trust their liberal tendencies will go no further in that direction.

I have lived close to the noble redskin in my youth. I have lived with him on his reservations and accepted him in the same manner. Indians are stoical and solemn. Why? Because they never have picnics. They have never had to have them. They never hope to have them. They have lived close to the zoo all their lives and their squaws know the art of mixing hickory smoke and dog soup so that you couldn't taste the leaf hoppers in the mixture if you tried. Humanity wants a treat when it goes on a picnic and the only way you can treat an Indian is against the law nowadays. So if we depend on picnics to recast the stolid countenances of our original brothers into the carefree and zestful miens of the adopted Americans we shall wait longer than for farm relief. All of which goes to show how unjust it is to limit the definition of a picnic to "food partaken in the open air."

Yet on the other hand I have my Baltimore opponent fast. I shall not leave the reservation to clinch it either. If the sons of Sitting Bull and Rain in the Face have withstood so many outdoor gastronomic bouts without being entirely devastated, with Yankee liquor and the Department of the Interior on top of it, why in the name of Fanny Farmer can't we try a little ourselves? (Picnics, not liquor.)

I have wondered for some time who brought the first picnic to America. Those who came in the Mayflower had none with them, for the Bradfords and Brewsters preferred to save up all their hilarity for the Boston tea party. It wasn't the Jamestown colony, for they couldn't have agreed on a menu. It wasn't Oglethorpe's Georgians, for they didn't have the price of paper plates. It was too peaceful for the Irish and too wasteful for the Scots. I am satisfied from my own knowledge of antecedants and appetites that the picnic was imported by Norwegians and Germans. Ludefisk and wiener wurst taste equally powerful indoors or out. Should we ever determine the real author of the first American picnic we shall send out a subscription sheet to erect a monument in his honor. It will be higher and nobler than the one Sidney Smith built to immortalize Andy Gump at Lake Geneva.

Its base shall be sandwiches and layer cake done in marble and granite, surmounted by a human figure wearing a necklace of frankfurts and bearing aloft a trident on which are speared three golden marshmallows.

(*Turn to page* 61)

Growing vegetables the greenhouse way

Under Glass

By E. R. Lancashire

Ohio State University

A lettuce crop, nearly mature, under glass.

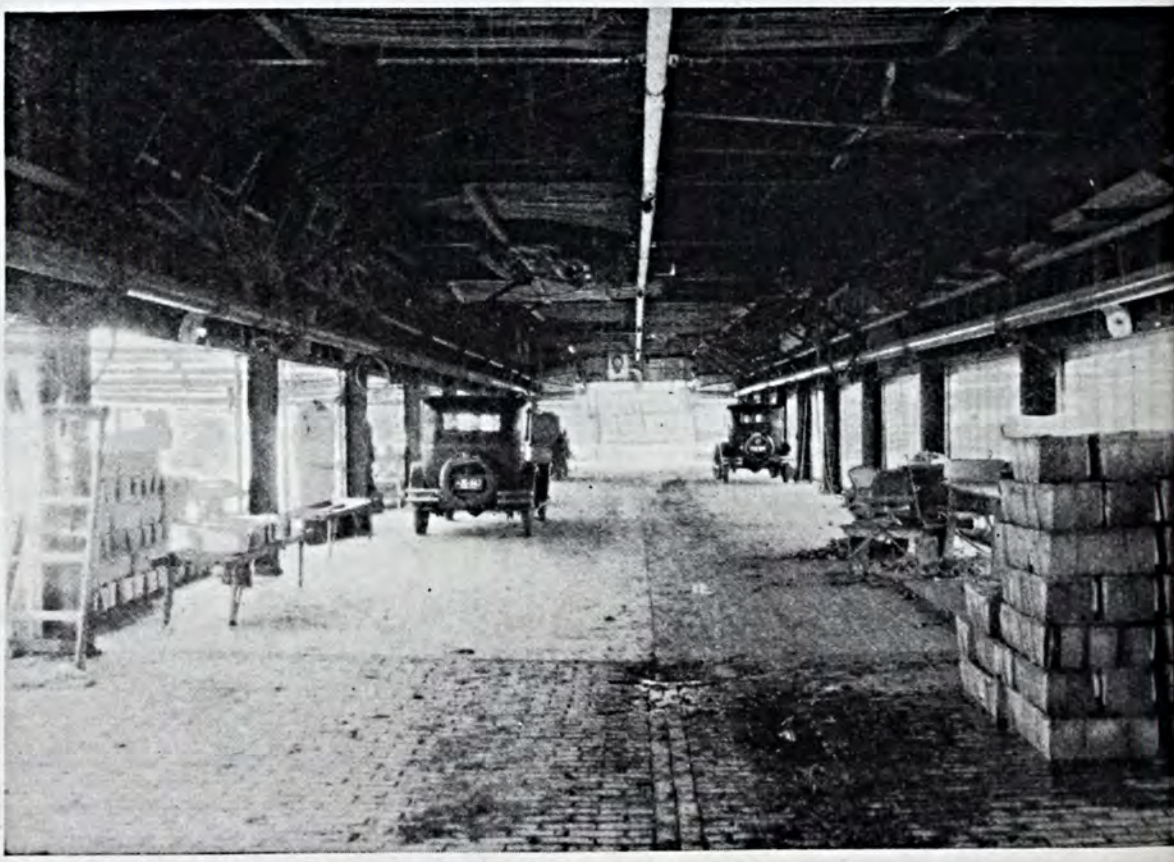
PERHAPS the first vegetable to be grown the greenhouse way was lettuce. The records show that as early as 1880 at least one grower in or near Boston, Massachusetts, was producing lettuce in glass-covered houses. The business grew and spread. Grand Rapids, Michigan, Toledo and Cleveland, Ohio, and places in New York and Philadelphia learned to produce vegetables the greenhouse way. At the present time large acreages, covered with glass, are found producing tomatoes, cucumbers, lettuce, and minor crops in nearly all sections of the United States. In Ohio alone there are some 600 acres of such farming.

This growing business is in a state of continual change from the old to the newer methods of production and marketing. It has been stated that there is an art and a science to the business of agriculture. The two are clearly illustrated in the greenhouse way of growing vegetables. The art of growing tomatoes and cucumbers under glass or the greenhouse way has been handed down from one man to another until certain practices became well established. This well-established art of growing cucumbers and tomatoes called for the application of a heavy organic mulch to the surface of the soil. This practice was very common around Cleveland until some two years ago.

A change has taken place since then. A scientist, Professor I. C. Hoffman, from Ohio's Agricultural Experiment Station, became interested and in checking up the methods used in producing vegetables under glass, he found that the art of using a manure mulch or other form of organic mulch was a good way to reduce the yield of tomatoes and cucumbers. The science of agriculture has been in process of development some 300 years whereas the art of agriculture has been in operation since the days of the Garden of Eden. It is small wonder that changes found profitable by the scientific farmer have been adopted rather slowly by the tiller of the soil who has been thoroughly trained in the art of agriculture.

Soil covered the modern greenhouse way costs about one dollar a square foot or approximately $50,000 per acre. The costly overhead charges on such a system of farming make it practical to investigate each new contribution of the science of agriculture. More and more science and less and less art of agriculture are used by the successful greenhouse grower.

The first classic experiment, now some 300 years old, was not as especially fruitful of practical and profitable results as are some of the more modern ones. Yet it was man's first



Interior view of a packing shed.

How greenhouse soil is plowed.

attempt to break away from the art of agriculture. In this first search for truth Johan Baptista took an earthen vessel in which he placed 200 pounds of soil dried in an oven. This soil was moistened with rain water and in it he planted a shoot of willow weighing five pounds. After exactly five years the tree weighed 169 pounds and about three ounces. During this time nothing but water was added to the soil. Yet when the soil was weighed again it had lost only two ounces. The conclusion was that the 164 pounds and 1 ounce of wood, bark, and root system arose from the water alone.

Controlled Conditions

Since that time man has learned many secrets of the mysterious way in which a plant lives and grows. The observing grower can so control the water supply, the management of the soil, the temperature, the supply of plant food in the soil, as well as other factors, that maximum yields of high quality vegetables are possible. Nowhere is this control by man as complete as in a modern greenhouse.

Conditions in a greenhouse are under the control of the operator. He can ventilate or close the house. The soil can be sterilized and the same system of tile used for this work can be utilized to sub-irrigate the soil. Excess soluble salts present in the soil can be washed out through this tile system. It is also possible to control the amount of light, but at the present time the methods available are too costly. The temperature can be raised or lowered at will. The original soil can be completely changed through the addition of organic and inorganic fertilizers.

The scientist works best under just such controlled conditions. Recently, the Ohio Agricultural Experiment Station proved that a spring crop of tomatoes could be grown as desired, smooth or rough. All one needs to do is to control the temperature, regulate the water supply, and balance the amounts of nitrogen, phosphorus, and potassium to meet the changing needs of the tomato plant. By varying these factors a smooth or rough tomato is produced almost as readily as a wheelsman steers his ship. A turn or two extra on the water, too much or too little heat, or nitrogen in excess in the early life of a tomato plant or too little nitrogen during the bearing stage and the result would be an unsatisfactory crop of poor quality, rough tomatoes.

The science of agriculture has been busy with the greenhouse cucumber crop also. A nubbin is a cucumber that grew too slowly. The fancy market has little use for nubbins and so their producer is penalized. If every cucumber in every greenhouse was a fancy fruit, there would be little red ink needed even if prices were low. Less nubbins and more fancy fruits are needed.

The number of wasp-shaped cucumbers can sometimes be reduced. Such a cucumber may be the result of an interrupted growth. A fancy cucumber can be produced from 14 to 20 days after a cucumber is pollinated. If the pollination is not accomplished promptly, wasplike cucumbers develop. A good deal can be done with fertilizers to fill out the wasplike lines of such fruit, and many of them can be improved so as to grade number one in place of number two.

Regulation of the water supply is needed especially during the early growth of the cucumber crop. During the short, cloudy days of early January to March, watering the cucumber crop is easily over-done, especially when the soil drainage is none too good.

The greenhouse lettuce crop grows with as little help from the grower as any crop, yet in this field the contributions of science are invaluable. Feeding the lettuce crop, watering the plants, and improving the varietal strains are all favorite studies of the scientist.

Tile drainage, sterilization, and subirrigation systems for greenhouse soils can all be combined in one. The four-inch drainage tile are laid in lines 16 inches from center to center and from 13 to 18 inches from the surface of the soil to the bottom of the trench in which they are placed.

For each three to nine square feet of ground area to be sterilized, one horse-power of boiler capacity is required. The lighter the soil the less of it can be treated per horse-power. The shape of the area to be sterilized does not matter. Steam is released in the tile lines through ⅜-inch pipe nipples extending into each line. A steam pressure of at least 50 pounds is used in this work.

The steam is turned into the lines for from three to eight hours. The longer the time, the better the sterilization. All soil to be steamed at one time is first covered with canvas, and this cover remains in place for several hours after the steam is turned off. Soil tempertures of 190° F. at the surface and 160° F. six inches beneath the tile lines and at a point midway between them will give a good control of soil insects and diseases.

Liberates Plant Food

Such treatment of the soil liberates available nitrogen and phosphorus and perhaps potassium. A poor soil may become very productive as a result. If a highly fertile soil is so treated, this additional release of chemicals may result in harmful effects from their over-abundance. Such a condition is referred to as excessive soluble salts. These may be washed out through the tile system. A chemical test is first made to determine whether or not they are present in amounts of more than .26 of one per cent.

While the soil is still warm, from 10 to 12 inches of water will leach out excessive amounts of soluble salts. This method was successful at Warrensville, Ohio, with a soil containing 2.75 per cent of soluble salts.

After this treatment it was found that .44 per cent of soluble salts were retained by the soil. Cucumbers and

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Getting Joiners

By G. E. Langdon

Wisconsin College of Agriculture

WHY do some farm families just naturally join rural organizations and others remain "stay-at-homes?" Why are certain districts well organized and others extremely disjointed? Has the traditional isolation and long hours anything to do with keeping some families out of things? Are other families "joiners" and active members of clubs because of some advantage of kind of farming, home conveniences, nearness to town, size of family, or racial aptitude?

Since successful campaigns for better crops and better marketing are based on group action and instruction through farmers' organizations in large part, the why and wherefore of getting people to join is of interest to every agent.

The Wisconsin College of Agriculture has recently made a study of 280 farm families living in five different counties of the State to get a picture of the general scale of living of these families and their relation to such groups as farmers' clubs, farm bureaus, equities, granges, lodges, dramatic societies, boys and girls clubs, and marketing organizations. The members of these 280 families have told their personal experiences with rural organizations to aid in finding out why some districts are well organized and others not.

Careful study of these accounts has finally shown certain definite trends of farm life that differ rather widely from some of the old beliefs about why farmers "joined."

In the first place no community can be judged good or poor from the standpoint of capacity for organiza-

A farmers' picnic for both pleasure and profit.

tion simply on the basis of size and kinds of farms and prosperity of the farm families. Group activity seems to be somewhat independent of the physical and economic conditions under which people live and even of such a social welder as nationality. Neither "border nor creed nor birth" seems to play a great part in uniting farm groups for social purposes.

Those families having greater acreage and better living facilities such as telephones, automobiles and power machinery often did not take as great a part in community life as others less fortunate economically. In other words, the ability of certain farm families to get together and work out mutually beneficial plans for various social clubs and cooperative marketing organizations is not based on what these families have, but on certain more intangible qualities of what they are and what they do.

Farm families seemed to be much more likely to be active in organizations providing they were constant readers of magazines, newspapers, and books, as well as giving liberal amounts of time to listening to radio talks and news. At any rate, the families which gave more time to reading, radio, and other recreation apparently were more likely to take part in rural clubs than other groups which perhaps had the same or additional advantages in the way of home comforts or superior farm business.

Reading absorbs the most time devoted to any one kind of recreation on the farm. In districts where there were many organizations, it was found that 65 per cent of the persons interviewed gave more time to reading than to any other one recreation. The average amount of time spent in reading by persons in highly organized districts was as high as 340 hours a year and about 230 hours in the less organized sections.

At least one daily paper is taken by over 80 per cent of the families which were highly active in organizations and by about 77 per cent of the families which were not very active. The average number of periodicals taken was about six for the first group and five for the others.

The number of books owned and borrowed seems to have a clear relation to organizations because the average number owned by families belonging to many organizations is 70 while for families not interested greatly in rural clubs it is only 24. The average number of books borrowed for reading in a highly organized group is six and only about three in a low group.

Other Forms of Recreation

Interest in the radio seems to be closely tied up with activity in farm societies. Although families in both the low and highly organized groups own radios in about the same proportion of 35 per cent, yet when the actual amount of "listening-in" is measured, it is found that on an average the persons in high groups spend just twice as much time a year in listening to programs as do persons in the low organizations groups. Also, nearly 40 per cent of all the persons in the high groups use the radio, while only about 20 per cent of those in the low groups were interested.

Recreation in such other forms as auto riding, hunting and fishing, dancing, going to the movies, playing cards, and dramatics were enjoyed by both groups that were active in organizations and those that were not. Attendance at movies was highest among farm families that showed a medium interest in organizations.

Almost two-thirds of the persons in the high organization district attended or took part in one or more plays compared with about one-third of the total number of persons in low districts. About four-fifths of the persons in the high districts attended one or more picnics (school, Sunday school, or otherwise) compared with three-fifths of the persons in other districts. About 40 per cent of the

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X-rays *for* Plants

By

U. V. Wilcox

Washington, D. C.

Tobacco plant produced by the union of X-rayed sex cells. Note the greatly increased height and increase in number of leaves (most of them represented only by the remnants of leaf bases).

LUTHER BURBANK, were he alive, would find it possible to greatly stimulate his methods of crop breeding, plant changes, and the production of new varieties by the use of the X-rays. Long and slow changes can be accelerated, new species discovered, and even alterations produced with these powerful rays.

Plant specialists have discovered an entrancing new field of study. T. H. Goodspeed, Professor of Botany, University of California, Miss Edna Louise Johnson of the University of Colorado, Dr. L. F. Stadler of the University of Missouri, and Professor H. J. Muller of the University of Texas are among the scientists who are pioneering in a new field of plant production.

Gardeners and botanists at one time would watch carefully for the "bud sport" or mutation that would make it possible to produce a new variety of plant. It was the event of a decade or generation. Now, however, the X-rays offer opportunity to quickly change the whole life course of the plant that has been given regulated doses of the X-rays. Professor Muller's experiments indicate that evolutionary changes, or mutations, can be produced 150 times as fast by the use of the X-rays as they can by the ordinary processes of nature. This means that man can force the production of new and desirable plants. These mutations are the same things that the old-fashioned gardener called "sports". Mutations are what is obtained when a single-flowered plant suddenly produces offspring with double flowers. The common double golden glow, for example, is such a wild mutant; it just came of its own accord, without any invitation from a gardener. Later on some one saw it growing in the field and dug it up to take home.

Assisting or forcing nature in some way, so that new things will be produced faster than at the old rate, has for centuries been the breeders' dream. Until recently, however, there was not even a hint of hope that this dream might be realized, because nobody knew what made mutations. Nobody knew their mechanism. Until that was known, man lacked a handle to take hold of in his effort to push nature along a bit.

Searching for Rules

Then, in the language of the movies, "came the dawn." The arrival of the X-rays showed that the reproductive cells of plants could be changed. The chromosomes or the part of the cell that is responsible for carrying on its peculiar qualities meet with an accident and a new plant is produced. This is the mutation. The basic use of the X-rays for plants merely disturbs the chromosomes and mutations follow. Scientists are now endeavoring to find a rule or rules that will guide in the changes.

Professor Muller began his experiments with the little insect known as the fruit-fly, sometimes called the vinegar-fly and pomace-fly. The advantage lay in the fact that this insect breeds very rapidly, maturing in 21 days, as against 21 years in man, and intermediate times in plants.

The insects were exposed to heavy doses of X-rays and then allowed to breed. Presently the new generation hatched from their eggs. They were less numerous than might have been expected, but otherwise apparently all right. Then Professor Muller bred the first generation offspring and got a second.

Results were immediately apparent. Mutations such as he had often in an un-X-rayed stock turned up, together with a number of brand new ones. He estimates that he produced at least 100 distinct mutations, and that the X-

Three field-grown tobacco plants in progeny from X-rayed seeds. The plant in the center is very large and luxuriant, while the plants on either side are much dwarfed and exhibit many alterations in vegetative and floral characters.

A field grown tobacco plant produced by X-rayed sex cells. Dwarf, compact growth, and great vigor, alterations in size and shape of leaves and in floral characters.

rays speeded up the process over 1,500 per cent. Some of the insects had wings only half size, others no wings at all, still others wings of normal length but abnormally wide or notched at the end or splotched with odd patterns. Instead of their normal dark eyes some of the little flies had white eyes.

The simplest arithmetic will show that if the mutation-producing process can be speeded up even a tenth as much with plants as with the fruit flies, the gain in breeding of new crops, new species, and new flowers will be enormous.

Professor Goodspeed has applied radium salts to tobacco seeds. Taking approximately 250 seeds and placing them in a gelatin capsule such as the druggist uses he inserted the whole in a lead cylinder, on the outer surface of which were fastened the needles containing radium salt. The lead was thick enough to stop all the rays given off but the high speed gamma rays which were allowed to bombard the seeds for various periods of time.

The gamma rays, acting upon the dry tobacco seed, will not kill the embryo unless the dosage is more severe than that applied to human beings. He found, however, that a lesser dosage slowed up the earlier growth of the seedlings.

By allowing the tobacco seed to germinate, a relatively light dosage of the gamma rays will kill many of the developingembryos, and will cause various distortions among ones that survive.

Later Changes May Come

"Even though there may be no striking influence on general growth and vigor of the plants which grow from X-rayed or radiumed seeds or seedlings, later generations from these plants may exhibit definite changes in flower color, flower shape, stature, leaf size, shape, and other growths," Professor Goodspeed said in discussing his work. "Some of the new types in the expression of these plant characters are inherited, persisting without modification in later generations as something new in the species with which the experiment was begun.

"These changes are reflections of vital alterations in the hereditary material carried in the cells. The alterations were produced as a result of absorption of the rays from the X-rays tube or from the radium by the cells at the growing points of the seed or seedling."

Thus again we have the mutations. The powerful unseen rays affect the life courses of the plants as they affect the life courses of the fruit flies and as they undoubtedly would affect larger animals. We know, of course, that the X-rays and the radium rays have immediate and powerful results when applied to human beings.

Professor Goodspeed, who has, perhaps, gone further in his experiments on plants than others, says "Many of the irradiated pollen grains and eggs of the tobacco plant will be capable of normal fertilization, and as a result seeds will be produced from flowers which were given X-rays or radium treatment when they were in the bud stages.

"The plants which grow from these seeds exhibit a bewildering series of changes in any one or in all plant characters, when they are compared with the plant which grow from normal untreated sex cells. If the original parent race of tobacco bears a red flower, these variant plants from X-rays or radium sex cell treatment will show on one plant, perhaps, a light pink, on another a pink, on a third a dark red, on a fourth, a purplish flower color, and so on."

Professor Goodspeed continues: "The surface of the trumpet-shaped flower on some plants will be broader than that of the normal flower borne on the untreated plant, or narrower on other plants. The tube of the flower similarly may be treated and altered in length and there will be plants all of whose flowers are abnormal and distorted.

"The leaves will also be changed in shape and in texture and sometimes the leaf tissues will be rearranged and some of them even inverted. The size and vigor of the whole plant may be strikingly different from that of its untreated relatives. There will be dwarfs and giants, stout telescoped plants, and slender long-branching plants.

Speeding Up Burbank

"Usually a striking change in general appearance is accompanied by changes in all particulars of plant structures, both those which can be seen with the naked eye on the outside of the plant and those which appear only under the microscope in sections of the tissues. Many of these variant plants which grew from seeds that followed the union of X-rayed or radiumed sex cells were partially or completely sterile.

"Many of the variant plants showed under the microscope their origin from treated sex cells because the dividing cells at the apices of the roots or stem exhibited abnormalities in the amount of nuclear material passed on to the new tissues or peculiarities in behavior.

"Such plants became mosaics of hereditary materials and showed differences in the character of the same plant organ on different parts of the one plant body. This may result in important changes in agricultural practices. For, if a treated fruit tree, for example, were in this condition, then side shoots might appear, different in character from normal ones, and either worse or better than the normal changes of this sort could be propagated from cuttings and immediately supply some new and valuable variety."

Thus we have the slow processes of Burbank outdone—speeded up a thousand-fold. It requires but little imagination to vision a new plant kingdom when the plant specialists discover the secrets and the rules having to do with the dosages of radium and X-rays.

Dr. Stadler of the field crops department of the University of Mis-

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Oklahoma's Sweet Potato Kings—

Get More No. 1's

By Charles Kilpatrick

Ft. Smith, Arkansas

"THIS has been a hard year for sweet potatoes, and if we had not fertilized, we would have made a complete failure." Thus spoke Sterling Camp, who with his brother, Tom Camp, comprise the farming team of Camp Brothers, Castle, Oklahoma. For several years they have been the "sweet potato kings" of Oklahoma, producing between 20,000 and 30,000 bushels every year. However, sweet potatoes are not their only interest, as they are following a well-balanced system of farming. Tom Camp has won the Master Farmer's Medal.

"While getting better than the average yields from our sweet potatoes," Sterling Camp continued, "the percentage of No. 2's was far too high. We resorted to commercial fertilizers, using the 4-12-0 mixture. Our yields increased some, but still the percentage of No. 2's remained high, which meant that we were not getting enough marketable potatoes. This past spring Mr. H. L. Bankhead, our county agent, was consulted, and he assisted us in laying out a series of tests with commercial fertilizer.

"The tests we made were as follows:

"As the fertlizer previously used contained no potash, these tests were planned primarily to study the effect of potash in improving the quality of potatoes and increasing the yield of marketable potatoes.

"All of the fertlized plots received the same amounts of nitrogen and phosphoric acid, while the amount of potash varied from no potash to 24 per cent.

"The fertilizer without potash gave an increase over no fertilizer of only 48 bushels per acre of marketable potatoes. The fertilizer containing 4 per cent potash gave an increase over no fertilizer of 63 bushels, while the increase of marketable potatoes from the fertilizer containing 24 per cent potash was 77.5 bushels.

"The results show that the yield of marketable potatoes increased as the percentage of potash in the fertilizer increased.

"And thanks to our county agent and extension service for laying out these demonstrations for us," concluded Mr. Camp. "We believe they have shown us our mistake."

Fertilizer used		*Yield per acre No. 1's (Marketable)*	*Yield per acre No. 2's (Seed)*
No fertilizer		129.5 Bu.	145 Bu.
500 lbs. 4-12-0 (N.P.K.)	Per A.	177.5 "	132.5 "
500 lbs. 4-12-4 " "	" "	192.5 "	125 "
500 lbs. 4-12-24 " "	" "	207 "	112 "

A Master Farmer

John Reynolds of Middletown receives the honors for 1929

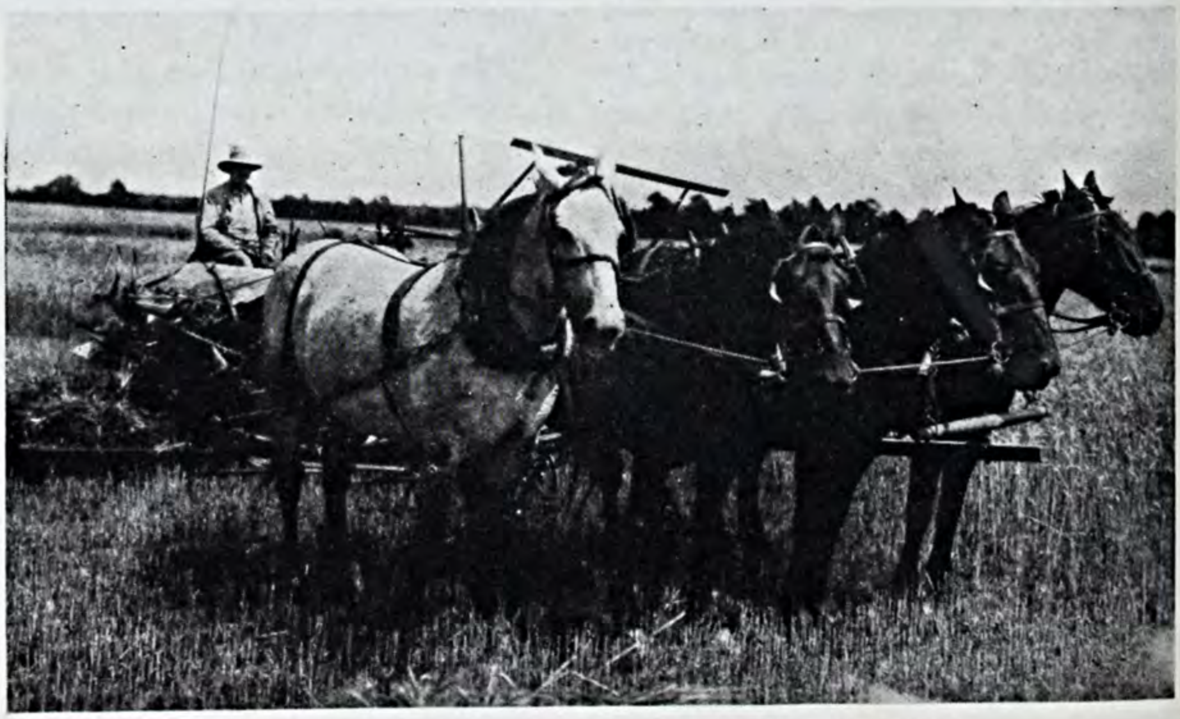
LAST winter 12 men from five states had the honorary degree of Master Farmer conferred upon them and each received a medal awarded by the *Pennsylvania Farmer* at a banquet held in Harrisburg, Pa., in the presence of 300 guests. These 12 men were picked from 400 nominees by a committee of 12 judges, all of whom were men of agricultural importance in the eastern United States.

The Master Farmer project is a movement to honor outstanding achievements in agriculture. It is nation-wide in its scope and is conducted under the auspices of a cooperating group of farm papers.

The Delaware Master Farmer for 1929 is John D. Reynolds, of Middletown. Mr. Reynolds is a share renter. He says, "I would rather rent a good farm than own a poor one." He is not one of those share renters who moves every year for one reason or another. Mr. Reynolds and his landlord cooperate in the farm enterprises and as a result this 365-acre New Castle county farm has been brought into a high state of production during the last 12 years.

The farm is completely fenced and all fields are conveniently located in reference to the farm buildings. The farmstead, with its well-kept lawn, is located some distance from the road at the end of an avenue of fine shade trees.

The rotation practiced by Mr. Reynolds consists of *(1)* cultivated crops; *(2)* wheat, 2 years; *(3)* sweet

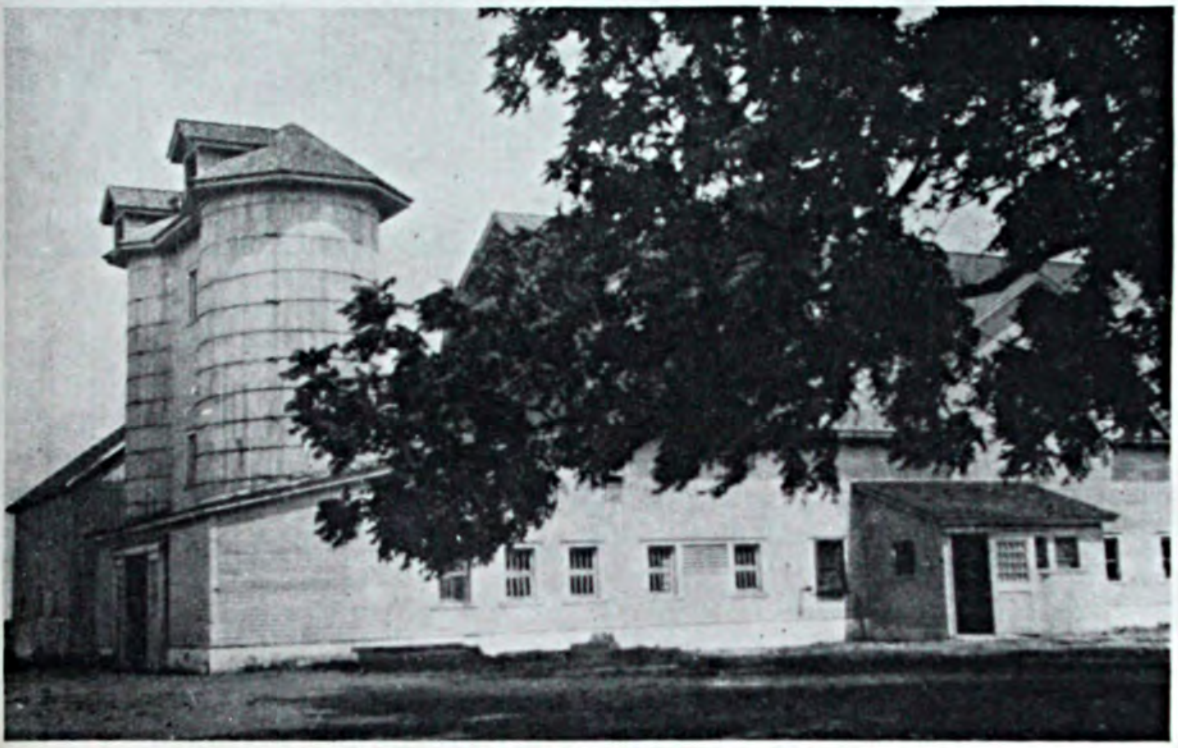


Harvesting wheat with a binder to save the straw for bedding.

from DELAWARE

By George L. Schuster

Delaware Agricultural Experiment Station



A cooperating landlord supplies Mr. Reynolds with this fine equipment.

clover. This season there are 125 acres of wheat, 43 acres of corn, 23 acres of sweet corn, 20 acres of tomatoes, 65 acres of sweet clover, and 30 acres of permanent alfalfa. The remaining acreage is occupied by woodland, homestead, and garden crops.

The farm has been limed every four years and as a result there is sufficient lime in the soil to grow the crops desired. Mr. Reynolds says, "I grow my own nitrogen." A visit to his sweet clover and alfalfa fields proves his statement. Besides this he annually produces over 500 tons of manure from his livestock. He buys superphosphate and muriate of potash in 200 pound bags and mixes this at home in the proportion of three bags of superphosphate to one bag of muriate of potash making approximately an 0-12-12.

0-12-12 Better

At one time Mr. Reynolds used an 0-12-6 mixture but now he believes he obtains better results from the 0-12-12 which is used for all crops. Additions of nitrogen are made by manural applications where needed. For wheat he uses 300 pounds of 0-12-12 per acre, 200 pounds is applied to corn in the hill, 1,000 pounds is used for tomatoes, half broadcast and half in the hill. His average yields from these practices have been 30 to 40 bushels of wheat per acre, 8 to 10 tons of

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Don Clark and his alfalfa.

Banking on Alfalfa

By J. L. Mac Dermid

County Agent

UP in northern Vermont, in a county which borders on the Canadian line and drains almost entirely towards the St. Lawrence river, an interesting alfalfa contest is being conducted.

A thrifty little Vermont bank, located in a village of little over 1,000 population, has offered prizes totaling $300, for a three-year alfalfa contest. A feature of this contest is that each division is based on the 1931 seeding, and that soil preparation receives as much consideration (and prize money) as the results of each of the first two years' crops. It all started as the result of a short talk given by Don Clark of Glover, Vermont, at the 1930 Barton Farmers' Day. Mr. Clark is a young farmer whose name is already well known in his county.

He distinguished himself in the 1929 Farm Bureau Membership Campaign, is Master of Glover Grange, and the youngest director in the Orleans County Farm Bureau.

On the occasion in queston, Mr. Clark was one of 300 farmer guests of the Village of Barton. A forenoon "talkie" and a fine dinner had been enjoyed and the program of informal talks was begun. He was asked to say a few words on "What Barton Can Do for Its Farmers." His suggestions were numerous, and to the point. Among them was the sugges-

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By E. R. Jackman

Oregon State Agricultural College

Prophesying PRICES

IN recent years some of the potato dealers of a speculative turn of mind have done their gambling only after painstaking studies of the weather. In former years the dealers had all the best of it as price reports were not available and no uniform grades existed upon which to base printed price records. But this has all been changed with the widespread adoption of the U. S. grades, telegraphic price reports by the Bureau of Agricultural Economics, telephones in every farm house, and automobiles and radios.

Today the potato buyer faring forth hopefully on a hot market tip that the price is advancing, is quite apt to be met by growers with better and later market information obtained from their radio loud speakers. So the potato game "ain't what she used to be", and veterans of the trade are forced to sit around and get what satisfaction they can from swapping yarns of big deals they made back in 1905 when they knew of price advances or drops several days ahead of the farmers.

News disseminating channels are today just as available to farmers as they are to dealers. When one considers also the price and yield forecasts put out regularly by the Department of Agriculture it is not hard to believe the wail of hundreds of potato dealers that their business has been reduced to a brokerage basis with no possibility of speculative profits.

And now the last stronghold of the speculative type of dealer seems about to lose all of its strategic importance. During the past few years a few clever dealers here and there have discovered more or less independently that by watching the weather in the important potato producing areas they can beat the government forecasts by about a month

The potato crop is perhaps more susceptible to weather changes than any other crop. That is why large acreages do not necessarily mean large yields or vice versa. When that great potato producing area, for example, from Minnesota around to Michigan has a dry hot July, observers know that millions of bushels have been lopped off from production.

If August continues hot and dry, the shrewd observer gathers his shekels in one hand and his contract book in the other and hies himself out into the byways to "take on a few spuds" as he nonchalantly expresses it. The growers from whom he buys will read in the government crop reports about a month later that

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Bill Heintz's 4-8-8

By R. E. Marshall

Columbia, Missouri

BILL HEINTZ is a thrifty farmer and a natural born leader of St. Louis County, Missouri. The soil on his farm and in his neighborhood is hilly and until the spring of 1929, neither he nor any of his neighbors had used any commercial fertilizer notwithstanding the fact that all of them were growing some early potatoes for the St. Louis market.

Last spring, Assistant County Agent Lyle Seaton and the writer went to see Bill about putting a fertilizer demonstration on his early potatoes. We outlined the usual procedure, anticipated the benefits to be secured, and ended by telling him that we would furnish the fertilizer combinations for the demonstration.

After Bill had agreed to furnish the geography and labor for the demonstration and as we were about to leave, he turned to me and said, "Are you sure there are no hooks in this? I always have been skittish of these offers to get something for nothing."

Seaton assured Bill that there was no hook in the proposition, all we wanted him to do was to "tell" all his neighbors about the extra growth and yield of the potatoes.

As summer wore on, we kept close track of Bill's potato operations to make sure that better practices of spraying and cultivation were carried out, and when it came time to dig the plots, Bill gathered in a number of his neighbors to prove that there were added bushels beneath the bigger vines.

Without any fertilizer the potatoes made 174 bushels per acre; with 700 pounds of 4-8-0 there were 179 bushels per acre; but when 8 units of potash was added, the 700 pounds of 4-8-8 brought the yield up to 238 bushels.

A few days after the demonstration meeting, just when Bill had the potatoes dug on his fertilized plots, a buyer came along and offered him $1.75 a bushel for all the potatoes he had out. The next day, Bill dug the potatoes on the unfertilized acreage and stored them in his cellar.

In two weeks the buyer came back, asking for more of those "good potatoes." Bill took him into the cellar and showed him the potatoes. The buyer took up a handful of the tubers, squeezed them, then looked awry.

"No," he said, turning to Bill. "These are not the same potatoes. These are not nice and firm like the others were; $1.50 a bushel is the best I can do on these."

So Bill sold the potatoes from the unfertilized plot for $1.50 per bushel. However, he put the increased bushels that the fertilizer had shown him, together with the increased price the buyer had paid for the fertilized potatoes, and made a story in which a 4-8-8 analysis was the oft-recurring theme, further details of the story being added by way of proof of the correctness of the theme. And he kept his part of the agreement. He told the story far and near.

The results the spring of 1930 as seen through the eyes of Wm. Bayer, manager of the Chesterfield Farmers' Elevator Co., some six miles away, is that eight tons of 4-8-8 fertilizer were sold in Bill's neighborhood, mostly in two to four bag lots!

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¶ These American roosters appear aggressive but are no match for the fighting cocks of India where they are sent to act as—

Feathered Missionaries

By

J. J. De Valois

Katpadi, South India

PROBABLY no new missionaries from America were ever more talked about before their arrival in the Arcot Mission of South India than some late recruits—a dozen Rhode Island Red and White Leghorn "feathered missionaries."

The Indian pastors, teacher-catechists and village Christians were told that four men, each with two wives, were coming out from America to do missionary work in India with us.

"Kurdathu; Kurdathu. Sare alle. Verndaam!" (Don't allow it; its not right; we do not want them) was the unanimous exclamation from the worried Indians. "For 75 years the missionaries have been teaching us that polygamy is sin and that it should not be tolerated in the Christian church. How then can we receive these new missionaries if each has two wives.

"Yes, but conditions in America are changing. The old time missionaries came out with long beards or full mustaches. The women then wore long skirts and high-necked blouses. You accept our present young men without even a mustache and our American women with their bobbed hair and short skirts. We must not be old fogies. We must be progressive and keep up with the times," taunted the American speaker.

"Yes, that may be true. Perhaps we are too conservative, but we cannot accept these new missionaries if they each have two wives. Please cable the Board of Foreign Missions in New York not to send them," was the decided opinion of the Indian people.

When finally the fact was disclosed

that these new workers were of the feathered variety, the anxiety of these men gave way to hearty laughter. That changed the situation. They agreed that such missionaries were very necessary and most welcome. Then the questions began to roll in. How much would be the cost of shipping a dozen fowls 12,000 miles? Who would feed them on the way? How could I trust strangers to do that for me? Would they arrive alive? How was it possible for one highly bred hen to lay over 300 eggs within a year! Surely I must be mistaken that roosterless hens would lay infertile eggs that even the most orthodox vegetarian Hindu could not take objection to. How was it possible that baby chicks could be shipped a thousand or more miles before they needed their first feed? Could eggs really be hatched in a wooden box with only a lamp? Fifty thousand eggs in one such incubator; America surely is a land of wonders!

These particular ladies and gentlemen left the Iowa State College Poultry yards in October headed for the New York headquarters of the Board of Foreign Missions. Immediately they were caught in a railroad strike and were returned to Ames. It looked as though they were to miss their boat but arrive they did the last day.

Transportation Difficulties

In the meantime the bags of feed were lost and the birds descended upon the Foreign Mission Secretary in the heart of New York City without any feed and a six week boat journey ahead. The city-bred secretary was in a dilemma. Advice was sought from all quarters, the New Jersey Experiment Station, a poultry farm, even neighbors trained in the raising of chickens, with the result that the morning of their departure fifty pounds of scratch grain and fifty pounds of mash was bought in the downtown section of the city. The birds were soon on their way to the

The missionary, with a sun-helmet, explaining the good qualities of one of the "feathered missionaries" to a group of interested school boys. Notice the solid granite fence posts which cost five cents delivered.

A swarm of flying, white ants. Early in the rainy season these termites leave their ant hills at night and are attracted by a light. They then drop their wings and soon die and often can be gathered by the gallon in the morning. They are considered a delicacy. These ants are a great pest but they do make excellent feed for poultry in supplying fresh animal protein.

docks accompanied by their feed. One of the crew of the "City of Shanghai" was given instructions as to the care of the precious shipment.

A novel form of insurance was next secured for the party as the shipping company disclaimed any responsibility for the safety of the birds. Provision in case of the demise of any of the fowls was made in the following ambiguous terms:

"It is understood and agreed, in addition to the perils hereby insured under this policy, to include the risk of mortality and all dangers incidental to the transportation of the cattle but not to be liable for damage or loss of any animal landed alive. Each animal separately insured."

"Warranted by the assured that the animals are sound and healthy when received on board and that in case of the death of any animal such disposition shall be made as to realize the fullest salvage for the benefit of this company."

The full cost of transportation for the globe trotters was $115.30:

Expressage Ames, Iowa to New York	$18.05
Trucking in New York	2.00
Feed for the journey	5.12
Ocean freight and care	69.00
Insurance	11.03
Madras harbor dues and clearance	7.10
Freight in India to destination	3.00

The birds arrived in perfect condition with a few eggs in the coop to prove that they meant business in India. The 12,000 mile trip extending over 45 days evidently had not daunted the courage of these pioneers. The people flocked around to greet the "feathered missionaries" they had heard so much about. Several expressed disappointment that the fowls were not larger. "We expected them to be three feet tall," said one man. Value evidently meant size in their estimation. They could not appreciate the inherent quality that had been bred into these "300 eggers."

Poultry Improvement

The wheels of progress have moved so fast in America that it is hard to believe that only 50 years ago the early pioneers invaded the trackless prairies of the Middle West. Each household took with them the family cow for milk and a few mongrel hens for eggs. The large standard bred flocks of Wyandottes, Leghorns, Plymouth Rocks and Rhode Island Reds raised on a commercial basis in that very area today, present quite a different picture. It really is only within the last ten years that the most rapid development has been made in the Middle West where the majority of the American billion dollar industry is still located. Individuals always resident in the community or the country cannot appreciate the great changes that are taking place so rapidly in America. Persons who have been residents abroad for seven or eight years and who return are best able to compare properly and appreciate most fully what is going on. Such has been the position of the writer.

The motor car or express train is no greater improvement over the covered wagon or ox-cart as a means of locomotion than is the present day organized American poultry industry compared with the few scrub hens kept by the early pioneer. Extension experts still bewail the lack of interest shown in selling eggs and poultry on a quality basis. If such persons could step into India for a few months study, they would be more optimistically inclined toward those conservative farmers of America. The Indian poultry industry is still in the homesteading period.

So far India has no standardized poultry. "Commercial poultry farming" is still an unheard of term. The English Government officials, business men from the West and Missionaries have been doing something in the way of importing improved fowls and through their influence a few small poultry yards have sprung up. A few of the Provincial Governments have added poultry husbandry departments to their agricultural improvement programs, but most of them are still too busily engaged in the larger projects of cattle and other livestock breeding work to consider poultry work which many still consider of minor importance.

The United Provinces have done more than any other section. They have a very well equipped poultry plant and have done a great deal to popularize the industry in their section. Last year they made a beginning at marketing eggs in England. A poultry plant with a hundred laying hens is still a large enough attraction to bring visitors a good distance.

The average mongrel hen is just like Topsy—she has just grown. They are a nondescript lot of many and varied colors. They have the habits of wild birds laying clutches of 10-15 eggs and then going broody. Ordinarily about three clutches are laid a year, of which two are usually hatched. The eggs on the average do not exceed an ounce and a half each. Many are mere sparrow eggs of an ounce and a quarter.

Families frequently keep a few scrub hens around the place as scavengers, getting the few eggs they can and raising a few chicks to spread a feast for a visiting relative or friend. When we speak of incubators of 50,000 eggs capacity, the farmers of India stand aghast. Even a 50-egg machine will attract large crowds at an exhibition. The idea of shipping baby chicks is entirely unknown.

The Fighting Cock

Traveling to the villages of India, one is certain to see the proverbial fighting cock. How carefully they are groomed and fed! The owners of these birds take them to the weekly shandy—village market where a dozen or more villagers gather—and one of the favorite sports of the day is the cock fight. If the fight is one to test the endurance of the birds, they may continue for hours and hours. The endurance of the fighting cock is marvelous indeed. Very frequently the contest is designed to be a fight to a finish. In addition to the well developed spurs of the gentlemen, small knives are also tied to the legs of the birds to facilitate them in their destructive work. The birds are carefully fed and trained for these contests and are even given a good drink of toddy—intoxicating drink—to instill more courage and fight into them. The villagers of India cannot afford to maintain the English racing sport or the American baseball game. Nor have they $20.00 to buy ringside seats

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DIET vs. DRUGS

By C. T. Gregory

Purdue University

WHY pamper the weak corn plant? It can never be anything but weak and its children, the corn kernels, will almost unfailingly continue its weakness. Plant this weak seed, give it good growing conditions, and it will survive. But, let the weather be adverse, let the soil be low in fertility, and almost invariably it will succumb.

Pick the seed corn in the field from plants that have produced well matured, well filled ears. Such plants show that they have found the diet to their liking.

Treat this seed with one of the organic mercury compounds and it will almost as invariably live. By the treatment we seem to throw about the little seedling a zone of disinfected soil in which the death-dealing fungi or bacteria cannot survive. The pampered seedling, once established, usually grows and may produce an ear, but in any event it will produce pollen. Therein lies the greatest danger of subsequent trouble.

Pollen of any plant carries within it the characters of weakness or of strength lying within the plant. The pollen of the pampered weak plant carries the inherent weakness of the plant that made seed treatment necessary. It spreads this fatal fault to many of the surrounding plants, and then the farmer wonders why his corn does not improve. He fears it is running out and hunts a new strain. This is one danger of treating poor seed corn that is not immediately apparent and which may be lost sight of in our enthusiasm over the increased yield.

Mother Nature places many troubles in the path of the little plant in the form of low temperatures, excess moisture, parastic fungi and bacteria. Her's is the idea of the survival of the fittest. Why balk Mother Nature in her endeavor to rid herself of the weaklings? Why balk her with a man-made disinfectant that kills the fungous and bacterial enemies of the seedling corn plants? Far better to aid Mother Nature and pick seed from the strong plants in the field or test the seed corn and use none but the strong germinating seed.

It might seem from what I have said that I am utterly opposed to seed corn treatment but I do not oppose it. On the contrary I have encouraged Indiana farmers to use it, but, always after they have eliminated weak strains by testing or field selection. There is no question that during cold wet springs even the strong seedlings may suffer from over-exposure. Under such conditions it usually pays to treat, but good corn growers have frequently used the treatment and found it did little or no good. However, three or four cents an acre is a small premium to pay to insure the seedling against all chances of rotting.

A Disease of Weak Plants

All evidence shows that corn root rot is a disease of weak plants. Perhaps it is a misnomer to call these troubles root rot because it is not always only the roots that are rotted. Usually the stalk is rotted and frequently the shank of the ear. But, call it what you will, there exists a disease of corn that reduces the yield and greatly impairs the quality. Furthermore, all experimental evidence and the evidence of corn growers prove that it is a disease of weak plants. These same evidences also prove that the proper diet of the corn plant plays a leading role in the control of this root-stalk-shank-ear rot disease. Even the weak and ordinarily diseased strains can be made relatively healthy, better yielding, and better in quality if the proper diet is furnished.

The corn plant is becoming quite human in its need of a dietician to prescribe for its ailments. This situation demands the attention and should command the attention of extension agronomists and plant pathologists.

Corn diet means available fertility, and more than this, it means the proper balance of the different essential elements, nitrogen, phosphorus, and potassium. To help their patients, these corn dieticians must learn to read the symptoms in the corn plants. Moreover, they must learn to interpret their reading.

We know that nitrate deficiency is indicated by a yellowing, firing, and finally the death of the leaves. The characteristic of this firing is that it extends up the midrib and spreads outward over the leaf. The plants will often be stunted under conditions of serious nitrate deficiency or starvation. Furthermore, this trouble is liable to develop at almost any time in the growing season and is often called drought injury.

Potash deficiency is characterized by the firing of the margins of the leaf. In severe cases there is often a yellow striping of the leaves accompanied by stunting and severe burning that may be mistaken for nitrate starvation. The internal nodal tissues are also brown or rotted.

Phosphate deficiency appears as a stunting of the plants without leaf firing. Frequently, however, the margins of the leaf will turn purple. The internal nodal tissues are also brown or rotted.

Let's suppose for example that we examine a field and find decided symptoms of nitrate starvation. But suppose, too, in this same field that potash deficiency is just around the corner, so to speak, and is masked in its expression in the corn plant by the predominant nitrate deficiency. This is where the Hoffer stalk test will play its part.

Probably every specialist has heard of this test, and I will not describe it in detail. Let me merely say that the nitrate test, sulphuric acid and diphenylamine, will give a blue reaction in the presence of excess nitrates stored in internodal stalk tissues. The potash test, hydrochloric acid and potassium thiocyanate, will indicate the iron deposits in the internodal tissues when potash is deficient.

With this test at hand let us go

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Weed Killers

By L. R. Combs

Iowa State College

Inspecting the results of an application of sodium chlorate to quack grass.

MUCH interest is developing in Iowa and other Mid-western States in the use of chemical weed killers. This interest is due largely to two or three factors. The first of these is the development of chemical weed killers at experiment stations throughout the country and the second is the realization on the part of farmers of the seriousness of Canada thistle, quack grass, European bind weed, and other weeds.

In Iowa the interest has been increased by new weed laws which place the responsibility for weed eradication on county and township weed commissioners who have authority to go on premises, after the owner or tenant has been warned, and clean up noxious weeds.

Demonstrations in various counties of Iowa during the 1929 growing season showed the practicability of using chemical sprays to kill weeds. The only type of chemicals yet found which will effectively kill underground parts of weeds as well as the tops are the chlorates, according to R. H. Porter, extension plant pathologist at Iowa State College, Ames, Iowa. These chemicals are absorbed by the tops and carried to the roots.

Sodium chlorate is the one which has been tried the most extensively at Iowa State College. One pound per gallon of water is considered the best solution and the liquid is applied at the rate of 2½ to 5 quarts per square rod. Quack grass or Canada thistle may be sprayed any time after the plants are six to eight inches high until they begin to blossom. With a dense stand the most thorough job can be done when the plants are about six inches high.

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¶ E. V. McCOLLUM (right) is the subject of this article which is fourth in a series

By

Dr. A. S. Alexander

University of Wisconsin

The Inquiring Mind *and the* Seeing Eye

DR. E. V. McCOLLUM came to the Wisconsin Agricultural Experiment Station from Yale University in 1907. After I had studied the man day by day, talked with him many times, asked him difficult questions, gone to him for counsel, and watched the progress of his work for several years with keenest interest, I made this prediction:

"Mac and the *rat* are destined to revolutionize the world's knowledge of animal nutrition."

That prediction was more than verified. The marvelous discoveries of this plodding, persevering, self-sacrificing, conscientious, and eminently well-trained young chemist culminated not only in throwing the light of truth upon many previously puzzling problems of animal nutrition, but disclosed facts of paramount importance relative to the dieting of the human race.

> **Give unto me, made lowly wise,**
> **The spirit of self-sacrifice;**
> **The confidence of reason give;**
> **And in the light of truth,**
> **Thy Bondsman let me live.**
> *Wordsworth.*

Often, I met Dr. McCollum in the corridors of the Agricultural College or visited him in his laboratory. There he was surrounded by tier upon tier of cages, housing rats of all colors and sizes, and the atmosphere of the place sometimes suggested what Shakespeare called, "the rankest compound of villanous smell that ever offended nostril." As I noted the Doctor's tall, spare frame and sometimes tired and drawn face, from which beamed those great soulful, kindly eyes, I said to myself:

"If charity should begin at home, I think Mac had better completely feed himself; for evidently his brains are burning up his body."

I wondered, too, if ever there was another man so completely captivated by the lure of his entrancing, thoroughly organized and persistently pursued research work. Always, however, he was willing to cease his labors for a time and discuss with me some puzzling questions regarding azoturia and lymphangitis of the horse, rickets of the hog, and pregnancy disease of the ewe.

Dr. McCollum proved a veritable "walking dictionary" of information, wonderfully exact in the facts he had stored away in his marvelous memory yet, withal, simple, unassuming, and modest in his method of advancing his opinions and conclusions.

Is it any wonder that such a patient, persistent, and thorough scientist, perfectly prepared and equipped for his work, succeeded so well in his search for truth that he has been given recognition the world over and honored by many scientific societies?

Born on a Farm

Elmer Verner McCollum was born March 3, 1879, on a farm near Fort Scott, Kansas, and early became inured to hard work. At the age of seven he began milking cows and when 11 worked in the fields. A year later, when his father's health failed, he and his brother took entire charge of the farm work. Their herd numbered some 25 head, and the butter from the milk of these cows was the family's chief source of income.

At the age of 17, when he had attained the height of 6 feet and weighed 122 pounds, he was allowed, by special dispensation of the Prin-

Laboratory, showing Dr. McCollum and cages containing his sanitary rats.

cipal, to enter the high school at Lawrence. He worked his way through the four-year course, making a good record. Then he entered the University, took two years of pre-medical work, and then devoted his time and talents to organic chemistry, with which study he had become enthused.

After an additional year of post-graduate work, he entered Yale University, in the autumn of 1904 and received the degree of Doctor of Philosophy in 1906. While at Yale he earned his expenses by tutoring, and left the institution with $1,500 on hand.

From 1907 to 1917 he was a member of the faculty of the Wisconsin College of Agriculture, where his eminent work was done in collaboration with the noted chemist Professor E. B. Hart. Then he was appointed Professor of Biochemistry in the School of Hygiene and Public Health of Johns Hopkins University, Baltimore, Maryland. There, surrounded by multitudes of his beloved "sanitary rats," he is today working away as diligently and delightedly as ever, delving into the hidden mysteries of nutritional chemistry.

Dr. McCollum's reputation as a research worker has chiefly been earned by his discoveries relative to the varying values of fats in the nutrition of animals and man.

Dr. M. D. Munn, President of the National Dairy Council, stated in the *Dairy Farmer* that it took nearly five years of experimental work on innumerable combinations of diets before Dr. McCollum finally demonstrated that growth proceeded in young animals when butterfat was added to their ration, and that the same food mixture would not induce growth when lard, vegetable oils, and certain other fats and oils were used in place of butterfat.

This was the first definite scientific determination that butterfat contains some element of principal essential to growth, not found abundantly in any other food fat. He, therefore, concluded that there is some substance in butterfat which is not found in fats generally, and which is absolutely necessary for the promotion of growth and the proper maintenance of life in the young and adult animal. He also determined that the fat of egg yolk and that of the vital organs of animals produced a similar effect on growth.

"Vitamin A"

This growth-promoting element was given the title of "Fat-soluble Vitamin," or "Vitamin A." Its discovery was followed by many experiments demonstrating the supreme importance of milk in the diet of the human race. That fluid nutrient is now recognized and correctly valued as the chief and most readily available source of Vitamin A, through its butterfat, and is known further to contain other vitamins, a high quality protein and the mineral elements, calcium and phosphorus, which build up bones and form sound teeth in the young.

Dr. McCollum at the Wisconsin Station and shortly afterward Osborne and Mendel at the Connecticut Station, showed that rats failed to grow after being fed for three or four months on rations of purified nutrients which lacked fats. The addition of lard, commercial olive oil, or commercial cottonseed oil caused no improvement, but when butterfat, egg fat, or kidney fat was added, the diet was made complete and normal growth and reproduction resulted. What was lacking in the ration was not fat, but some substance soluble in fats and hence carried in the butterfat and egg fat. It is this mysterious element that is now known as Fat-soluble A, or Vitamin A, and for discovery of which Dr. McCollum is given chief credit.

Further investigations by Dr. McCollum and others have shown "that the cereals are generally poor in Vitamin A, with the exception that yellow corn contains enough of it for

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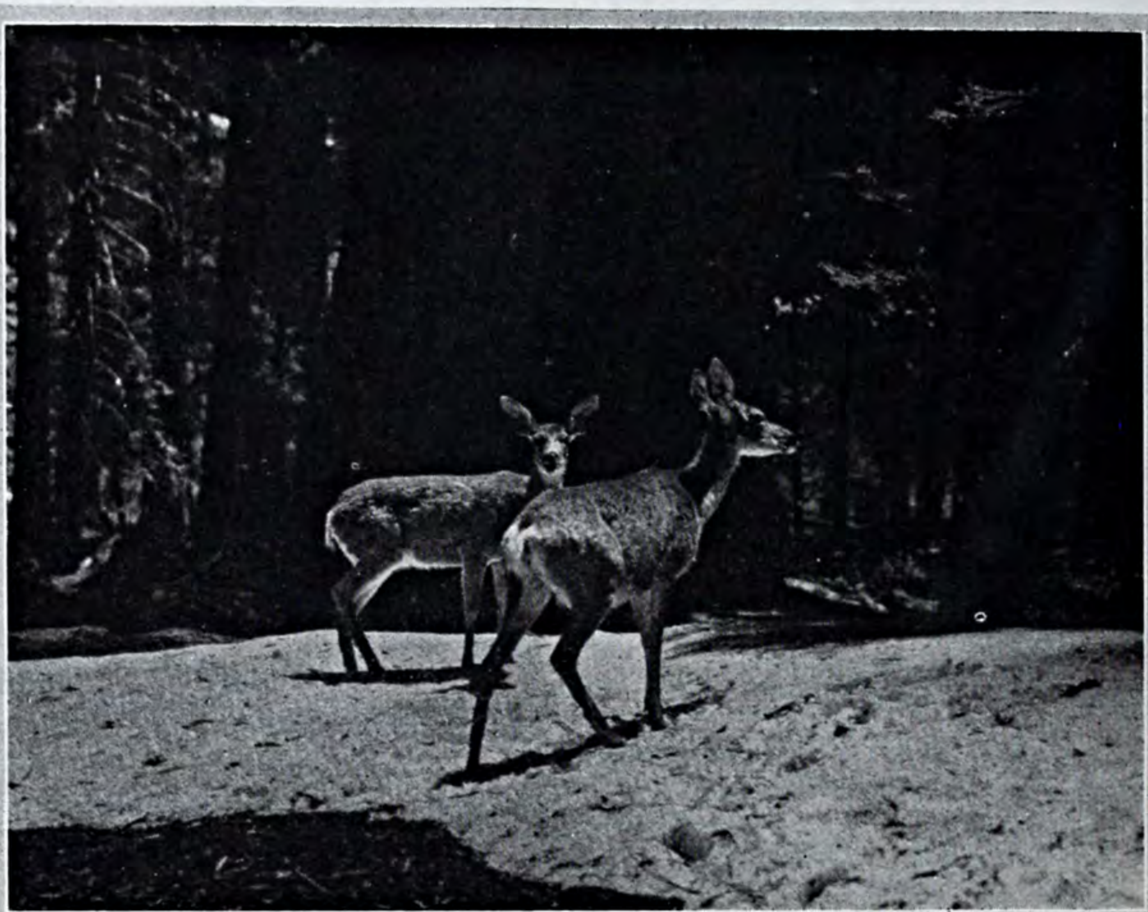
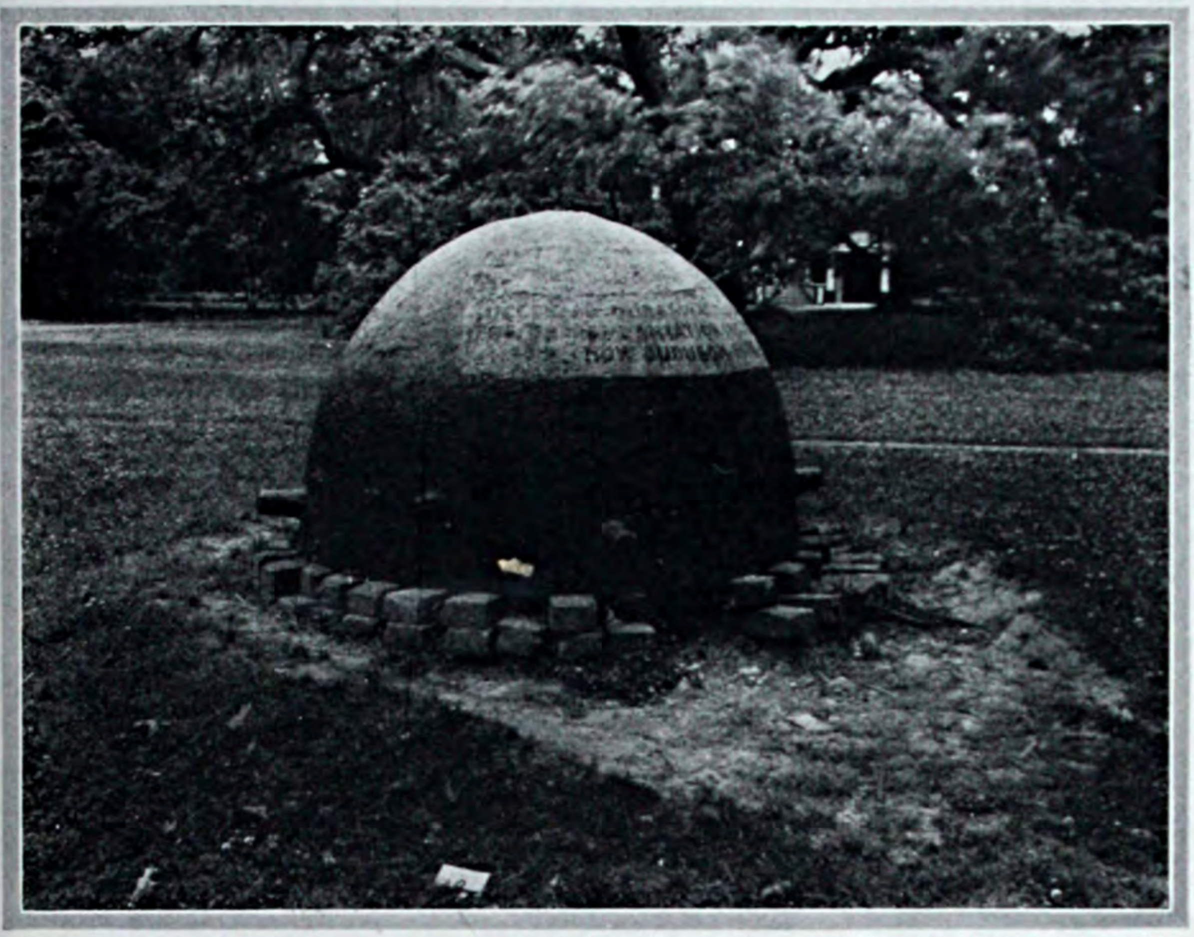
Ready for an argument.

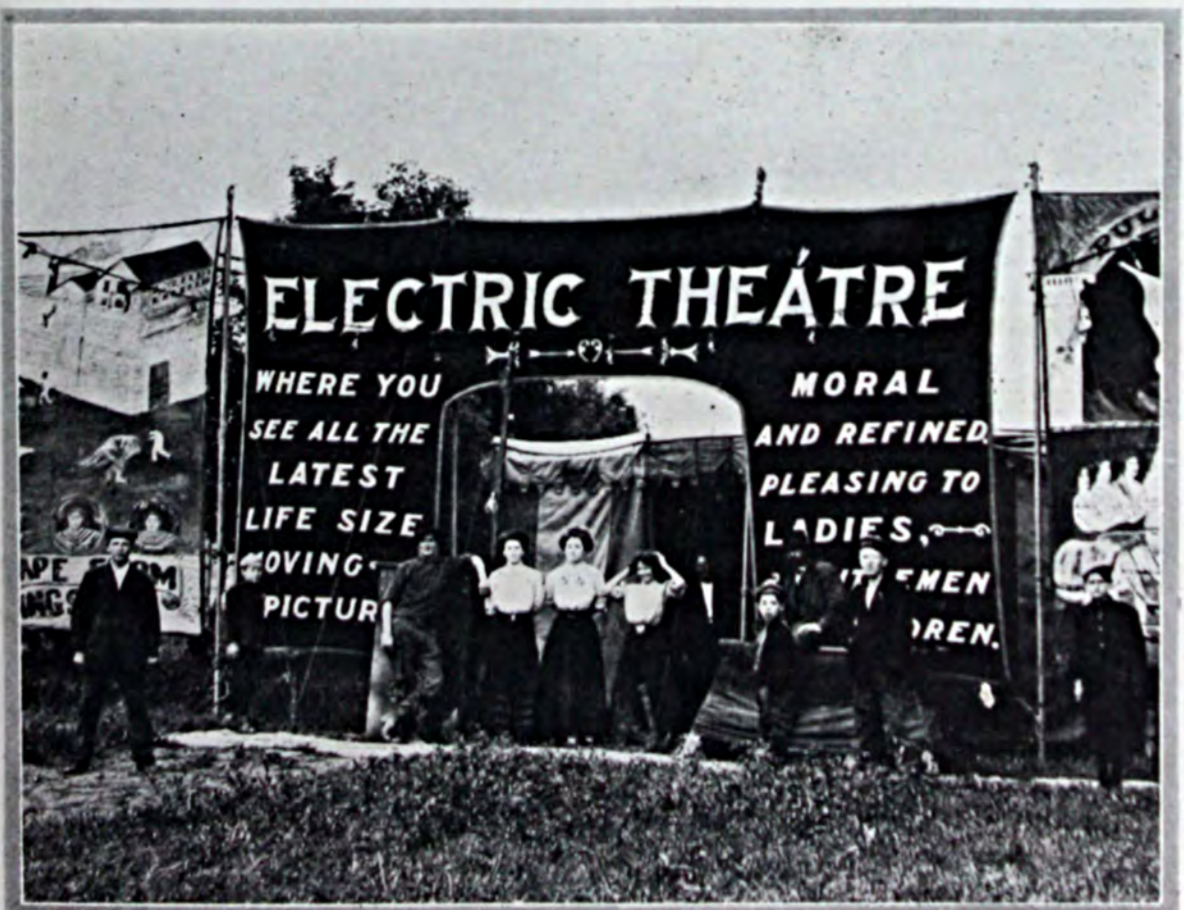
PICTORIAL



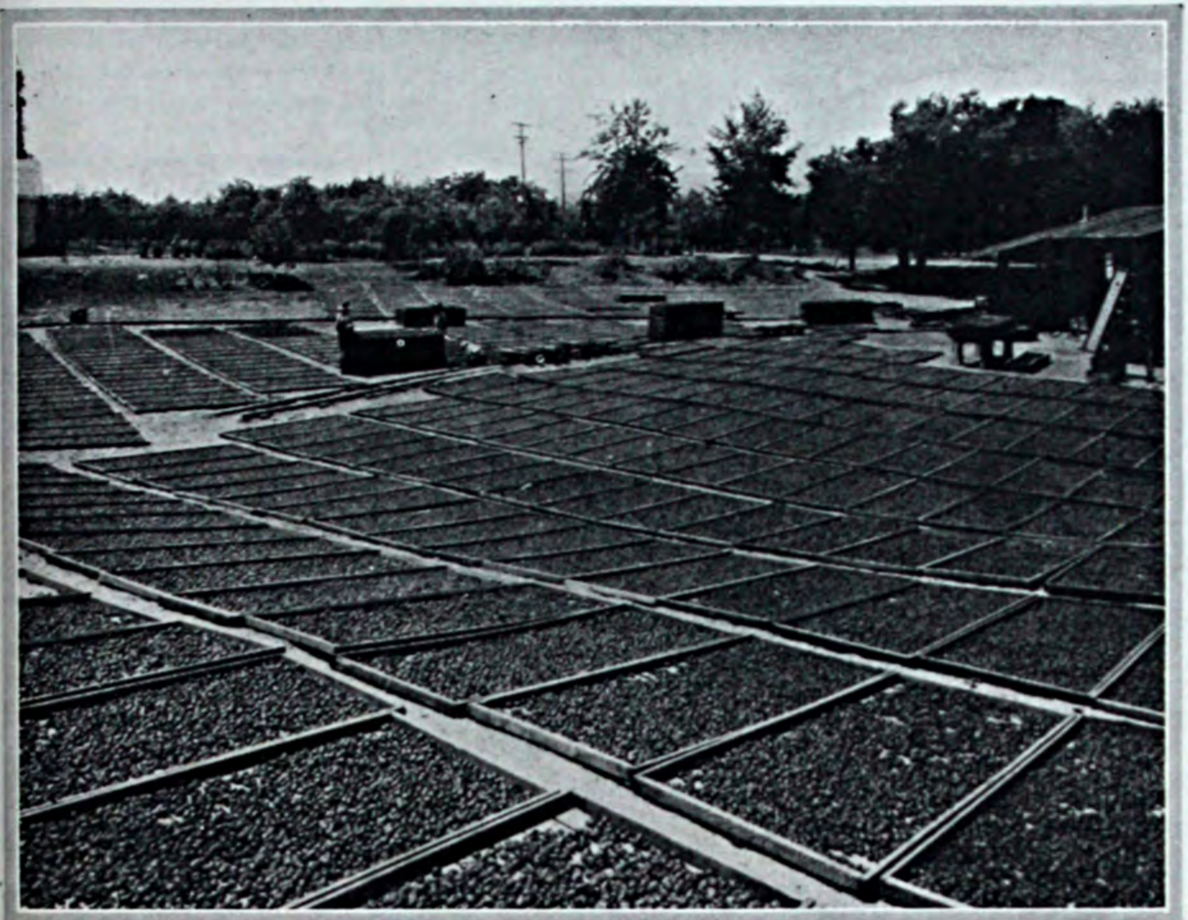
Above: Two mule deer in Sequoia National Park, California. Deer, bears, and many other wild animals in the California parks are becoming almost as blase to strangers and automobiles as a chow pup in a dogstore window. Below: Vacationing.



Above: Louisiana's first sugar bowl, the inscription of which reads "This is the kettle used by Etienne de Bore, the father of the sugar industry in Louisiana when he first succeeded in granulating sugar in 1795." Below: An old-time movie.



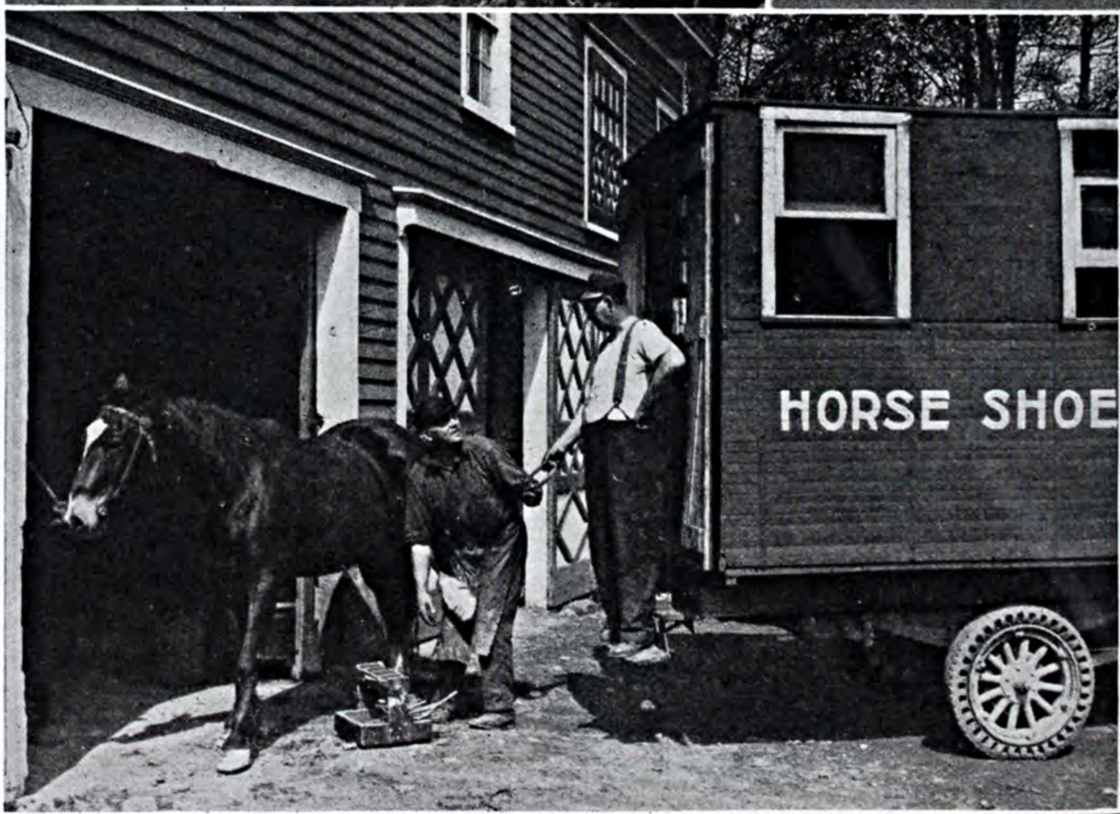
The main street of Lake Charles, La., as it was in 1887, above, and as it is today, below.



Above: Giving prunes the sunshine treatment in California. Below: Hay wagons in the big city—hauling hay in Greater New York.

This picture not only has rustic beauty, it shows a hastily constructed, but effective, irrigation ditch on the farm of T. J. Charles, Republic county, Kansas. The Charles farm of 480 acres is half bottom land and half second bottom lying between the Republican river and White Rock creek. Its owner had for a long time felt convinced that irrigation from either stream was possible. Last year with one of the worst drouths of the century in northern Kansas, Mr. Charles decided to put the theory to a test. With a four-inch centrifugal pump and a tractor for power, a crew of two men managed to irrigate about 50 acres of corn before drouth had ruined it. He estimated that for each hour the pump was run, an acre of corn was irrigated and 30 to 50 bushels of corn assured.

Below: In the old days you took your horse to the smithy. The modern blacksmith comes to your horse, hauling his entire shop on a truck.



The Editors Talk

The Effects of Declining Prices

There is considerable speculation as to how national prosperity will be affected by the downward trend of basic commodity prices should this decline continue.

That this is no mere academic question is well illustrated by a strike of most of the workers of one city last month. Due presumably to price reductions of a basic commodity produced in that city, a wage cut of $1 per day was proposed. Thus, lower prices often mean lower wages which may result in strikes. In this case the entire city was much happier when the difficulty was settled and everybody was back at work.

As one newspaper stated: "It is a dull summer at best but yesterday's experiences demonstrated that even a dull period is something far, far different from a complete suspension of business operations."

Will a continued decline in basic commodity prices be proportionately bad for the farmer? The answer is perhaps not. Although the prices of many agricultural products have declined with the general downward trend, a continuance of the trend may bring about a more drastic price cut for industrial products than for agricultural products. This would mean that 100 pounds of cotton, tobacco, corn, or other farm produce would acquire an increased purchasing power in industrial products.

If the general decline should continue, there is hope that it would produce a better balance between agriculture and industry, placing a higher relative value on farm produce. In recent years industry has been well off, while the farmer has suffered from relatively lower prices. Economists say that such a situation cannot continue indefinitely. Perhaps the change is just over the horizon.

The Need for Realists

Addressing the recent convention of the Canadian Society of Technical Agriculturists, Dr. G. F. Warren called attention to the fact that agriculture is now passing through a period of change, the significance of which is far greater than that of the industrial revolution.

Although we are still too close to these changes to judge their real import, it is vitally necessary to ferret out all obtainable facts. It is up to us to study industrial and social causes and effects regardless of whether our findings will be pleasing or displeasing to our businesses and ourselves.

The optimist does not deem this the correct method. He is not always keen about facing facts, but prefers to will things by his optimistic attitude of persistent talk, apparently hoping to eventually bring about the desired condition of affairs.

The optimistic attitude undoubtedly has some good points; however, business should not be run on an emotional basis. Amalgamations of banks and even governments cannot permanently control or alter the effects of fundamental economic changes. How then can mere talk effectively control such conditions?

These days of change need realists, who sound all available sources to find facts and face these facts courageously, making adjustments accordingly. This does not mean that we must sit still and accept a calamity. However if a storm is coming it is best to know this with ample time to reach the cyclone cellar. In the last analysis it simply means that we must see things as they are and be honest with ourselves.

How's Your Calcium?

Our pages are full of problems concerning the best diets for plants. As a matter of variation, now comes an item of interest in human diet.

Lack of calcium, according to Dr. Walter Timme of the Neurological Institute, New York City, in many cases is responsible for crossness, tiredness, misbehavior, and other symptoms of problem cases, both child and adult. But whether this lack of calcium in the blood can be overcome by increasing the quantities of milk, fresh fruits, vegetables, and cereals eaten, Dr. Timme has not said.

The supply of calcium to the blood is controlled by the tiny parathyroid glands in the neck, scientists now believe. When these glands reduce the supply of calcium there is apparently a disturbing effect on the nerves and subsequent conduct of the individual who then misbehaves, showing inordinate fatigability, irritability of temper, and even incorrigibility.

"How's your calcium" may be the "retort courteous" to the man in temper. Offer him a glass of milk and see what happens.

Taxation

The total of funds raised by taxation is increasing every year, making of taxation a more and more serious problem. We are seeing a great deal on the subject in the press and we hear it talked at every turn. Rightly so, for taxation is something which affects all of us and particularly our American farmers.

In the early history of the country when the largest part of our population lived on farms, the land a man owned was a relatively good measure of his wealth. Under such a system a general property tax was a fairly just tax. The situation has changed and at the present time the land a person owns is no fair index to his wealth. In fact with the great congregation of people in cities, the general property tax has become worse than useless. It has proved an actual hardship on our rural communities.

The underlying principle in taxation is to make the man who has the most pay the most. The income tax was a step in this direction. However in many parts of the United States, the property tax is still a very important part of the revenue collected. In some sections where this exists some classes are very heavily, while others are very lightly, taxed.

When our population was not so mobile, in general as young people finished the schools in the community, they settled in the same community. However, the rapid movement to the city means that the country school system is educating a large part of our urban population. This works an injustice on rural people.

Another example for instance is the local flour mill and other local industries that were taxed for the support of the community. Nowadays a good deal of the trend of industrial growth has been toward concentration of industries in large centers, as large milling and baking industries which have replaced the local plants in their service to the rural communities.

It used to be fair to have roads supported by local taxation. Recent studies indicate that of the vehicles on State roads only a very small proportion are owned within the township, a somewhat larger proportion are owned in the county, but the largest part of the travel is done by vehicles outside of the county. This means that for road support the local community is not a large enough unit and should not be taxed so highly for road upkeep.

There are many proposed solutions for the taxation problem from as many eager students of the problem. Income taxes, inheritance taxes, the proper allocation of State and Federal taxes, and many other propositions have been considered for the adjustment of what is generally conceded the abuse of the general property tax. Certainly something must be done and the subject deserves active thought on the part of every voter sending representatives into law-making positions.

Fertilizers in the Pacific Northwest

The cotton, potato, tobacco, and other intensive agricultural areas of the East are often spoken of as the fertilizer territory of the Nation. Hence, the catch phrase: "As goes the cotton price, so goes the fertilizer tonnage." These areas are of undoubted importance and without them the fertilizer industry would not be what it is today. However, if the industry is to attain a profitable degree of stabilization, it must face the big job of extending the use of fertilizers over a larger territory, into states which now may be small consumers.

This fact attaches added importance to the growing interest in the use of fertilizers in the Pacific Northwest, due to the adoption of more intensive agricultural programs in that section. The States of Washington, Oregon, Idaho, and Montana comprise a huge empire served by a varied, but in spots intensive, agriculture.

What is more intensive than the production of apples in the Wenatchee Valley of Washington? Land in bearing orchards is worth $1500 and more per acre. The acre investment in equipment and irrigation systems is large and permanent. In the production of quality fruit for distant markets, growers cannot afford to risk poor crops. Laid out in these orchards are many experimental plots to study the effect of complete fertilization. These plots will do much to properly direct the increasing use of fertilizers.

In the vast wheat fields of eastern Washington where nitrogen is a limiting factor, the profitableness of commercial nitrogen is being studied. Fertilizer interest is increasing in the coastal berry and trucking districts, as well as in the intensive areas of Oregon.

Although not much fertilizer is used at present in eastern Washington and Oregon and in Idaho, Colorado, and Montana, leaders both in the trade and in experimental work are giving much attention to intensive study of the question of its use. Thus, the use of commercial plant food will gradually spread inland from the coast.

This vast area of the Pacific Northwest presents an abundance of problems—a great variety of soils, crops, and climatic conditions—a far greater variation than exists in the older eastern fertilizer areas. There is need for much work to be done and the workers are all too few. In this spread of the use of fertilizers, the fertilizer men of the Pacific Northwest through their association and the experimental workers in their respective fields are to be congratulated on the efforts they are making to solve some of the problems.

The Price of Fertilizer

During the period from 1880 to 1900 there was a downward trend in the retail price of complete fertilizer. During that period the fertilizer tonnage in the United States approximately doubled,—that is, with the declining prices there was an increase in fertilizer consumption.

During the period 1900-1914 the average retail price of complete fertilizer per ton remained approximately constant. The fertilizer tonnage of the United States was approximately quadrupled during this period.

During the earlier period farm prices as well as fertilizer prices declined. In the latter period fertilizer prices remained constant and farm prices rose. This seems to indicate that the fluctuation in fertilizer tonnage has been influenced more by changes in demand for fertilizer than by changes in the price of fertilizers.

We hear about the price of fertilizer being so high that the farmer cannot afford to use it. According to the statistics above the old law of supply and demand works just as much in the fertilizer trade as it does in any other business.

The Success Habit

Old mother cat knows her kittens and what life demands of them if they escape drowning at the hands of the cat's proprietor. So she teaches them how to be successful mousers.

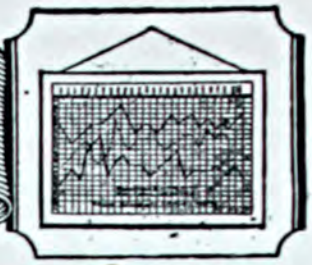
She brings in dead mice for the kittens to practice on. The catlets growl and pounce and stick their teeth into the dead mice with great courage and gusto. In their first fight they come off victors. Which is just what mother cat wants. She wants them to think success, to feel confidence, to fear no mouse.

In our next catchapter the parent brings back not dead mice but disabled mice, so the kittens will have a little, but not too much, resistance. And finally she brings back strong healthy micies for the kittens to try on their piano. By this time the kittens are habituated to success.

Foxes and dogs train their juveniles by the same process; and a puppy untrained is apt to get so badly bitten in its first battle with a rat that forever after all rats look ten times bigger than they are.

Men are like that. They need two or three successes in order to get the success habit and the courage to try.—*Wisconsin Horticulture.*

AGRICULTURAL DEVELOPMENTS



Citrus Culture

IN the new Bulletin 33 of the Porto Rico Experiment Station is given a most interesting treatise on the cultivation and fertilization of citrus fruits. The author, Mr. H. C. Hendricksen, states that fertilization practices prevailing in the Island are not consistently satisfactory or economical. The lack of uniformity in analyses used, the quantity applied, and the time of application have prompted the Experiment Station to investigate critically these aspects of citrus fruit fertilization. Based on a very exhaustive study of this subject, the author makes the following suggestions:

Instead of heavy application of any fertilizer all at once, it is more economical to use specific analyses high or low in nitrogen and potash at at least three different periods. He recommends that 10 pounds per tree of a 6-4-4 analysis be applied in early December and that 10 pounds of a 4-6-6 analysis per tree be applied in March and that a third application of 10 pounds per tree of a 2-6-10 fertilizer be applied in June.

The aim of fertilizaton with this crop, he states, is to mature as early as possible and to attain a high stage of dormancy by early December. This objective is accomplished by the use of a high nitrogen—low potash analysis in December and a low nitrogen—high potash analysis in June.—*E. N. Bressman.*

FORTY-FIVE MINUTES PER ACRE

When wheat was harvested with a sickle and threshed with a flail, from 35 to 50 hours of labor were required for harvesting and threshing an acre with a yield of 15 bushels, according to some figuring done by the United States Department of Agriculture. The introduction of the cradle saved about 10 hours per acre. At present farmers in the Great Plains use from 4 to 5 hours in harvesting an acre of wheat with a binder and threshing from the shock with a stationary thresher; from three to four hours when the crop is harvested with a header and threshed with a stationary thresher; and an average of three-fourths of an hour when the combined harvester-thresher is used.

PASTURE FERTILIZATION IN HOLLAND

The Director of the Department of Agriculture for the province of Manche, northern France, Mr. M. Vezin, reports on a trip through Holland and draws a comparison between the Province of Friesia, East Holland, and his district.

The latter produces 1,620,000 gallons of milk annually. Friesia, on the other hand, produces 2,430,000 gallons. This is due to the great care that is given to pastures, to the selection of animals, to the methods of feeding being used, and to cooperative efforts.

The pastures, just like other crops, are kept in the best of condition. Weeds simply do not exist. The usual application of fertilizers is 53.5 lbs. nitrogen, 110 lbs. phosphoric acid, and 220 lbs. pure potash per acre, which corresponds to 710 lbs. of basic slag (16 per cent) and 440 lbs. muriate of potash given during the winter, and 270 lbs. nitrate of soda and sulfate of ammonia in different applications during spring and summer.

It is easily understood that the growth on the pastures is very vigorous and that 30 cows can be kept in excellent condition and in a very high productive stage on a 74-acre farm. —"Le Phosphate et les Engrais Chimiques," November 15, 1929.

THE ICE CREAM INDUSTRY

It takes the milk of 1,300,000 cows to make the ice cream eaten in this country in a year. There are about 4,000 ice cream factories and they turn out approximately 350,000,000 gallons of ice cream annually.

CANADIAN PASTURES

It is becoming more and more apparent that the judicious use of fertilizers as top-dressing on pasture lands is likely to be quite profitable.

Basing their suggestions on the results of cooperative pasture fertilizing tests conducted last year and upon results obtained in other parts of America and in Europe, the Department of Chemistry at the Ontario Agricultural College recommends the top-dressing of pastures with 300 to 500 lbs. per acre of 3-10-5 or 4-8-6 fertilizer, or with 300 lbs. 0-12-8 or 0-14-6, followed by a second top-dressing, about 10 days later, of 200 lbs. soluble nitrogen salts.

Pastures on sandy or gravelly loam soils benefit materially from fertilizers fairly high in potash. This is especially true where much alfalfa is found in the pasture. High potash fertilizers always increase the per cent of clover in the pasture, while phosphoric acid invigorates the root growth of pasture grasses and legumes.

The fertilizer should be broadcast evenly on the pasture field soon after growth has started in the spring, and preferably after the dew has dried off the grass and clover. In many instances, good results have been obtained by harrowing the pasture, where possible, after fertilizing it. The best results will be realized where the pasture is well drained and where the soil is sweet.—*News Bulletin No. 45, Ontario Agricultural College, Guelph, Ontario.*

THE PRIESTLY SWEET

One of the most valuable new Jersey types of sweet potatoes is the Priestly which was originated in New Jersey as a mutation or "sport." This new variety is a valuable one in nearly all northern growing sections because of quality and yielding ability. In both New Jersey and Iowa it has given remarkable results.

Hal C. Wolford of Conesville, Iowa, one of the largest sweet potato growers in that State, is enthusiastic about the Priestly variety. He says:

"The Priestly has a tendency to produce tubers of desirable shape when grown on heavy soils, where many of the standard varieties produce heavy vine growth with few potatoes of desirable market quality. It also is a long keeper. Retailers and jobbers suffer heavy losses on account of the rapidity with which sweet potatoes decay after being removed from winter storage. A test including eight standard varieties taken out of storage, subjected to various conditions and temperatures, discloses the fact that Priestleys were the last to decay.

"It now appears that the Priestly is the best strain for northern sections where the crop is sold in markets preferring the Yellow Jersey type. This is especially true for Iowa, which uses around 1,000 cars of sweet potatoes annually and produces around 100 cars, or less than 10 per cent of the amount consumed, and where the soil is inclined to be too heavy rather than too light for profitable sweet potato production."—*E. N. B.*

Canada exports over $70 worth of agricultural products per head of population, or products with a total value of $700,000,000.

Foreign and International Agriculture

Feathered Missionaries

(*From page* 24)

A satisfactory poultry house built by a group of vocational boys. The walls are of sun-baked bricks. The wire front and door admit light and air. The roofing thatch is readily available. All these materials, except the poultry wire, can be obtained in any village in South India.

at a pugilist fight. Man's inherent lust for blood is satisfied by the cock fight. Even a heavyweight prize fight often lacks the action and excitement that a good pair of cocks can stage. Thousands of rupees are won and lost in this betting sport.

The lure of the cock fight often stands in the way of poultry reform. Movements are on foot by Government and Missionary agencies to eliminate all the native cocks from a village and restock them with pure breeds from imported stock. Those who follow the fighting game are as loath to give up their prize birds as the New York Yankees would be to sell off Babe Ruth, their prize attraction. Nor do they usually care to trouble themselves to the extent of keeping their gaming pet confined. The result is that such a bird not only continues to perpetuate his kind but also makes life pretty miserable for the more docile, domesticated bird whose breeding has been for the egg basket rather than for the prize fight ring.

In the large cities like Madras, Bombay or Calcutta, there is a sizeable poultry and egg market, but this influence hardly reaches to the thousands of interior villages. The majority of village people who keep a few fowls do so to provide a feast for a visiting relative or friend. Such village fowls are kept in a most haphazardly fashion. Kites and crows carry off eight of the ten chicks hatched. Those that do survive this natural selection process, become the village scavengers and make their living in that way.

Eggs as an article of food are not yet very widely appreciated in India.

Need Salesmanship

A difficulty in the way of persuading the people of India to get the American habit of "an egg a day" is the fact that the orthodox Hindu is a vegetarian. It takes a lot of persuasion to convince some of these gentlemen that an unfertilized egg would meet the most religious views very acceptably because such "hen fruit" contain absolutely no spark of life. The majority of eggs that are today being used in India are eaten by the Mohammedans and low caste Hindus who really are outside the pale of religious observances. These two classes represent a population of 66 and 60 millions respectively who would be able to consume a goodly number of eggs irrespective of the religious views of the Hindu.

But they also need something of the high powered salesman idea to get them to appreciate the value of eggs in the diet. We are happy to say, however, that changes are coming over India very rapidly, and the attitude toward the lowly hen too is changing along with many other reforms. When the lowly one and a quarter ounce native hen egg matures to the size and quality of the American U. S. Special, it may be more easy to convince people of the desirability of egg consumption.

Poultry enthusiasts are banking heavily on the virtues of cross breeding for the rapid development of the Indian fowl. It is hoped that the prepotency of the Western birds will transmit the desired egg laying propensities while the disease resistance of the Indian fowl may be carried over from the dam's side. Through many years of natural selection,a great deal of disease resistance has been built up in the native fowl, kept as it is under very crude, unsanitary conditions.

It is very doubtful whether the imported, highly bred Western fowl would be able to live under such conditions. The cross bred bird, however, has already demonstrated its value in this respect. Several breeding stations are springing up where splendid pure bred cockerels can be purchased. The improvement over the mongrel is at once very striking. The egg size at once rises at least half an ounce and the egg production is doubled. The offspring too are of a uniform color inherited through the prepotent male bird. Caponizing is recommended for the half bred cockerels.

The breeds that seem to do best in India are the White Leghorn, Rhode Island Red and the Black Minorca, in order of importance. The climate seems to have a degenerating effect so that fresh importations must be made every third or fourth year to maintain the standard. This naturally will be expensive until a more or less indigenous breed may be developed. There is ample room for interesting research work along this line.

India is credited with being the original home of the fowl and as such will doubtless again develop this industry in time to make a real contribution to the feathered world. The climate of South India, never falling below 65 degrees, naturally eliminates many of the western troubles and expense of housing. Even the imported fowls seem to thrive under the sweltering heat of summer, rising to 110 degrees.

There are many unique difficulties as well, for example, snakes, mongooses, crows, kites, petty thieving, diseases and lack of marketing facilities. These will doubtless be overcome in time and India will be on the map supplying a goodly share of the egg demand.

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

One of the chief difficulties encountered in the use of commercial fertilizers is the application of fertilizer materials uniformly and at the desired rate of application. This difficulty is largely mechanical. Little or no data were available on comparative drilling qualities of fertilizers or the factors affecting these properties. Fertilizer distributors in this country were designed for the handling of low grade fertilizers. The present trend toward use of more concentrated fertilizers is rapidly making present day machines obsolete. Realizing this condition, the United States Department of Agriculture has quietly conducted investigations with numerous distributors and a variety of fertilizer materials both low grade and concentrated. Results of their findings were recently published in Technical Bulletin 182, United States Department of Agriculture, entitled "Factors Affecting the Mechanical Application of Fertilizers to the Soil." This bulletin is a valuable contribution to our knowledge of fertilizer machinery and drillability of fertilizers.

Soils

"Success With Sandy Soils" (Wisconsin Agricultural Experiment Station, Bulletin No. 416,) largely concerns correct soil management. A. R. Albert and A. R. Whitson very thoroughly discuss the various phases of the proper management of this class of soils, important not only in Wisconsin, but also in many other parts of the country. It is clearly brought out that leguminous green manures, properly fertilized, and liming are the basis on which the sand farmer must work. The authors very logically explain that a green manure crop, in order to be of greatest benefit to the soil, must be well fertilized with potash and phosphoric acid. They point out, that the use of a fertilizer ratio high in potash is very necessary in this type of farming, owing to the fact that legumes require large amounts of potash, while sandy soils are usually very poor in this nutrient.

The control of sand blowing; soil moisture; proper rotations; tillage; adapted crops and their fertilization are all thoroughly discussed by the authors in this publication. Anybody having to deal with sandy soils, certainly will find this bulletin to be a valuable hand-book, and the principles contained therein pertain not only to Wisconsin but to almost any part of the country with sandy soils.

"Soil Sterilization," Univ. of Fla., Agr. Exp. Sta., Gainesville, Florida, Press Bul. 423, *Apr.,* 1930.

"Macon County Soils," Univ. of Ill., Agr. Exp. Sta., Urbana, Illinois, Soil Report No. 45, *Dec.,* 1929.

"Factors Influencing Runoff and Soil Erosion," Agr. Exp. Sta., College Station, Texas, Bul. 411, *Mar.,* 1930.

Crops

Of particular interest this month is Bulletin 344, "Growing Potatoes in Illinois" by the Illinois Agricultural Experiment Station. Although Illinois is not an ideal potato-growing State, it is pointed out that with improved cultural practices, including selection of seed, disease and insect control, proper cultivation and careful attention to the proper use of balanced fertilizers, a large proportion of potatoes consumed in the State could be profitably grown.

Extensive experimental work has revealed a great variation in the soil requirements for fertlizing elements on the principal soil types. Barnyard manure has consistently given the largest increases and money return of any fertilizer treatment. Sandy, peaty, and clay soils low in active organic matter are known to be deficient in potash, and on such soils is recommended. Because the potato crop is a heavy feeder and must grow rapidly and mature before hot weather, commercial fertilizer is quite generally being recommended and used. The proportion in which the three essential plant foods should be used varies with different soils. The state authorities recommend 500 pounds per acre in the row, or 1,000 pounds per acre broadcast of 3-18-9 for dark colored silt or clay loam; 3-15-12 for light colored soils and 3-9-18 for sandy soils.

"Experiments with Legumes in Alabama," Agr. Exp. Sta., Auburn, Ala., Bul. 232, May, 1930, R. Y. Bailey, J. T. Williamson, J. F. Duggar.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Calif., Vol. XIX, No. 5, May, 1930.

"The California Avocado Industry," Univ. of Cal., Berkeley, Cal., Agr. Ext. Service Cir. 43, Apr., 1930, Robert W. Hodgson.

"Growing Early Cabbage," Conn. Agr. College, Ext. Service, Storrs, Conn., Ext. Bul. 148, April, 1930, Albert E. Wilkinson.

"Vocational Agriculture in Florida," Dept. of Agr., Tallahassee, Fla., Quar. Bul. Vol. 40, No. 2, Apr., 1930, Nathan Mayo, Commissioner of Agr.

"Mushrooms and Their Culture," Univ. of Fla., Agr. Exp. Sta., Gainesville, Fla., Press Bul. 425, Apr., 1930, George F. Weber.

"Louisiana Corn Varieties," La. State Univ., A. and M. College, Agr. Exp. Stas., Baton Rouge, La., La. Bul. 210, Feb., 1930, H. B. Brown.

"Pasture and Forage Crops for Louisiana," Div. of Agr. Ext., La. State Univ. and A. and M. College, Baton Rouge, La., Ext. Cir. 140, Apr., 1930, R. A. Wasson.

Annual Report for the Fiscal Year Ending Nov. 30, 1929, Agr. Exp. Sta., Amherst, Mass., Bul. 260, March, 1930.

Fifty-second Annual Report of the North Carolina Agricultural Experiment Station, for the fiscal year ended, June 30, 1929, Agr. Exp. Sta., State College Station, Raleigh, N. C.

"Planting Rates for Early Varieties of Corn," Agr. Exp. Sta., N. D. Agr. College, Fargo, North Dakota, Cir. 43, May, 1930, P. J. Olson.

"Varieties of Apples for Pennsylvania," Pa. State College, School of Agr. and Exp. Sta., State College, Pa., Bul. 253, Apr., 1930, F. N. Fagan and R. H. Sudds.

"Pasture Crops for Swine," Pa. State College, School of Agr. and Exp. Sta., State College, Pa., Bul. 254, May, 1930, Mark A. McCarty and M. F. Grimes.

Forty-second Annual Report 1929, Texas Agr. Exp. Sta., College Station, Texas.

"Abstracts of Bulletins 393-404 and Circulars 53-54," Texas Agr. Exp. Sta., College Station, Texas, Cir. 56, Dec., 1929, A. D. Jackson.

"Berry Cultivation in Western Washington," State Coll. of Wash., Western Wash. Exp. Sta., Puyallup, Wash., No. 16-W. New Series, Apr., 1930, H. D. Locklin.

"Sour Cherry Fruiting," Agr. Exp. Sta., Madison, Wisconsin, Bul. 415, May, 1930, R. H. Roberts.

Economics

Virginia ranked first among other states in the production of early potatoes and in the shipment of sweet potatoes in 1929; second in the production of spinach and in shipments of apples; third in the production of tobacco and of peanuts; and fourth in the production of cabbage. The estimated gross farm income from crops, forest products, livestock and livestock products was $216,873,000, compared with $220,122,000 in 1928 and $226,136,000 in 1927.

These facts are presented in "Virginia Farm Statistics, 1929" which has been compiled jointly by the Bureau of Agricultural Economics of the United States Department of Agriculture and the Division of Agricultural Statistics of the Virginia Department of Agriculture. The bulletin is published as Number 7 of the latter department. Data are included on acreage, yield, production, and value of

(*Turn to Page 52*)

Northwestern Peat Soils

An abstract by W. L. Powers

Oregon State College

FOUR different types of peaty soils have been recognized in the Northwest. A profile sample of the soils studied are:

1. Tule and sedge peat from Klamath marshes located in an elevated semi-arid region and having slightly alkaline reaction. The substratum to ten feet down is collodial, diatomaecious, siliceous muck.

2. Woody-sedge peat (a) from Lake Labish and (b) from Wapato Lake in the subhumid Willamette Valley, with a marshy substratum and faintly acid reaction in the upper horizons. (c) Soil from Coquile Valley and (d) from Sandpoint, Idaho, were examined and correlated with this group.

3. Sedgy, acid, muck from near Clatskanie in the lower Columbia river bottom.

4. The fourth kind of peat is brown, acid soil from the coast near Astoria, formed from sphagnum moss and woody matter including slowly decaying spruce wood. The substratum is silty clay loam. A profile sample of raw sphagnum peat from Cottage Lake near Seattle has been analyzed and grouped with this kind of peat.

Earlier fusion and strong acid analyses show these soils are usually high in nitrogen and sulphur and low in potash.

Nearly all these soils contain contributions of mineral material. Volatile matter in the surface layers is found to be fifty to ninety per cent. Reaction values were determined by the use of 1:5 suspensions using the hydrogen electrode.

The net amount of bases, (Ca and Mg) extractable with tenth normal barium chloride is low except with a subsoil overlying the calcareous or marly substratum. The amount of bases so extracted seem to decrease as organic content increases, indicating that material so held in nearly pure peat is very limited and the degree of saturation with bases low. Little data from other investigations are to be found for comparison in this regard.

Water soluble nutrients were determined using five parts of water to one of air dry soil (Seattle soil 10:1) and reported in per cent dry weight. Analyses were made of samples representing each group from fallow pots treated as were triplicate parallel series of two gallon pots employed in planthouse fertilizer trials. Nine to twelve treatments were used, making three to four dozen pots of each kind of peat.

Water soluble potassium in untreated soils from these areas is limited, especially in case of Klamath and of sphagnum peat. All three soils show an increase in water soluble potassium six weeks after treatments with potassic salts, barnyard manure, or calcium carbonate, or a combination containing one or more of these. Analyses repeated after six months using Lake Labish soils showed a general increase in water soluble constituents from incubation in the planthouse in an uncropped condition.

Oats, mint, potatoes, flax and clover have been grown in fertilizer trials with the four kinds of peat in two gallon pots and or on field fertilizer plots. Potassic salts and other treatments mentioned which have increased water soluble potassium generally result in increased yields. Full efficiency of potassic salts was not obtained except in the presence of a fair supply of nitrate.

Trials indicate that potassium sulfate will give slightly larger yields and a higher quality of product than potassium chloride.

The length, strength and yield of flax fibre has been markedly increased through the use of potassic fertilizers using Lake Labish soil. In one case the fibre yield was trebled. Cooking quality and dry matter content was highest with potatoes grown with the aid of potassium sulfate and a large number of pressure tests with automatically registering equipment clearly indicates the potatoes from this lot were slightly firmer as judged by two seasons results.

The study is being continued and effect of imperfect drainage, liming and soil inoculation are projected, in which the Department of Bacteriology is cooperating in measurements of carbon dioxide evolved and in studying the microorganic activity as effecting the soil solutions of these peat soils.

Drainage and usually supplemental irrigation are desirable for moisture control in these soils.

The marly substratum and well decomposed condition of Lake Labish peat and the mineral fraction explain in part its established productiveness, while the low concentration of potassium indicates increased use of the same. The raw brown woody acid peat is suited for production of grasses and cranberries and with lime, manure and potassic fertilizer may be used for truck crops.

Klamath marshes with deep drainage and supplemental irrigation are mainly suitable for forage crops. In time such hardy vegetables as the climate will permit and the market require, may be grown thereon.

Michigan Pastures

By A. J. Patch

East Lansing, Mich.

METHODS of handling pasture lands which more than double the amount of feed produced per acre are indicated in the experimental field trials carried on during the past two years by the soils department of Michigan State College. Amounts and kinds of fertilizers, lime, and plowing and reseeding were tested on blue grass pastures in 1928 and 1929.

All three methods of increasing the growth of grass in the pastures were effective. Most of the experiments were conducted on fields where the soil was a fairly fertile loam with a clay sub-soil. One trial made on hilly, sandy land showed the same type of response to better practices, but the increase obtained in grass growth was much less than on the good soils.

Applications of ground limestone gave no increase in grass growth the first season. The material apparently fails to become available the first season when it is applied on soil as a top-dressing. It probably will give results later.

When one and three-fourths tons of hydrated lime were used as a top-dressing, a 60 per cent increase in grass growth was obtained. This lime becomes quickly available for the plant's use. The grass grew earlier and stayed green later in the fall than in parts of the same pasture where no lime was used.

Remarkable increases in yields of grass were secured through the use of fertlizers with and without lime. Several analyses of complete fertilizer and also the different fertilizer components separately were used in the tests. Complete fertilizers were the most successful in stimulating growth, but the superphosphates appeared to be aspecially valuable in promoting the growth of clovers in the pastures.

Three hundred pounds of fertilizer were the standard rate of application for these trials. Analyses of 5-12-4 and 10-12-4 were the best aids to better pastures.

Less Over-grazing

In the Kalamazoo county field the increases in growth secured were: with hydrated lime alone, 60 per cent increase; with 300 pounds of 5-12-4 alone, 102 per cent increase; with the same amount of 10-12-4 alone, 116 per cent increase. When both lime and fertilizer were applied the results were a 150 per cent increase in grass growth with 5-12-4 and lime, and a 174 per cent increase for 10-12-4 and lime.

Plowing pastures and reseeding them with a good grass mixture gave good results, but this type of renovation is impracticable on hilly land where breaking the soil will lead to excessive surface washing before the new seeding gets a start. The grass seed was sown with a nurse crop of oats in these tests.

The experiments were conducted on pastures which had become run-down through overgrazing and this condition had encouraged the growth of weeds. If these become troublesome, the members of the soils department recommend that they be mowed before they go to seed. The increased growth of grass tends to keep the weeds down and the pasture is not so apt to become damaged from overgrazing.

A means which increases the carrying capacity of an area from two cows to five cows is an important aid to many small dairy farms where the lack of pastures has been the limiting factor in enlarging the herd. Summer butterfat prices have been high enough in the past few years to make the production of more pounds a profitable venture. The use of lime and fertilizers as spring top-dressings will lead to larger profits.

Squash or Pumpkin?

By E. N. Bressman

Lincoln, Nebraska

THERE is a great deal of confusion in regard to names of both pumpkins and squashes. In fact most growers are unable to distinguish between these two vegetables.

Pumpkins are commonly called squashes and squashes are commonly called pumpkins. County fairs, State fairs, and other exhibts frequently incorrectly classify pumpkins and squashes. Oftentimes, a judge places a squash first in a class of pumpkins and many times a pumpkin is given the blue ribbon in the squash class.

It is of interest to know that there is a simple means of distinguishing between the two. The easiest way is by means of the stem which holds the specimen to the vine, since a part of this stem is usually attached to the vegetable. On pumpkins, according to the Iowa Experiment Station, this stem is hard, woody, and furrowed. On squashes the stem is soft, and usually rounded and enlarged where it is attached to the vegetable.

A recent publication by the Iowa Experiment Station, states that there are two groups of pumpkins and one group of squashes. They find that one group of pumpkins is easily crossed on the squashes, but that it is almost impossible to cross the other group of pumpkins with squashes. In this way they account for the large difference of opinion in regard to the crossing of these two vegetables. The study carried on by the Iowa Station included 98 pumpkins and squashes.

Wisconsin Corn Fertilizers

GIVING the corn crop a "shot" of quickly available plant food in the form of commercial fertilizers has more than justified the expense, according to C. J. Chapman, soils specialist at the Wisconsin College of Agriculture. The application of commercial fertilizers by means of a special attachment on the corn planter gives that crop three advantages over the non-fertilized crop, he claims.

It starts the crop off quickly in the early spring; advances the maturity in the fall from a week to ten days, which may be the margin needed to beat the first killing frost; and, at the same time, it increases yields and improves the quality and feeding value of the crop.

Following the recommendations of the College, and as the result of their own experience and observations, Wisconsin farmers will use approximately 18,000 tons of commercial fertilizer on the corn crop in 1930. For the prairie soils, the use of straight superphosphate or mixed fertilizers carrying a small amount of nitrogen and potash in addition to the phosphate is recommended. Such mixtures as 2-12-6, 3-18-9, and 3-14-6 have been used with excellent results, Chapman states.

For the lighter colored clay and silt loam soils, he advises the use of fertilizers carrying a little more nitrogen than those used on the prairie soils, or such mixtures as 4-16-4, 5-15-5 and similar combinations.

On sandy soils, bottom mucks, and peats the fertilizer for corn should be relatively high in its potash content. Mixtures of 2-8-16, 3-9-18, 3-12-12, or even 0-9-27 and 0-8-32 combinations will cover the requirements.

Stable manure or legume residue should, however, be used as the chief source of plant food for this crop, since corn is a heavy feeder on nitrogen. "Commercial fertilizers for corn applied in small amounts of 100 to 150 pounds per acre cannot be expected to take the place of a liberal application of manure, but should be used as a supplement to it," he concludes.

Bill Heintz's 4-8-8

(*From page* 20)

It might be explained further that assistant county agent Seaton had, in this same neighborhood, 12 potato club members last year and one of the requirements for membership was that each member must use fertilizer, a 3-12-4, on his potatoes. But when the elevator manager was questioned, he had recorded no increase in sales of 3-12-4 over other years.

To this, the county agent made this comment: "Bill's demonstration showing the 4-8-8 to be the most profitable fertilizer combination must have been much more convincing to the farmers of the neighborhood than the plots of the potato club members who had used the 3-12-4."

The man upon whose farm a demonstration is located is a very important factor in disseminating the results. Naturally, the first thing is to demonstrate that fertilizer turns the trick, but a man who is a natural leader in the community will get this information into circulation quickly.

Prophesying Prices

(*From page* 19)

there has been a big drop in the prospective yield and they retire to the rear of the barn and kick themselves vigorously for selling.

The fact that the weather of July does not manifest its damage to the potato crop until late in August is now being recognized by the crop reporting service of the Department of Agriculture. As a result it is likely that before many seasons we will have our crop reports dished up for us all seasoned to taste with data gleaned from the thermometer, the barometer, and all of the allied tools of the weather man. Charts and formulae are in the process of making, and preliminary estimates made the past two years with the help of these came extremely close to the final yields.

For example, Verne H. Church, Agricultural Statistician at Lansing, Michigan, reports that weather conditions up to September 1, 1928, would have forecast a potato crop for that state of 115 bushels per acre and that the actual yield was 117 bushels. Frederich W. Waugh and Chester D. Stevens, statisticians in New England, hit the 1928 Maine yield within six-tenths of a bushel per acre as early as September 1. When one considers, as the American Potato Journal points out, that the Maine yield has ranged from 125 to 315 bushels per acre, an error of six-tenths of a bushel per acre is scarcely large enough to be mentioned.

Statisticians have come in for lots of razzing. Commander H. H. Frost said recently that there were three kinds of lies: lies, damnable lies, and statistics. But the study of statistics is going forward with an impetus never before achieved. These preliminary studies indicate that formulae made up from weather records and resultant yields may be the most valuable price forecasting aids we have. This article has dealt with potatoes, but the same methods will apply to other crops, to a certain degree.

Skilled Kansas wheat observers may at some future date look over the crop and estimate it as 5,000,000 bushels short, while a young man in Washington, D. C. might differ by predicting it to be 10,000,000 bushels long. The latter guess will undoubtedly be the better one due to the fact that it will be fortified by accurate weather data correlated with yield figures for more than 70 years. The up-to-date Idaho potato grower may remark optimistically to his wife across the supper table: "Well, Martha, I see by the thermometer that spuds went up 35 cents today."

Banking on Alfalfa

(*From page* 18)

tion of prizes for some worth while effort or achievement.

The Barton Bank took him up on this, and asked him to suggest something, so he fortified himself with the Agronomy Specialist and the County Agent and placed alfalfa before the bank directors. The three-year contest, with separate prizes for each year, is the result.

As mentioned previously the prizes for each year are based on the 1931 alfalfa seeding. The second and third sets of prizes contain nothing unusual. They are awarded to the best first and second-year showings of alfalfa, and are based on standard scorings for yield, evenness of stand, freedom from weeds, etc. The first edition of the contest is outstanding in that it is based on soil preparation from the spring of 1930 until the alfalfa is seeded in 1931.

In featuring soil preparation as an essential of alfalfa, the Barton Savings Bank and Trust Company seems to have hit at the root of the matter. Although Orleans county is a highly specialized dairy county and alfalfa is recognized as the "Queen of Dairy Feeds," the alfalfa acreage is negligible.

Removing Obstacles

Much of the land, especially on shallow soiled hillsides, is not adapted to its use, but nearly every farm has areas which seem suited to this crop. The chief obstacles to its acceptance seem to be correction of soil acidity, control of the ever-prevalent witch grass (quack grass), and the preparation of a better seedbed than is the common practice of the county.

Advance reports from the contestants seem to indicate that these points will be well taken care of. Soil acidity is being corrected by liberal applications of lime, several of the men using more than one application to insure thorough mixing with the soil. One man has a theory of soil humus as a corrective for soil acidity which he is backing against lime, but each has the idea of having sweet soil by seeding time next year.

Witch grass is receiving a variety of treatments, which include a summer fallow with intensive cultivation, smother crops, and cultivated crops. Probably the widest variation in methods occurs in the eradication of this weed and in the choice of crops for 1930. These varying crops and methods, of course, have considerable bearing on the fertilizer practice being followed.

Dr. E. Van Alstine, State Agronomy Specialist, and the County Agent have dual functions in this contest, in that they were selected as judges by the bank and are looked to as advisors by the farmers. In order to be fair to both positions, they have provided suggestions and information by letter and have been firm in leaving the choice of methods to the individual contestant.

Careful records of each field are being kept so that the soil treatments for the winning fields may be given full publicity at the close of the contest. These reports include history of the field, soil tests at stated intervals, detailed records of each type of soil cultivation, fertilizer and lime applications, kinds and yields of first year crops, etc.

This Banker-Farmer project has stirred up considerable interest among a group of farmers who are extremely skeptical as to the possibilities of growing alfalfa.

Reviews

(*From page* 46)

the principal crops of the state, also the number and value of livestock by counties, with comparative data for earlier years. Such data are of value to anyone interested in the trend of agricultural production in the State.

"Piedmont Farm Business Studies," Agr. Exp. Station, Clemson College, S. C., Bul. 264, March, 1930, W. C. Jensen and B. A. Russell.

Insects

"Insect Pests of Trees and Gardens," Agr. Exp. Station, Fargo, North Dakota, Cir. 42, Apr., 1930, J. A. Munro and Hazel W. Riddle.

Diseases

"Black Spot, Powdery Mildew, and Brown Canker of Roses," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 426, Apr., 1930, William B. Shippy.

"Diseases of Sweet Potatoes in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 212, Mar., 1930, Geo. F. Weber and Erdman West.

"Zinc Chloride Treatment for Pear Blight Cankers," Univ. of Cal., College of Agr., Berkeley, Cal., Agr. Ext. Cir. 45, June, 1930, Leonard H. Day.

A Master Farmer

(*From page* 17)

tomatoes per acre, 75 to 80 bushels of corn, and 4 tons of sweet corn per acre.

Up-to-date machinery is used on the Reynolds Farm.

Several years ago the County Agent interested Mr. Reynolds in white sweet clover. This season his 65-acre field of sweet clover is supporting 47 head of cattle and 12 horses and they can't keep it down. He is the only farmer in the community with plenty of pasture.

The fine Holstein herd on the farm has been built up through six tuberculin tests. Several losses were encountered at first but now he has a tuberculin free herd that will average about 8000 pounds of milk flow per animal. The herd is housed in a dairy barn, that is equipped with up-to-date stanchions, automatic water fountains, mechanical milkers, and an isolated milk cooler, all complying with health regulations. The silos, granaries, the feed-mixing room and the hay loft for the 30 acres of alfalfa are all conveniently located.

In addition to operating the farm Mr. Reynolds has found time for public activities. At the present time he is taking an active interest in the wheat marketing Act, and is a director of the Eastern States Farmers' Exchange. He has a daughter who is a graduate of Michigan Agricultural College and a son engaged in the farm machinery business at Middletown.

Mrs. Reynolds keeps a cheerful home and where one always feels welcome. Their love for the farm is exemplified by the clean, neat appearance of the farmstead. Mrs. Reynolds has a flock of 100 fine young Bronze turkeys in which she takes great pride. There is also a flock of about 200 white leghorns on the farm.

Mr. Reynolds visits the Delaware Experiment Station occasionally for information and new ideas and he cooperates with the Station to obtain information. The Department of Agronomy has been conducting wheat variety tests on his farm for four years and the seniors from the College of Agriculture visit his farm frequently to study his methods.

A part of his herd.

X-rays for Plants

(*From page* 14)

souri has been at work for several years with the X-rays, and as a result has speeded up many hundreds of times the rate at which improved varieties of grain, vegetables, and fruit can be developed. Six thousand progeny, or families of young barley plants from X-rayed crops are growing on the experimental plot under his care. In these groups the outgrowth of heredity has been violently influenced by exposure to a powerful X-rays.

Dr. Stadler expects to find new traits of growth, new qualities of grain, new rates of growth and ripening—in fact, as great a number of mutations as he could have expected in his entire life under the old system of patient selection and development of the rare or occasional mutations in which Nature's processes were undisturbed.

The X-rays, once a curiosity, then a medical tool, is to become a useful source in agriculture. The farmer, perhaps uninterested in its previous development, may soon have the benefit of its power in the results produced, while the millions of consumers will have new foods. They may, incidentally, find it necessary to learn all over again the elementary lessons in botany, nature study, and natural science.

A pot-grown tobacco plant produced by the union of X-rayed sex cells. Note very dwarfed with misshaped leaves and no production of flowering shoots.

Diet *vs.* Drugs

(*From page* 26)

back to this field again. The stunting of the plants and firing of the leaves indicate trouble. The nitrate test will be negative, showing insufficient nitrates. The chances are that the potash deficiency test will be positive, though perhaps not heavy. But, remember that a moderate test in a stunted plant is much more serious than the same test in a large plant.

Always test the soil for acidity. In an acid soil I would always suspect phosphate deficiency with stunted plants. Under the same conditions on an alkaline or neutral soil I would suspect potash deficiency.

To better and more easily adapt corn to the soil, the next great step, and probably the most important step, is field selection of seed corn. In almost any field of corn there are always some plants that produce better developed and better matured ears than the average. Where a farmer has practiced field selection for years, such plants are easily found. This fact in itself is proof enough of the truth and value of this practice. Choose the well-matured ears on vigorous healthy stalks. Do this just before a killing frost. Pick the plant with ripe husks on green stalks and more important still, this plant should stand in a full stand hill, not alone.

The vigorous plant with a well-matured ear is a plant that has obtained from the soil all the necessary plant foods. This plant possesses that intangible something we term disease resistance, for want of a better name. The seed of the plant will carry much of this resistant character.

The continued selection of such plants is the best way to overcome root rot. It supersedes testing and treatment though it should never entirely replace them. Such plants will also greatly simplify the fertlizer problem because they are best able to utilize the fertilizer that the grower can afford. The poor, weak plants will respond to fertlizers but the strong plants will respond better. It is always easier for the doctor to prescribe a diet for the healthy, hearty eater. So it will be easier for the corn doctor and for the farmer to use the correct fertilizer on the strong plant than on the pampered, weak ones.

Weed Killers

(*From page* 27)

The first application of the chemical will kill the tops and these should be raked and burned about three weeks after the application of the chemical. When the new shoots are about six inches high, a second application of the chemical will be necessary and a third may be advisable in many cases. If plants are allowed to come into bloom they should be cut, raked, and burned and the new shoots should be sprayed when six to eight inches high.

If only one application is to be used, the best results will be secured on Canada thistle when the weed is in the bud in June or late in May when the plant is about 12 inches high, according to Mr. Porter.

Sodium chlorate in the steel or iron drum is relatively harmless. When dust or organic matter is mixed with the chemical it becomes highly inflammable. Clothing, wood, or other materials when soaked with the chlorate solution may be set on fire easily by friction and often explode. A person walking through a sprayed field may find himself suddenly surrounded by flames. One area in Iowa sprayed at the rate of 12½ quarts per square rod caught on fire spontaneously on a hot, sunshiny day.

Spray machinery should be well painted, as should the wagon-boxes in which the chemical solution is hauled. Clothing saturated with the solution should be washed carefully before being worn. Spray pumps should be cleansed thoroughly if they are to be used for other purposes, for a little of the chlorate will damage fruit trees and shrubs.

Calcium chlorate, according to preliminary tests, will kill weeds if used in a strong enough solution, but is not as effective pound for pound as sodium chlorate. However, it has one advantage in that chemists say that it absorbs moisture from the air and is less likely than the sodium chlorate to be explosive on plants.

Sodium chlorate is not considered poisonous to livestock although tests at the Minnesota Experiment Station have shown that cattle given the chemical in capsules may become sick.

The safest plan would be to keep livestock off the sprayed areas for two or three weeks, according to Mr. Porter.

Both sodium and calcium chlorate may be secured at from 9½ to 12 cents a pound. This makes the cost per acre, if 100 gallons to the acre are used, about $10 or $12 for one application.

Under Glass

(*From page* 8)

tomatoes grew unusually well, but lettuce was injured. More leaching or the use of additional manure to tie up the soluble salts will be needed before lettuce will grow well on this soil.

Sub-irrigation of the soil through these tile lines is possible and practical. By using such a system of irrigation the surface inch or so of soil can be kept reasonably dry. Water can be brought from below. This method would aid in the growth of a larger root system. It is unusual, but sometimes such reverses of the normal procedure are very much better than the established way.

Drainage of the greenhouse soil would be greatly improved with the installation of such a system of tile lines. The grower obtains control of soil drainage, soil insects and diseases, and excess soluble salts and makes it practical to sub-irrigate.

Plant growing methods used in producing greenhouse lettuce, tomatoes, and cucumbers are fairly well established. Tomato plants are produced in six weeks, cucumbers in four weeks, and lettuce in three to five weeks depending upon the season of the year. Not so many years ago it was thought that plants needed age before it was safe to set them in a permanent location. Now it is proved accurately that younger plants withstand the final transplanting with less check to their growth rate.

Tomato plants produced in four to six weeks from seeding can be set in the greenhouse 10 days before the blossoms open. Plants with more developed flowers frequently are forced to shed them because of the shock sustained in moving to the final location. Tomato seeds are planted in rows in flats. The rows are three inches apart and the seeds are placed six to the inch of row. As soon as the first true leaves appear, the seedlings are shifted to 4-inch pots. From these pots they are moved to the greenhouse soil.

Cucumber seeds are sown in rows in flats, and just as soon as the young seedling is large enough to hold between the finger and thumb, it is lifted and placed in a 4-inch shallow pot. From this pot the plant goes to the greenhouse soil about the end of the fourth week or when it is six inches high.

Lettuce will reach transplanting size in about seven days. The seedlings are placed two inches apart each way in flats, and after two to four weeks the plants are ready for the final shift.

In past years a good many plant growers lost seedling plants because of a disease called "damping off" or "wire stem." The organisms causing this trouble are now killed by soil sterilization or else the upper one-half to one inch of soil is kept dry to inhibit their growth. The several soil organisms causing damping off live in that part of the soil and cannot exist there if it is too dry. Planting seeds in rows and stirring the soil between the rows immediately after a good watering will aid in this control.

The same principles which govern soil preparation out-of-doors apply to the greenhouse soil. Organic fertilizers are plowed under in such a way that they will be distributed as evenly as possible through the upper eight inches of soil. A layer of manure between the surface soil and the subsoil is just as detrimental here as elsewhere.

Decaying organic matter in the soil requires the action of bacteria and they in turn require nitrogen. If the decaying process is rapid, the available supply of nitrogen in the soil may be almost entirely diverted from the growing crop to the job of feeding the bacteria, for their power of gathering nitrogen is greater than that of the plant roots. When this happens, the most effective remedy is the application of available nitrogen as a top-dressing. Two hundred pounds of some nitrogen carrying chemical can be used per acre.

Cultivation in the greenhouse has three objectives. They are weed-killing, covering up soil cracks, and keeping the surface soil loose. Shallow cultivation just often enough to accomplish these three objects is all that is needed. Mulching a greenhouse soil with organic materials is a very costly business and the cost far offsets any advantage the system may have. A reduced yield usually is the result of mulching greenhouse soils with organic materials.

Fertilizing Methods

Normal conditions require the use of nitrogen, phosphorus, and potassium in chemical form to supply the needs of a greenhouse crop. Of these three elements only nitrogen can be leached from the soil. The fixation of phosphorus and potassium by the soil occurs within a week or so of the time they are applied. Knowing this, the grower can obtain the maximum results by mixing the phosphorus and potassium fertilizers with the soil in such a way that they will be fixed where the plant roots will be most likely to find them. The roots of a greenhouse vegetable are most abundant in the first six to eight inches of the surface soil. Cultivation prevents root growth in the upper inch or two of soil.

Since available nitrogen is readily lost from the soil unless plant roots are present to take it up, the most practical way to apply it would be as a side-dressing in amounts sufficient to meet the needs of the plant for a short period. Another application could be made about two weeks later and in fact as often as may be required. The effect of nitrogen on vegetation is easily seen, and the intensive vegetable grower knows how to look for nitrogen starvation symptoms.

The method of fertilizing the early greenhouse tomato crop developed at the Ohio Agricultural Experiment Station calls for the application of manures and chemical fertilizers at such a time that there will be very little available nitrogen during the short, dark, cold days of winter and early spring. If too much nitrogen is present in the soil during this time, the tomato plants grow large and soft and as a result the blossom buds may drop before they open or the fruits may fail to develop. The loss of one or two bottom clusters means a good many dollars even in a small house.

The program calls for the application of 25 tons per acre of well-ripened manure to keep up the organic content of the soil. This manure, plus 1,000 to 1,500 pounds of an 0-12-24 per acre, is applied in preparation for the fall crop. The use of sulfate of ammonia as a top-dressing is begun the following spring as soon as the early tomato crop has set two clusters of fruit. From 300 to 350 pounds per acre are applied every week or two during the bearing season. Superphosphate induces large root systems and early ripening, and potash produces high quality and contributes somewhat to disease resistance.

Such a heavy nitrogen feeding resulted in earlier maturity. When soils lack in phosphorus or potassium this would not hold true. The size and number of fruits was increased more than 18 per cent. Nitrate of soda gives equally good results and is quicker acting, but it leaves a residue of sodium in the soil that is very injurious to greenhouse crops when the concentration becomes high enough. This can be washed out as already described.

This fertilizer program meets the requirements of the other crops grown the same year as far as phosphorus and potassium are concerned. Cucumbers need nitrogen at frequent intervals during their bearing period. Perhaps the only danger from the use of such a heavy nitrogen feeding program occurs during periods of short cloudy days when the amount of light is reduced. There is also danger in applying nitrogen before the plants begin to set fruits. It is during bearing and bright, warm, long days that nitrogen is most needed. Cucumbers need even more nitrogen than tomatoes. The same top-dressing program used for tomatoes would meet the needs of the cucumber crop.

More trouble is caused by overwatering greenhouse tomatoes, cucumbers, and other crops than by an insufficient supply. The plants' needs for water change with the age of the plants and with changing seasons. It is safe to say that plants need water enough to keep them from "flagging." Whenever a plant gets dry enough to wilt it is likely to be damaged. Flagging is a term used to indicate the pre-wilting condition.

A soil over-supplied with water reduces the amount of root growth made. Smooth, high quality fruits are obtained by watering sparingly and only as needed. The more water given, the faster a plant grows and the rougher the fruits will be, especially in the case of the tomato. Early in the development of a plant and during cloudy, short days it is best to be very stingy in the matter of watering. In some cases a soil well supplied with water-holding organic matter can do without water for four or five weeks. The grower is always on the lookout for the "flagging" of the leaves, however.

Lettuce is a cool season crop and can be grown successfully at night temperatures of 40 to 50 degrees F. Its ability to grow well at such low temperatures is one reason it is such an important greenhouse crop. These temperatures are not safe without ventilation. Fresh supplies of air are needed and ventilation is almost as important as temperature.

Tomatoes do best with night temperature of 55 to 58° F. Rough fruits are likely to be more numerous at higher or lower night temperatures. Lower temperatures slow up the growth rate too much and higher temperatures cause the plants to grow rapidly. Such a rapid growth may result in a smaller number of fruits.

Importance of Light

Cucumbers require higher night temperatures than tomatoes. From 65 to 70° F. are needed at night. Day temperatures for these crops will average 10 degrees higher than night temperatures. On cloudy days the night temperatures can be used.

Without light, greenhouse plants would have little value. Green color in plants is due to the presence of chlorophyl and this in turn uses energy from the sun. Carbon dioxide from the air passes through leaf openings and is absorbed by the leaf tissues. Nitrogen, phosphorus, and potassium as well as seven or more other elements are brought to the leaves in water solution. A reaction takes place between these elements and the carbon and oxygen in the carbon dioxide. The result is the formation of sugars, starches, and protein materials. The more light the faster the reaction can be.

Normal plant development occurs when there is a balance between the amount of light and the amount of these several elements, nitrogen in particular. Unless there is this balance between the nitrogen furnished by the soil and the sugars and starches developed in the leaf by the action of light on the chlorophyl, the plant growth will be soft and unfruitful. Nearly all growth will be vegetative. The solution is to control the soil's supply of nitrogen so that during periods of slow growth there will be only limited amounts available.

More and better experimental work is needed to insure the grower of continued improved conditions. A great deal has been done, but there is plenty of opportunity remaining. The art of agriculture is now reinforced by the science of agriculture, but 300 years is a relatively short time. The next few years will no doubt produce as many real scientific contributions as have been made to date. Many of the observations made concerning the greenhouse way could be examined with profit by any grower.

Getting Joiners

(*From page* 10)

high groups attended one or more dances during the year, and 60 per cent attended one or more card parties, compared with about 35 per cent who went to dances, and about 50 per cent who went to card parties.

All told, the chief symptoms of ability and interest in rural organizations seem to be those pertaining to certain forms of educational facilities such as periodicals taken, books in the home library, and time spent in reading and radio auditing. At any rate, they are most closely associated with organization activities. Church attendance bears little or no relation to other group interests or to number of meetings attended. Also the size of the family and the ages of the different members seem to have no particular relation to the interest the family feels in organizations.

J. H. Kolb of the Wisconsin College of Agriculture, who has directed this study says:

"To a large extent the organization situation in the selected school districts seems to be shaped by the less tangible factors pertaining to the history, traditions, and culture of the neighborhood or the community. Among these are early settlement and nationality backgrounds, neighborhood groupings, and stimulation in the way of suggestions and promotion from outside agencies.

"The people in the high organization districts appear to have had for a long time certain common objectives and tendencies to work together. In the low organization districts they have had little in common and have not learned the art of cooperating with each other in groups. With less experience in group activities as a background on which to build, the low organization districts usually get less stimulation from outside agencies than do the districts which are already highly organized.

"Apparently this makes for possible overloading with some families in well-organized localities and provides little or no organizational opportunity for families in poorly organized localities. Studies of several families also suggest that those families who are assuming the leadership and sharing the support of organizations in highly organized localities can not be expected to assist in the promotion of additional organizations.

"On the other hand, these case studies show a desire and a need for organization opportunities in poorly organized districts and indicate the presence of potential leadership there to direct them, under sufficient counsel and guidance from organization promoters."

The Inquiring Mind

(*From page* 30)

normal growth of rats. It is plentiful in the green portions of plants and also in the softer portions of beef fat, cod-liver oil, carrots, and sweet potatoes." (Feeds and Feeding).

At Wisconsin, Dr. McCollum, in conjunction with Professors E. B. Hart and J. G. Fuller also did notable experimental work relative to the role of inorganic phosphorus in the nutrition of animals; with Professors Hart and G. C. Humphrey, work on the role of the ash constituents of wheat bran in the metabolism of herbivora; alone, relative to the nuclein synthesis in the animal body; with Professor H. Steenbock, on the nutrition of the pig; with Hart, Steenbock, and Humphrey, regarding the physiological effect on growth and reproduction of rations balanced from restricted sources. In 1918, Dr. McCollum issued an important circular entitled "Hints on What to Eat During the War."

The role of the rat in the varied research undertakings of Dr. McCollum has been invaluable. "Mac and the rat" have become a veritable tradition. The Doctor has used the previously loathed rodent by the thousands and today is employing the lowly animal as busily and effectively as ever at Johns Hopkins University.

The number varies with the nature of the work and that varies from year to year. We are informed by Dr. E. Becker, of Dr. McCollum's laboratory, that the rats used number between 2,000 and 3,000 a year, and some years probably as many as 10,000. His colony has been in existence for about 18 years, so that approximately 90,000 to 100,000 rats have been bred and used.

Guinea pigs were also used for scurvy work over a period of about three years. A pair of prairie dogs were sent to the laboratory and their offspring were used for work with scurvy. These animals, like rats, are immune to scurvy. For a while, pigeons were used in order to determine the difference between the Vitamin B requirements of birds and mammals.

Always Helpful

The rats now employed are the best that can be grown. They show the direct results of ideal environment, good diet, and careful selection for mating. They are housed in a room about 40 feet x 30 feet x 15 feet, with 24 windows and eastern, southern, and northern exposure. Strictly sanitary conditions are maintained. No disastrous epidemic has occurred. The rats are closely observed and weighed at short intervals. Inferior specimens are discarded, as are rats with sore eyes, mangey coats, or bloody noses. The breeding rats are fed milk daily and fresh raw, green vegetables three times a week, in addition to a balanced ration of cereal grains and a mineral mixture.

Well-fed female rats are quite ferocious in the care and protection of their young. They build nests of excelsior and wood chips, provided in the cages, and remain in the nest nursing their young and vigorously protecting them throughout most of the day, until the young are about 19 days old. By that time they have a full coat of fur, their eyes are open and they take food and water in addition to nursing their mother.

Dr. McCollum is interested in all phases of nutrition. He knows the diets and dietary habits of people throughout the world, as well as of animals. He was one of the first to realize the value of a well-balanced diet for humans, as well as for farm animals, and tells of all of these things in his illuminating book, "Food, Nutrition, and Health."

Of him a colleague has well said: "He is one of those very unusual people who can always find time to help someone else over the rough places. Whether it is a problem of chemistry or nutrition, or just one of those every-day problems common to us all, one can always be sure of a sympathetic hearing from the man who has not only made an outstanding success of his work, but who enjoys life and knows how to live."

All of us, I feel sure, will heartily wish this eminent man, of the inquiring mind and seeing eye, many more years of successful, useful endeavor and happiness.

Picnics

(*From page* 4)

The inscription will read, "Go to the ant, thou sluggard, consider his ways and beware." Such a tribute to American optimism and courage should stand beside the granite horrors dedicated to our soldiers in every court house park. The duties of peace are often just as hazardous as the arts of war. Send in your donations to No. 19 West 44th street, and state your preference for hard or soft boiled. The contract may be awarded to Gutzum Borglum.

I TALKED with a farm draft horse the other day, one of the Percheron family who knows his bran and gad flies. He remarked with firmness that he reckoned the auto had come to stay, but he was not so sorry about it, especially on Sundays. His mother told him that back in the old family chaise period they used to hitch her up for long drives with heavy picnic baskets. After she had been toiling behind the plow or cultivator all week it seemed as though Sunday ought to be a mare's vacation. So he felt as though his kindred owed the motor car a deep debt of gratitude for relieving them of so much fuss and muss on the Sabbath.

"They used to kick if a little oats got into the cake box," he said, "but now I wonder what they say with the alemite grease in the salad."

Then I got to thinking how the auto has made such an interchange of town and country relations in the summer time. The folks in the country spend their Sundays with picnic lunches washed down with pop at the park resorts or in the city recreation gardens. The city people go in the other direction and get their fill of fresh air, green pastures and beggar lice on their pants. Once upon a time you could go out in the country on Sundays and get invited to dinner, if you timed your arrival nicely. Nowadays you must take your own picnic provender because nearly every farm house is closed with a wolf hound stationed at the gate. The great American habit of going somewhere to see things has enlarged the trade for the delicatessen stores and made the farmer as great a gadder as any of the Gideons. As he is a hefty eater by occupation and inclination, it takes a keen steward to satisfy his picnic requirements.

There has grown up another commercial side to agriculture arising from the wanderlust of the motor mad city people. This is the road side stand, operated by some farmer or by a shrewd town trader who uses the watermelon patch and the silo as an inviting background. Upon close inspection you generally find he carries more goods sold in a drug store or candy shop than products of the soil. But the growers who display deleted milk and fumigated apples have generally cashed in fairly well in my state if they began to issue advance warnings half a mile down the road in either direction.

SEVERAL years ago one could have picked out a real dirt farmer behind such a counter and you could patronize him with zealous interest in agricultural welfare. But now things have changed, due to so many picnics. The only real way to detect the true identity of the rural salesman is to ask him if he sells oleomargarine. His mode of reply will be your answer.

Have you considered the effect of picnics on the great American complexion? Tan and sunburn was once the distinguishing mark of the bucolic resident, or the sole possession of the Italian laborer or the Irish policeman. Universal excursions under the burning sun to golf courses and picnic haunts have erased the facial differences between rural and urban dwellers. Only last week a bronzed young village sheik was spotted by our party as "the president of the local bank" because the clerks in the chain store wouldn't have so much spare time on the fairways. The hired man and the rah-rah boy are the same under the skin and on it, too. I am elated that the vitamin theory, ultra-violet rays and all that scientific stuff has come to cheer the hearts of those who sell picnic kits and second hand Fords.

The embattled farmer is, however, torn between the call of the wild and the necessity of staying home to protect his property. Modern auto parties afield are ruthless. So he doesn't know whether to go to the park to eat lemo and peanuts or remain on deck to watch his lares and penates.

My state legislature, still under the partial dominance of Granger threats, passed a rigid trespass law that had more teeth in it than an alligator. City folks got so they simply toted loaves of bread into the country and got the filler for their chicken sandwiches like Sherman and Coxy's Army. They busted down those sacred old rail fences and trampled the grapes in the vineyard. They uprooted the pumpkins and picked the vines clean of cabbage. They were so discriminating that they selected Guernsey herds to milk on account of the higher cream line. But thanks to our watchful solons a man who

climbs through a wire fence nowadays must prove no intention of mayhem, grand larceny, or malfeasance in office or spend the night in the hoosegow.

A few picnics ending like that will teach city folks to be as self-reliant as they advise farmers to be. It removes one of the public drawbacks to the picnic fever, but there is one more left to eradicate.

THIS is the litter habit. Too many vernal landscapes on Sunday evening look like paper hangers had been working in the cow pasture. Appearances are bad enough, but results are sometimes worse. In our state when the spring fishing season begins it is the signal for tremendous forest fires. I sometimes think there are more suckers and bullheads on land than in the waters beneath. Our schools should teach the rising generation that scenery and outdoor virtues are public trusts. We must see to it that conservation becomes something more than conversation. If we can't agree to that doctrine to protect the native beauty of the wild, then let's build another rock garden in the back yard and fry our fritters at home.

People who frequently picnic will agree that our landscape needs friends. My state has an organization with that laudable title. Maybe when your state gets up enough ambition they will organize one also. Some landscapes never had any friends, such as the coal fields of Illinois and Pennsylvania and part of the Bad Lands in Dakota. Other beauty spots held out warm, inviting arms to the weary newcomer. Appreciative folks drank in the scenery without an orgy, and returned refreshed and charmed for another week in the tread mill. A minority played false to the friendly fields. They scattered egg shells and paper boxes, broke down shrubs and hogged up the scarcest wild flowers. Not content with that they had a commercial zeal to advertise their week-day wares to others who might come that way; so flamboyant signs and gaudy daubs besmirched the fences and insulted the rocks and trees. If this keeps up much longer we may have to install a state commission to regulate picnics. Why not? It's right in line with modern necessity, as half our regulatory laws are enacted to protect ourselves from ourselves.

As I said before, the picnic was probably discovered for America by the hardy immigrants from northern Europe. If you have been so unfortunate as never to have beheld a real Turnverein or Nordskylag picnic you don't know the meaning of social community recreation. With the diminishing use of lager, alcohol and snoose this type of picnic may not carry quite the local color it once possessed. But as a stimulant to patriotism and appetite nothing in my state equals it except a thresherman's barbeque. It takes an All-American linesman to hold his own in the lunch gang on such occasions. We actually need more of the old cave-days fighting ability at grub time anyhow. Too many of us have it served on card tables where one false move will spill the whole works. We are too feminine.

SERIOUSLY, however, I claim that these picnics invented by the hardy pioneer immigrant settlers of my native state were incubators of fervor for the new land and its golden opportunity. Men and women worked hard all the year and met on such occasions to give vent to their stifled ardor for the communism that is built on federated independence.

Begun perhaps as a family affair, the picnic had soon branched out to take in the whole countryside for one joyous outdoor hurrah. Lately the college of agriculture has been trying to re-create such settings, minus the blind staggers. They have found that those one-time well knit communities are distracted and torn asunder with modernity and complexity. Their aim has been to revive some of the traditions and customs which helped to make the original citizens of the west a band of progress. But somehow thus far we haven't quite succeeded in this any more than we have saved the country church from cobwebs. The people who attend *will* talk about such mundane things as tires, mileage, and chain stores, and so very little at all about ideals, hopes and patriotism. The public picnic, like the old gray mare, isn't what she used to be; even though you search far and wide for hot contests and warm speakers.

Need I discuss that form of chaperoned carnival known as the Sunday school picnic? In some parts of the country I believe it has declined in popularity along with the livery stable and the hay rack. When you stop to think of those excursions we had as youngsters you must admit that it was the rides to and fro that furnished most of the fun; and so now we are denied that anticipation because it only takes a few whizzes and a bump to land us at Brown's glen. The promise of a picnic stimulated Sabbath school regularity in the doldrums of summer time, just as the sanctity of juveniles became alarmingly unreal early in December.

IN one respect I declare that the athletic events of the scholastic picnics have improved since my junior era. It is in the way the leaders participate in the jumps and races. Formerly the teachers wore trailing skirts and tight waists and their long locks of hair had to stay piled neatly with a gross of pins. The ministers and superintendents came in frock coats, or were bound up in the garb of dignity. When you find a school picnic party now it is hard to tell the sheep from the shepherdess or the goat from the bell wether. You find out that people over fifteen years of both sexes have legs that can run and bare arms that can swing and punch. Everyone is trying to remain young and active, thereby retaining a certain form of religion that does as much for the human form and spirit as the corset and commandments sought to do of yore.

To picnic where your parents picnicked in those far-off golden days is probably a joy akin to provincialism and local clannishness. But somehow I cannot force myself to become a "citizen of the world at large" or graft on my ego the breadth of vision which venerates the Chinese joss house along with the old homestead at Hardscrabble. Sometimes I hope for a broader outlook that would cause me to admire the jungle flora the same way I take in the beauty of old lilacs at the ruins of grandfather's cabin.

BE as it may with me, I am honest in my conviction that to take our family lunches into that quiet old gorge in the hills where Father and Mother skipped across the self-same stones in the twinkling little brook is the last word in nature communion. I sit there with my family around me. The soft rustling of the leaves and the murmur of the stream brings to me, as little else can, the old truth that nature and the forces of earth move surely and silently on while men are but the actors of a one-night stand in the dramas taking place on this scenic stage. Sometimes I sort of feel as though unseen hands were stretched in welcome from the past generation to this one, in a fellowship of place and purpose; not in a haunting, dreadful way, but with serene and majestic benediction.

And so I have come to appreciate picnics from many angles, not the greatest of which is the commissary. I know it is the same with you. A picnic, like every other form of recreation, is just what you make of it. Whether you have ambitions for simple picnics or sublimated festivals, there are three things you mustn't forget—moderation, mustard and marshmallows.

UNIMAGINATIVE

Two miners who had been brought up in the same village, but had long since drifted apart, met the other day. "Hello, Tom! Let's 'ave a drink," said one.

"No, Jack," replied the other, who had recently come under the influence of a revival mission, "I 'ave been born again."

"What!" exclaimed Jack, looking down at the other's legs. "Born again, an' still bow-legged?"

Judge—"Now, I don't expect to see you here again, Rastus."

Rastus—"Not see me here again, Jedge? Why, you all ain't going to resign yo' job, is you, Jedge?"

"Abie, how's business?"

"Oi, terrible! Even dose vot don't pay ain't buying nothing!"

A little boy was sitting behind a baldheaded man in church, who was scratching the fringe of hair on one side of his bald pate. The old gentleman kept it up so long that the little boy became interested, and leaning over said, "Say, mister, you'll never catch him there. Why don't you run him out in the open?"

Lady: "But don't you find that horseback riding gives one a headache?"

Instructor: "No, madam, just the reverse."

APOLOGY PENDING

The ladies of the Helping Hand Society enjoyed a swap social on Friday evening. Everybody brought something they didn't need. Many of the ladies were accompanied by their husbands.—*Opelike (Ala.) Star.*

He: "My ancestors came over in the Mayflower."

She: "It's lucky they did. The immigration laws are a little stricter now."—Exchange.

Mr. Smith was seeing a friend off to Denver.

"Be sure," he said, "to look up my friend, Mr. Lummac, while in the city. Lummac—you can remember his name as it rhymes with stomach."

A few days later his friend returned and encountered Smith on the street.

"Do you know," he said, "I tried and tried, but I never could find that Mr. Kelly."—*Baptist Observer.*

Timothy Hay: "How did you like Venice, Uncle Eli?"

Eli: "I don't know. I only stayed there over night. The whole place was flooded."

A Scotchman had lost his wallet and had it returned to him by the police three days later. He was asked to examine the contents to see if his money was all there.

"Aye, the money's there a'richt, but, mon, ye've it three days—what about the interest?"

How Much Potash?

. . . . *for your* truck

IT will pay you to make sure that your truck fertilizer contains plenty of potash. The final figure in your fertilizer analysis shows its potash content. See that this figure is as large or larger than the other figures of the analysis. Potash costs little and pays big! Demand a high-potash fertilizer.

The importance of plenty of potash is well illustrated by the fact that the average truck crop removes from the soil more potash than both nitrogen and phosphoric acid combined.

Potash-fed truck has the profit-insuring qualities. After handling and shipping it is fresh, bright and firm and not bruised, spotted and wilted. Potash overcomes loose texture, flabbiness, and helps control disease, giving your crop excellent flavor and color. Use a high-potash fertilizer.

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of Amsterdam, Holland

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"Extra potash pays extra cash" is a slogan wherever extra potash is used at planting or as side-dressing.

Printed in U. S. A.

Better Crops WITH PLANT FOOD

September, 1930

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 XV NUMBER THREE

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Agricultural and Scientific Bureau

N. V. POTASH EXPORT MY.

of Amsterdam, Holland

Directors: J. N. Harper G. J. Callister

This young man is very proud of his fine team. Good farm animals are always a valuable asset to any farm.

Better Crops with PLANT FOOD

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Frost is coming and days of —

Harvest

By Jeff McDermid

IN August of this year I visited my friend, The Master Farmer, who was harvesting the ninetieth successive annual crop of grain from one of the oldest farms in my home state. He was operating a modern binder with a power take-off from a tractor, instead of the cradle that his father used, and which he proudly showed me as a relic of priceless family value.

It was only a matter of a few hours for my friend to harvest the 30 acres of oats and barley, whereas when his father cut the crop of wheat from 50 acres laboriously plowed by oxen, he required four men to cut and eight men to bind after them in a period of five days' work. Thereupon followed a fever of stacking with slow moving ox-teams, and the coming of the tread-power thresher had to be awaited with patience. When the wheat was threshed, it had to be hauled to a distant cash market on the lake, because the railroads had not yet arrived to challenge the water routes.

In a crop of 1,000 bushels of wheat there were 25 wagon-loads. Each one of these precious items of the harvest had to be transported over rough, unbroken, dusty, or muddy roads to a market that paid less than 70 cents a bushel. A load of 2,400 pounds, or 40 bushels of wheat, could be hauled by horse teams at 25 or 30 miles a day. Farmers living 100 miles or so from this only cash market camped out along the trail or stayed at taverns. My host's father was farsighted indeed, for his homestead was located a day's drive from the lake port market, so he could make the trip in two days going and coming. Yet with only 30 dollars in his jeans after the long trek to market, and with visions of more than 20 other weary journeys before winter set in on his season's liquidation, I truly wonder if my host's father or his neighbors faced any stiffer dilemma than the Federal Farm Board of 1930.

IN growing and marketing his wheat the pioneer farmer had no dizzy inventions, mechanical and mental, to help or hinder his slow moving progress. As we observed before, his 50 acres employed 12 men to harvest the crop of 1,000 bushels. They may have been slow movers, but they were fast eaters and bountiful providers of simple fare. He needed them to stack, and a whole crew of them were required for threshing. In those days a few acres *had* to support more human mouths and exacted from each human frame more tithe in the shape of muscular labor.

His road to market was not paved nor provided with motor truck facilities. No grain exchanges docked him or "hedged" him about with red tape. If anybody had told him to cut his acreage of wheat he would have been as wrathy as the Governor of Kansas, and he would possibly have said even more. He had no machinery to eat up his profits. He let the harvest hands do that, because providing food and shelter were the primary jobs of a pioneer community.

Our son of the Pioneer finds it harder to be a *financial* success in these days when it is easier to be a *mechanical* success. I reckon that about sums it up in most of the trades and crafts that look to farmers for their post toasties. The release of so much human energy from the elemental tasks like food production, enabling the surplus to enter the realms of essay writing, peddling, and motion pictures, bears as much relation to the present dilemma as the surplus bushels of wheat that Mr. Legge wants to sell. You see, all these extra harvest hands have to get a living somehow disposing of the trinkets and services that everybody (including the farmer) have come to desire more or less.

Our son of the Pioneer can do all the harvesting in two days that his father and 11 men sweated over for a week. But mechanics stepped in and sped the plow beyond the census rate. If we had started our "eat more" campaigns so as to even up the vast gulf between food production and population, maybe by this time the human stomach would have distended enough by natural inheritance so as to save the days for the hard pressed farmer. Our colored advertisements of cheese, milk, and fruit cannot increase intestinal capacity or satisfy the wants of the moneyless.

All these cold economic figures on consumption do not satisfy me about the matter. I know there are too many hungry folks among the surplus harvest hands who left the farms years ago to get into the city's simple life. Somebody had a corner on the surplus perhaps, but these starving people don't seem to get into the right corner where the cupboard stands. If we could get this agricultural movement all set to iron out that difficulty while we are cutting through the ticker tape that ties us, it might solve the problem a little faster than to look only at the production and storage side.

Sometimes I think secretly, for it is bad form to express it, that maybe we

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Progressive farmers look for real farm relief in —

Rebuilt Soils

By C. A LeClair

St. Louis, Missouri

GONE forever are the days when the fertility of our agricultural lands can be considered inexhaustible. The time has come when the same genius that has been exhibited in the improvement of livestock must now be applied to the maintenance of the fertility of our soils on which in the final analysis all agricultural wealth depends. Marginal land farmers, and those who have failed to increase the productiveness of inherently good soils, are finding it increasingly more difficult to subsist.

More grain drills, corn, potato and cotton planters with fertilizer attachments are being purchased by farmers in the present generation than ever before in the history of the country.

No longer can farmers anywhere in America hope to continuously take wealth from their land without re-investing a part of their returns in a systematic program of soil fertility maintenance.

It would seem that in direct proportion to the extent that power is applied to farming does it become necessary to employ commercial fertilizers to enrich the soil. This fact is evident when it is remembered that with oxen it took centuries to exhaust the fertility of some of the Atlantic Coast State soils. With horses Ohio farms were in many sections depleted in less than a century. Then when tractors replaced the horse in the Dakotas, farms that were supposed to never wear out were made practically barren in less than a generation in some sections. Conversely, wherever a systematic attempt has been made to combat plant food wastage in this country, prosperity now reigns.

Efficiency Counts

Farmers who consistently grow a bale of cotton, 40 bushels of wheat, or 100 bushels of corn to the acre are making money even when cotton brings as little as 16c a pound, wheat 80c or corn 50c a bushel. Fertile lands mean low production costs of quality crops and consequently tend to insure a profit to the grower regardless of fluctuations in market prices. After all, the present low price of farm products is indicative that the better producers have developed methods of growing everything with less effort and expense. In other words, mass production methods have been put to work on the farm. For example, fewer hens and cows are now producing more eggs and milk than was the case five years ago. Likewise, fewer trees are producing more and better fruit in 1930 than was the case in 1920. Again, whereas formerly 25 per cent of our improved land produced nothing more than a poor crop of noxious weeds, we today have laws in many states making it compulsory for farmers to eliminate such waste.

The Basis for Success

All of this brings us face to face with the fact that it is not the number of acres farmed but the amount of per capita production that offers the basis for continued agricultural prosperity. To make two blades of grass grow where one grew before, therefore, is not only a commendable aim but the only one that any farmer can afford to follow.

Realizing that a fertile soil is the foundation of success in any type of farming, County Agricultural Agents are working overtime to give their clientele an understanding of the fundamentals of soil fertility maintenance. Their work is bringing about a more general appreciation of the fact that of the three major ways by which soils are depleted, namely, through leaching of plant food by rain, sale of fertility in products marketed, and erosion, the latter is most devastating. For instance, even in the comparatively young agricultural state of Oklahoma, C. P. Blackwell, director of the agricultural experiment station, emphatically points out the urgent need of soil conservation.

"This state's native soil fertility is largely gone. Our original supply of organic matter is exhausted. Our crop yields are on a steady decline," says Dr. Blackwell. Of some 16,000,000 acres of cultivated land in Oklahoma already 13,000,000 acres have been more or less impaired by erosion. To stop this loss farmers are being taught how to terrace and rotate their crops.

At the Missouri Agricultural College, under the direction of Professor M. F. Miller, an historic series of observations for many years has been in progress which has provided a measure of the effectiveness of different cropping systems in preventing erosion. The results of these studies reveal that it is much easier to prevent loss of plant food by "sheet wash" under a system of cropping which includes having the land in clover and grass one or more years in each round

The use of commercial plant food in profitable farming becomes proportionately more necessary as power is applied to the cultivation and harvesting of crops.

Farmers everywhere are becoming intensely interested to learn more about the use of commercial plant foods for profit. Farm women cooperate to make the educational meetings called by County Agents successful.

of the rotation, than by growing grain crops continuously.

The effect of growing legumes and grass as a means of maintaining the humus and tilth of land is having more significance as the evidence of Agricultural Experiment Station investigations accumulate. Tests recently made at the Rhode Island Experiment Station prove that even under a system of truck growing in a three-year rotation, it is possible to maintain a high level of production by the use of commercial fertilizers alone if every sixth crop grown is a clover crop to be turned under.

Prejudices are Removed

Since it is far less costly to maintain the productiveness of good land than to be obliged to rebuild a worn-out farm the use of commercial plant foods is no longer looked upon as a last resort. American farmers have the world's best batting average of intelligence. Old prejudices are gone. Already about one farmer in ten is today making use of commercial fertilizers to increase his yields and profits. Agricultural extension experts have done much to disseminate the facts. Last year, for example, County Agents throughout the nation installed nearly 100,000 soil fertility demonstrations and over 200,000 farmers treated their soil on the recommendation of these experts.

In this connection, a statement made by one of these missionaries of farm relief typically reflects the first-hand experience of one who is having phenomenal success in preaching the gospel of more profitable farming in his county. He says, "This problem of getting farmers to do the things we think is best for them is not so easy. Still when I look back a few years I can see a great change. I am gratified for the fact that I had used commercial fertilizer before I became a County Agent and was completely sold on the value of it. Then, too, I worked for one year as a salesman for a manufacturer of fertilizer. This was good experience to equip me for my present work. Now I find farmers intensely interested in soil problems. They realize that they have handled their stock and other phases of their business in a more scientific manner than they have their land. Hence, they are now rapidly becoming more than eager to learn and practice better soil management."

In the Midwest, particularly, farmers have become vitally interested in the use of commercial fertilizers. That

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This County

Two theories are discussed

WHEN a county agent gives advice to his farmers, it is as if he gave them signed blank checks. The wise farmer makes his worth a large figure." This recent assertion by a writer attempting to make clear the functions of a county agent illustrates how firmly entrenched is the notion of the agent as a traveling teacher who advises, directs, leads, and frequently exhorts his farmer constituency to better ways. The county agent, the colleges take for granted, is a sort of college professor assigned to a county, "the local branch of the agricultural college." It is true he varies his technique from that of the class room, and that he localizes, simplifies and makes more practical and pointed his teachings, yet he remains essentially a school teacher, according to this view.

Dominant as is this concept in the mind of much of the public, it is interesting and important to note that this is exactly what the county agent is not, in the opinion of another school of thought. It is curious, too, to recall that the beginnings of county agent work in America were made entirely independent of the colleges and that its founder, Dr. Seaman A. Knapp, although an ex-college president, insisted that the intrusion of this academic view-point would destroy the power of the county agent as a re-vitalizing force in American agriculture. The adult rural public learns by seeing and doing, he claimed, and his unique method of bringing improvement by establishing local demonstrations of better ways of farming and home-making was essentially a protest against the didactic, school-room method of approach. Shortly after his death in 1911 farm demonstration work was nationalized and turned over to the state agricultural colleges for local direction.

The swallowing process he predicted is well nigh complete, and today the college campus, according to proud assertion, "covers the entire countryside." No one will question the desirability of the extension of educational facilities as far as possible, nor will anyone claim that the present initerant school teaching that constitutes so large a part of present day extension work is inherently bad. But there are many who have witnessed the virility and power of the simple farm or home demonstration in re-making country communities, who believe that the American mania for standardizing even education has resulted in the abandonment of a stronger for a weaker method in the field of rural improvement.

A Farm Relief Measure

Few persons realize that agriculture and home-making extension work was a farm relief measure enacted by the Congress. It is true that the Smith-Lever Act nationalizing extension work was chiefly based upon 10 years of farm and home demonstrations in the South, but in its rapid expansion at the hands of officials of agricultural colleges it lost much of its homely rural "ground up" development and became a centralized, "top down" system. It became the voice of the col-

AGENT Job

By W. H. Darrow

Texas Extension Service Editor

This demonstrator, J. H. Willis of Hill county, Texas, is going over his records with J. M. Martin, county agent. This 75-acre cotton field has increased in yield 10 bales in two years by following demonstration methods. Terracing to prevent sheet erosion and to conserve moisture was a big factor.

lege to the farmer, instead of the self-help system of betterment the farmer was working out for himself with aid from the local extension agents. The modern trend in county and home demonstration work is toward long-time education of the rural masses, rather than quick, decisive, convincing reformations of the farm and home business.

The demonstration is simply the placing of a farm or home enterprise on a better paying basis through a period of months or a few years at most, and the keeping of records to show progress. This, the older school maintains, is the foundation of extension work. The other half of the county or home demonstration job, it is argued, is the extension of the results of these demonstrators to the neighborhood through meetings, tours, exhibits, and news stories.

In the academic type of extension work so common, a farmer asking information about the possibilities of Nortex oats, for instance, will be told by the county agent what the experiment station 100 or perhaps 500

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Second crop for 1930 on 120-acre field of R. T. Alexander.

$100 *per* Acre *from ALFALFA*

By O. T. Coleman

University of Missouri

ONE hundred dollars per acre return from five cuttings of alfalfa on 120 acres of upland soil in Howard county, Missouri, was made possible through the proper use of high grade fertilizer and limestone.

In the spring of 1928, R. T. Alexander plowed 120 acres of upland soil near Armstrong in Howard county, Missouri, and applied three tons of good limestone per acre on it. During the summer he worked this ground often enough to keep the weeds killed and maintain a surface mulch. By doing this, he was able to conserve the moisture and mix the limestone well with the soil, thus allowing it to dissolve more readily and more of it become available by seeding time. In the fall of 1928, 200 pounds per acre of a 2-12-2 fertilizer were applied and the field was seeded to good northern grown alfalfa. Just previous to sowing, the seed was inoculated.

About the time that growth started in the spring of 1930, another application of 125 pounds per acre of an 0-21-9 fertilizer was made on all of the 120 acres except a small strip that represented an average part of the field. The two cuttings made since then yielded an average of about 500 pounds per acre more hay where the 0-21-9 fertilizer was applied than on the strip where it was omitted. This showed quite clearly the necessity of feeding alfalfa to keep the yields up.

Last year Mr. Alexander cut three crops of hay from this 120 acres and this year he has taken off two crops. Each of these five cuttings have averaged fully one ton per acre and he has received an average of approximately $20.00 per ton, or a total return of $100.00 per acre from the land the past two years and, if the weather is seasonable, he will probably receive another ton at the third cutting this fall.

Figuring the delivered price of the limestone at $1.75 per ton, the cost of hauling and spreading at $1.00 per ton, the 2-12-2 fertilizer at $33.30

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Pepping Up PEPPERMINT *with* Potash

By Harry Gardner
Lafayette, Indiana

Professor S. D. Conner of Purdue University Agricultural Experiment Station (left) standing in a no-treatment plot of a mint demonstration on the farm of M. H. Lake near North Judson, Indiana. Mr. Lake (right) standing in a plot of mint which received 250 pounds per acre of 3-9-18.

IT is safe to say that every member of the great American family is familiar with the taste of peppermint. Few know how the oil is produced. Nearly a million pounds are consumed annually in flavoring chewing gum, candies, and bad tasting medicines; in drugs, as menthol for colds, and as a mild anaesthetic; in perfumes and in other varied uses. More than 75,000 acres of mint are required to produce such a quantity of oil. A dozen counties in the muck land area of northern Indiana and southern Michigan grow nearly two-thirds of the nation's requirements. Oregon, Washington, California and one or two other states furnish the balance.

Cutting mint fertilized with 0-8-32 on the farm of W. H. Lake, North Judson, Indiana. Mowing machine hidden by the tall growth.

There is no standard method for the growing of peppermint due to the lack of published experimental work on this crop. Mint growers handle it as their own individual experiences have taught them, resulting in varied opinions with regard to cultural methods and fertilization. When the price of peppermint oil was $25 per pound or even $5 and an acre of muck soil would produce 40 pounds of oil, it was not necessary to worry much about profitable methods of growing the crop. Now with the price of oil at $2 per pound and the yield of oil as low as 10 pounds per acre, methods of profitable fertilization are being sought.

New Practice Is Popular

One of the newer practices in mint growing which is getting the hearty indorsement of many successful growers is the fertilization of the crop before plowing in the fall. Some information has been obtained along this line from two fertilizer demonstrations started in the spring of 1929 in Starke county, Indiana. One of these demonstrations was located on the farm of Roy Shankland near Hamlet and the other on the farm of M. H. Lake near North Judson.

Four one-half acre plots in each demonstration received the same amounts of nitrogen and phosphoric acid in a mixed fertilizer while the amounts of potash varied from 22.5 to 67.5 pounds per acre. Then to get an idea of the value of nitrogen for mint on the high organic muck soil, two plots in each demonstration were laid out and received phosphoric acid and high potash mixtures but no nitrogen. In addition two plots were left untreated to show the results of continuous cropping without fertilization of any kind. Both demonstrations were supervised by county agent, W. K. Delaplane the first year and his successor, W. C. Haynes, this year. The two years' data are now available and are convincingly in favor of fall fertilization.

Little response in yields of oil was shown the first year when the fertilizer was applied in the spring. The check plots, receiving no fertilizer, produced as much peppermint oil as the fertilized plots which indicated that the mint grew on the residual plant food put in the soil by applications of fertilizer previous to the spring applications for the mint. The

Taking the steaming hot peppermint hay out of a tub after the oil has been extracted. This hay is dried and later fed to livestock.

second application of fertilizer was put on last fall before plowing. This year's data show decided changes in favor of the fall applications. The yields of oil this year on the unfertilized plots dropped sharply while the yields of oil from the fertilized plots in most cases were increased over the first year.

In the Shankland demonstration, the average yield of oil from the check plots was 27 pounds 8 ounces per acre while the average yield of oil from all fertilized plots, regardless of the fertilizer ratios used, was 33 pounds per acre. The lowest yield from the unfertilized plots was 24 pounds per acre and the highest yield from the fertilized plots was 35 pounds 8 ounces per acre. At the demonstration on the Lake farm, the unfertilized plots averaged 28 pounds and 8 ounces of oil per acre and all fertilized plots averaged more than 35 pounds per acre. The highest yield was 45 pounds per acre where 3-9-27 was used.

Plenty of Potash

Besides the trend in favor of fall applications of fertilizer for mint, the two years' data show a need for high potash fertilizers where the requirements for nitrogen and phosphoric acid are satisfied. On the Shankland farm this year $1.36 invested in potash returned $10.00 in peppermint oil, figuring the price of potash at six cents per pound when used in a mixed fertilizer containing nitrogen and phosphoric acid and the oil at this year's price of $2 per pound. Mr. Lake realized $24 in oil from an investment of $4.05 in potash.

Because mint production is restricted to relatively small areas in four or five states, methods of growing the crop may be of general interest. New fields are started by planting roots in rows three and one-half feet apart. The planting is done in the spring with roots dug from a field with an established stand of mint. Roots to plant an acre cost from $10 to $15. The first year the mint grows in rows but after that the roots spread and the mint covers all of the ground.

The mint is cut with a mower the same as any hay crop. It is raked when dry and taken to the distillery where the oil is extracted. The oil is in the leaves and great care is taken to get the hay properly cured with the least loss of leaves. Power mowers,

Tramping the cured peppermint hay into a tub where the oil is extracted by distillation.

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Make WHEAT Pay!

Combat Low Prices with High Acre Yields

Says G. P. Walker

Purdue Agricultural Experiment Station

WHEAT fertilization has come to be almost a universal practice in much of the Midwest producing area, but with the present low price, many farmers are considering the question of whether it will pay to invest in fertilizer for this fall's seeding. While the market outlook is not bright, the situation may change before next wheat harvest when the full effect of the widespread summer drought has been realized. If low prices continue, high yields per acre are necessary for profit, and the lower the price, the higher the yield that must be produced to come out ahead.

Labor, seed, taxes, and land rent or interest make up the larger share of the cost of growing each acre of wheat, and these acre costs vary only slightly with low or high yields. Raising the yield per acre reduces the cost per bushel. Intelligent fertilization of the crop often changes loss into profit by increasing yields to the point where the total cost for each bushel is less than the price for which it can be sold. Regular fertilization of the crop seems the rational practice for the growers in the soft red winter wheat belt.

Another item that should be considered in fertilizing wheat is the effect on the other crops in the rotation. The results of long-time field experiments show that a large part, probably half, of the fertilizer plant food applied for wheat is left for succeeding crops. The increased yield and quality of the corn and clover in the rotation often pays for the entire cost of the wheat fertilizer.

Purdue Experiments

Some practical information on what may be expected from wheat fertilization on Indiana farms is furnished by the results of field experiments conducted by the Purdue University Agricultural Experiment Station on a number of different soil types during recent years. In these experiments, guessing at the effects of treatments is largely eliminated as the tests are carefully conducted and the results are

Unfertilized 5.2 bushels per acre — Fertilized 17.1 bushels per acre

An application of 300 pounds per acre of 2-12-6 fertilizer on wheat was the ounce of prevention for a bad case of winter-killing.

Unfertilized
25 bushels per acre

Fertilized
39 bushels per acre

An application of 300 pounds per acre of 2-12-4 fertilizer grew two shocks of wheat where one grew without fertilizer on the Experimental Farm at Lafayette, Indiana, this year.

determined by weighing the crops produced and the materials used.

Two such experiments have been carried on the "black and clay" soil area of central Indiana for a number of years. On the experimental farm near Lafayette 300 pounds of 2-12-4 fertilizer costing $4.44 per acre on wheat have produced as an average of the last six years, 29.5 bushels per acre, while the unfertilized area has averaged 18.9 bushels. Three hundred pounds of 2-12-6 on wheat with 100 pounds in the row on corn have increased the average wheat yield on the Davis Forestry Farm in Randolph county from 12.5 to 23 bushels per acre during the same period. In both cases the increased clover and corn crops following the wheat have more than paid the cost of the fertilizer and left the 10-bushel wheat increase as practically clear gain. Wheat without fertilizer on the Davis Farm has been a consistent money loser.

At North Vernon on the light colored Clermont silt loam soil of southeastern Indiana, average wheat yields have been increased from 9 bushels on the unfertilized section to 17 bushels per acre over a 9-year period by the application of 200 pounds of 2-12-8 fertilizer. At Bedford, on the rolling limestone land of south central Indiana, the 12-year average wheat crop has been increased from 5 to 15 bushels per acre with 300 pounds of 2-12-4. In both cases the cost of these fertilizer applications and similar applications to the corn crop have been more than repaid by the increases of clover and corn crops following. On these soils satisfactory clover has not been possible except where wheat has been fertilized.

Six Bushels Net

On the light colored Vigo sandy loam of southwestern Indiana on the Purdue Vincennes farm, 300 pounds per acre of 2-12-6 on wheat and 100 pounds in the row on corn have increased the 5-year average wheat yield from 15 to 21 bushels after manure had been used on the corn crop. Here again the full cost of the fertilizer has been returned by the increased clover and corn crops, leaving the six bushels of wheat per acre as practically net return for the fertilizer used. On the Princeton silt loam soil on this farm, 300 pounds of 2-12-6 per acre on wheat has increased the yield five bushels over the unfertilized with the increased yields of clover and corn practically paying the fertilizer bill.

On the light colored sandy soils of northern Indiana, more potash and nitrogen in proportion to phosphate are needed. On the Sand Experiment field near Culver on Plainfield fine sand soil the wheat on unfertilized land has averaged nine bushels per acre for the past three years. An ap-

(*Turn to page* 58)

Hill applications of fertilizers gave the best results

Boost Corn Yields

By Rensselaer Sill

University of Wisconsin

FARMERS in Pierce county, Wisconsin, have used commercial fertilizers to increase their yields of corn and other crops for a long time. It was not, however, until their county agent, Harlan Seyforth, ran a series of demonstrations on the best kind of fertilizers to use on corn that they discovered just how corn yields might be made larger through a wise application of the proper fertilizer.

Pretty nearly every place Mr. Seyforth visited he heard the question, "What's the best kind of fertilizer to use on corn?" It was one of those questions that kept popping up at farmer meetings, in the letters coming to his office, and at farm visits. In some counties, in fact in most counties, such a question would be relatively easy to answer. But in Pierce county there were no available experimental data on which the county agent could base an answer.

As the future of corn growing in the county depended to a considerable extent upon a correct answer to the question, Mr. Seyforth and some of the farmers decided to run a few test plots on the fertilizer needs of corn. The soil of the county ranges from a mellow clay loam to a stiff loam, so first of all he sent samples to the State College of Agriculture for analyses.

Fertilizer Tests

Some 50 test plots were laid out and 20 different kinds of fertilizers applied. After watching the growth of corn on the plots all summer and after keeping careful records of growth and maturity, the corn was husked by hand in September, divided into three grades, and weighed. Results from the test plots showed a decided difference in yields from different kinds of fertilizers and from the broadcast and hill applications.

On the farm of William Jacques near Prescott, the 4-12-8 and the 2-16-8 fertilizers applied in the hill at the rate of 175 pounds per acre produced an increased yield of 11 bushels over the check plots. Mr. Jacques, who is a champion seed corn grower and who last year sold more than $50,000 worth of seed, also found that the fertilized plots produced very little immature corn and almost twice as much No. 1 corn as the check plots. When he applied his fertilizer broadcast, he found that the yield was four bushels less per acre than was obtained by the hill application, showing that the hill method is much better for corn.

This year Mr. Jacques expects to produce about 20,000 bushels of seed corn, most of which will be golden glow, a popular Wisconsin variety. He is also growing large quantities of Wisconsin number 7 and Minnesota number 13 in addition to the registered number 37 barley and purebred wheat.

Another demonstration plot on the farm of George Wild near Elm Rock, showed the need of a high potash fertilizer for corn, such as a 2-12-12. This kind of fertilizer increased the yield of No. 1 corn by 11 bushels per acre and hastened the maturity.

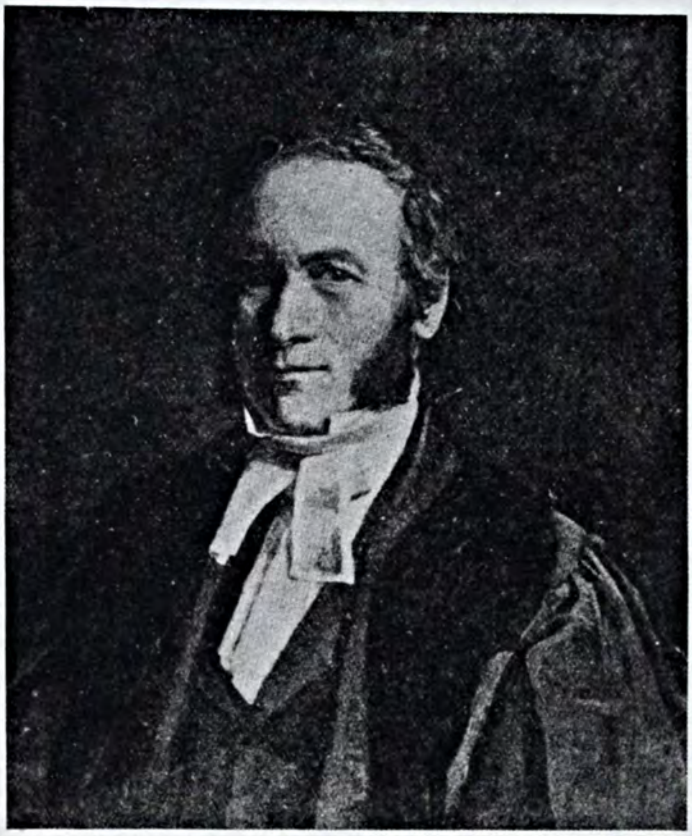
More No. 1 Corn

On some of the other test plots throughout the county, Mr. Seyforth found that a 4-16-8 applied at the rate of 175 pounds per acre was responsible for an increase of 13.10 bushels of No. 1 corn and No. 1 nubbins, a 4-12-8 increased yields by 12.29 bushels, and a 2-16-8 resulted in an increase of 12.25 bushels.

Several other kinds of fertilizers also gave good results, but those with a phosphate content of from 12 to 16 per cent and carrying about 8 per cent potash did best. Two per cent nitrogen seems to be sufficient for

(*Turn to page 52*)

The difference that fertilizers made in pasture yield.



REV. PATRICK BELL.

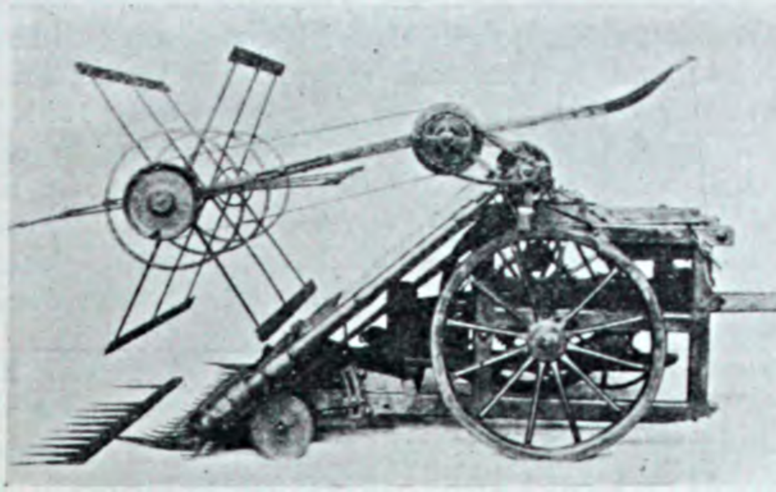
The Inquiring Mind *and the* Seeing Eye

By Dr. A. S. Alexander
University of Wisconsin

IT'S a far cry from the days of the Stone Age, when the sickle was first used for the harvesting of grain, to those of 1930, when the tractor-operated harvester-thresher, cutting a swath 16 feet wide, with two men operating the outfit, covers 45 to 55 acres in a 10-hour day. And what back-breaking toil modern implements have ended!

I can look back to the early seventies, in Scotland, when six sickle reapers and one hand-binder of sheaves did well if they cared for six acres of grain in one long day and when the cutting of two acres of grain was a big day's work for a man with the scythe. The "cradle" was an improvement on the earlier implements, but crude and wearisome to operate. I once cut seven acres of heavy oats with it in a new Iowa orchard where the little apple trees had been set out but 30 feet apart each way and am sure the agricultural student of today would call that "some job." It was!

No wonder, then, that men of inquiring mind and seeing eye have,



Bell's Scottish Reaping Machine of 1828, from a photograph of it as it now exists in South Kensington Science Museum. The original cutters are seen lying in front of the machine.

since time immemorial, been trying to find a better method of harvesting their crops of wheat, rye, barley, and oats.

We use the word "immemorial" a d visedly, for the reaping machine is a much more ancient implement than many people suppose. Both Pliny and Palladius describe one that was worked by oxen and much used in the grain fields of the ancients. Pliny said of it: "In the extensive plains of Gaul large hollow machines are employed, with teeth fixed in the fore part, and they are pushed forward on two wheels through the standing corn (small grain) by an ox yoked to the hind part. The corn cut off by the teeth falls into the hollow part of the machine."

Those were "stripping" or "rippling" machines and, in a measure, similar to "headers" of more modern times. The sickle, however, remained the chief harvesting implement in Europe until the beginning of the nineteenth century. The cradle seems to have been more generally used in America.

Inquiring into the history of the earliest reaping machine we find that in the British "Quarterly Journal of Agriculture" Vol. 1, 1828, p.p. 136-7 an author signing himself "D. C." has an article entitled "On the Use and Advantages of the Reaping Machine." Quotations from that article are made by Professor James Hendrick, of the University of Aberdeen, Scotland, in the Transactions of the Highland and Agricultural Society of Scotland for 1928 in which he treats of the centenary of the reaping machine.

The first machine mentioned by "D. C." was produced in 1812, by Mr. James Smith, Manager of Deanston Cotton Works, Doune. A committee of the Highland Society having inspected and tried this machine earnestly recommended that the Society present the inventor with 200 guineas "as a mark of their appreciation and as an encouragement to labor for the public good." This was in 1815. The writer admits, however, that the machine was not a success. It had a circular cutter and was pushed into the standing grain, as was the earliest machine of shear-like, cutting-knife pattern.

The McCormick-Deering Harvester-Thresher. The tractor-operated harvester-thresher shown cuts a swath of 16 feet and, with two men operating the outfit, can cover from 45 to 55 acres in a day.

The second machine mentioned was invented by Mr. Joseph Mann, Raby, Cumberland, in 1820, and also had a revolving circular cutter.

In the Quarterly Journal article by "D. C." mention is also made of the third notable reaper, a very hopeful machine "invented by Mr. Patrick Bell, a young man in the County of Forfar, Scotland, of high attainments in many of the sciences;" and in the same issue appears an illustrated account of Bell's machine which is termed "a beautiful piece of mechanism."

One Acre Per Hour

The next issue of the Journal (November 1828) gives an account of trials made with the Bell reaper which was operated by one horse and cut about one acre of oats, barley, or wheat per hour, and could be made for about £30.

The "Working of Bell's Reaping Machine" is further described in the Quarterly Journal, Vol. IV, 1832, and it is reported to have been working for some years. Details are given as to the number of machines that had been working, and as to the acreage cut by them in each year. It is stated that in 1832 ten machines were at work which cut among them 320 Scotch acres. When all conditions were right, one of the machines could cut 12 acres a day. Sharpening of the knives was necessary after cutting 50 acres. Loudon's Encyclopedia of Agriculture Vol. I, 2nd edition, London, 1831, also contains a full description of Bell's reaper, with two full page illustrations. The original machine, made by Bell is still in existence. Years ago I saw it in the Science Museum at South Kensington, London.

Patrick Bell, inventor of the 1828 reaping machine was the son of a small Forfarshire farmer, and was about 27 years old when he made his first machine. After living on the farm for some time he worked his way through St. Andrews University where he took his M. A. degree. He was a divinity student at the time he invented his reaping machine, always had been interested in machines, and continued making models of machines and implements after he became parish minister of Carmyllie in Forfarshire.

While living on his father's farm he also set up a small plant and from it lighted the farm house with gas, to the astonishment of the neighborhood. The use of gas at that time was unknown, except in some of the large cities. As a further evidence of young Bell's skill and progressiveness it may be mentioned that he grew beets on his father's farm and manufactured sugar from them which he sold to a merchant in Dundee. That was in 1828, or thereabouts, at which time

Model of the McCormick Reaper of 1831 in use. It required a boy to ride the horse, a man to rake off the cut grain, and six others to bind the sheaves. The capacity of the outfit was 12 acres a day.

the beet sugar industry was entirely confined to comparatively limited districts on the Continent.

After completing his divinity course at St. Andrews, Bell lived for a time in Ontario, Canada, not far from Guelph, acting as a tutor and occasionally preaching in the church of a Scottish settlement. He left Canada in 1837 and spent the rest of his life at Carmyllie, where he died in April, 1869. In the public library at Guelph may be seen photographs of Bell and his reaper. It is also stated that Bell had with him in Canada a model of his machine and that he left it behind him when he returned to Scotland; but, if so, it has been lost.

Cyrus Hall McCormick (1809-1884)
Inventor of the first practical American reaping machine.

Relative to Bell's reaper, which seems to have been the most notable machine of the early ones invented and the only one that survived and did profitable practical work in the field "The Book of Farm Implements and Machines," published in 1858 says: "It is known also that four of the machines were sent to the United States of America; and this circumstance renders it highly probable that they became the models from which the so-called inventions of the American reapers have sprung."

It would seem from an article in the 1865 issue of the Transactions of the Highland and Agricultural Society, quoted by Professor Hendrick, that certain of the earlier machines which appeared before Bell's machine of 1828 "had cutters which worked with a reciprocating motion applied to a tooth knife which worked between teeth or projections." Such an arrangement somewhat resembles the cutters of the present day, and also resembles, in certain respects, the shears used by Bell in his machines.

To Secure Agriculture

When the reaping machine came into general use, after the great Exhibition of 1851, the part which Bell had played in its development was recognized, and various honors were bestowed upon him, including the degree of L.L.D. from his *Alma Mater*, the University of St. Andrews.

At the General Meeting of the Highland and Agricultural Society on

Jan. 15, 1868, Dr. Bell was presented with a piece of plate and £1000 "by a large number of his countrymen in token of their appreciation of his pre-eminent services as the inventor of the first efficient reaping machine."

It seems unfortunate that Bell did not patent his invention. Many of the machines made from his model by ignorant and incompetent workmen were unable to work more than a few years. Relative to this Bell said: "Had I patented the machine at the time, all this bungling in machine-making would have been avoided; and the issue perhaps proves that, for the public benefit even, this was the prudent course to have been adopted. But I was always averse to this step being taken. *I wished the implement to go to the agricultural world free of any extra expense.*"

Those assuredly were the honorable motives of a true research scientist. As Professor Hendrick says: "He was a farmer's son, who had worked in the fields at harvest, and knew the severe nature of the toil to which harvest workers were subjected. He wished to present his invention freely to the agricultural public, and not to add to its cost by any royalties or profits accruing to himself."

At the time of its invention great prejudice against machines existed among farm laborers. The poor quality of the machines first made by careless or incompetent workmen also prevented the new invention from becoming popular. No manufacturer of agricultural machinery appears to have taken up Bell's machine until after 1850. Even in America, where labor was much scarcer and dearer and where agriculture occupied a much more important position than in Great Britain, the reaping machine made very slow progress.

Cyrus Hall McCormick built his first reaper in the old log cabin blacksmith's shop on his father's farm near Steele's Tavern, Virginia, and in the fall of 1831 gave it a practical trial. It was drawn by a horse, instead of being pushed into the grain like Bell's machine, and when given a fair chance is said to have "sailed along in fine trim." In less than half a day the machine had cut six acres of wheat—as much as six men would have done. One horse pulled the machine. One man drove the horse and another walked beside the machine and raked the gavels to the ground. Other men followed in the field and bound the grain into bundles at the rate of about two acres per man, per day. Later, the machine was pulled by two horses, and provision was made for the man with the rake to ride on the machine, facing the rear. Still later (1863 to 1875) the self-rake reaper came into common use.

Big Business

As was the case in Scotland, American farmers seemed loath to give up their old methods and adopt new and better ones. The selling of the new reaper was, therefore, a problem. During the 10 years following the invention of the McCormick reaper in 1831 not a single machine was sold. In 1841, however, two reapers were sold and sales then slowly increased. When an order for eight machines came from Cincinnati, McCormick began trying to interest capital in his invention and finally got a firm in Brockport, N. Y. to make 100 machines. In two years, after leaving Virginia, 240 reapers were sold; then McCormick entered into partnership with W. B. Ogden in 1847 and built a factory in Chicago. Later, he bought out Ogden and established the business which today has grown to such huge proportions and importance under the name of the International Harvester Company. By 1859 there were 50,000 reapers in the United States doing the work of 350,000 men, saving $4,000,000 in wages and filling the granaries of the country with some 50,000,000 bushels of grain.

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The Distribution of— Moisture

By L. F. Jonas

Ames, Iowa

TO cultivate or not to cultivate! Some farmers are ignoring the problem. Others are puzzling over it. Still others are accepting the most recent findings of scientific men and if they are cultivating at all, their cultivation is shallow.

Having a heavy bearing on the problem is the question, does water continually come from the water table to the surface or to the root zone of crops? There has long been a tendency to believe that it does. On the other hand, much investigational work has been done which would seem to disprove this, and to determine the relative distances that water will move above a water table and the effect that different types of soil have on this movement.

To present the latest conclusions of nationally known authorities on the subject, Harold D. Hughes, professor of farm crops at Iowa State college, Ames, Iowa, and Edwin R. Henson, assistant professor in the same department, co-authors of a book, *Crop Production,* on the press this summer, have devoted a part of the book to the results of recent investigational work.

In harmony with the conclusions they have drawn, the amount of cultivating done on the agronomy farm at Iowa State College has for some time been lessened, and what cultivation is done is relatively shallow. In general, there is no cause to cultivate, they believe. If farmers who cultivate to eradicate weeds would fight them

A chart drawn by Professor Henson showing at the bottom the extent of the water table in the various soils, and above, the per cent of water at different levels, and at the top, the per cent in inches the water rises above the water table.

other ways, it would be so much the better for their crops, they declare.

According to Mr. Henson, the new idea is fast taking hold and the use of shallow cultivating implements, the drift harrow, for instance, is becoming widespread.

Mulch paper is also being used with good results on the college gardens, entirely substituting cultivation.

Some of the experiments made by scientific authorities, upon which Professors Hughes and Henson have based the conclusions on water in relation to plant growth as set forth in their book, follow:

Limitation of capillary rise has been demonstrated by experimenters, in tubes 4, 6, 8, and 10 feet long and 8 inches in diameter, filled with sandy loam and Yolo loam soils. They were run in duplicate at Berkeley and Davis, California. The water evaporated from the surface in one month, as shown by the following table, gives a measure of the small amount raised by capillarity from a wet soil with free water at various distances below the surface:

Height Above Free Water	Inches of Water Berkeley	Davis
4 feet	1.57	3.50
4 "	2.10	3.69
6 "	.54	1.85
6 "	.70	1.99
8 "	.00	.97
8 "	.15	1.03
10 "	.00	.16
10 "	.00	.17

Capillarity in soils ceases when the diameter of the particles is more than 2 mm., and it varies with smaller particles in proportion to their fineness; the finer the particles the greater the lifting power, but the slower the movement, another quoted authority declares. Conclusions from the same source are that loss of water by evaporation from water underneath the soil surface decreases as the distance between the surface of the water and the surface of the soil increases.

A report from the New Mexico experiment station is that the maximum height that moisture will rise in soil-filled tubes set in water is: in a sandy soil, 32 inches, and in a clay adobe soil, 50.5 inches. It was found that there is but little movement of moisture from a wet into a dry soil, although moisture will move 30 inches from a wet soil to the roots of wheat.

Downward Percolation

In the matter of retention of moisture, it has been found that a soil kept mulched by placing a fine, dry layer on the surface lost 0.73 inches of water from the first foot, while an unmulched soil lost 1.52 inches of water during the summer as an average for three years. In the second foot of soil, the loss was 0.02 and 0.46 inches, respectively, and 0.00 and 0.04 inches for the third foot. This loss seems to indicate a moisture movement upward without a water table. In this experiment, mulch inhibited the absorption of water by increasing the amount of water held in the mulch. It has been shown that in the case of a moderate rain, the mulch may take up all the moisture and none of it will penetrate deeply into the soil.

Distribution of moisture in Nebraska soil, at intervals through a period of 17 months, in shown on page 55. The water table was subject to fluctuations varying from 17 to 20 feet below the surface.

It has been determined that when soils are thoroughly moistened and then protected from losses by evaporation they lose water by downward movement. "The downward movement will continue until the ratio of moisture content to hygroscopic coefficient lies between 1.8 and 2.5. When this downward percolation ceases, the soil contains only capillary and hygroscopic moisture. The moisture in the subsoil is able to move upward only slowly and such a short distance in a single season that it will

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The disc harrow has ruined many an asparagus bed.

Tons *of* Asparagus

By E. R. Lancashire

Ohio State University

AN acre of asparagus set out in 1900 has been producing at the rate of 3,000 pounds annually and the average net income per pound has been 15 cents. The asparagus bed on this general type of farm has returned about $450 each season.

This story, related by M. H. Rogers of Solon Road, Xenia, Ohio, could, no doubt, be duplicated in many parts of the United States. The interesting feature about this story is the soundness of the observations made by Mr. Rogers concerning the growing of this particular crop. The 40-odd tons of asparagus produced on this acre during the past 30 years is not just chance.

The marketing of a ton and a half of asparagus annually is done locally by Mr. Rogers. When the planting was young, he shipped the crop to Toledo. Conditions have changed, and the once distant market is not now as profitable as the local one. Fresh, green, tender asparagus is better appreciated at home than it used to be. To insure the customers the highest quality of "grass," as he calls it, Mr. Rogers has developed a definite schedule of handling this crop. Among the several things which he pays particular attention to are liming, fertilizing, cultural practices, and the harvesting of the crop.

Years ago, when the idea first developed, special care was taken to select the most fertile and well-drained acre of soil available. In fact, Mr. Rogers took two years to get this acre of soil ready and in shape for planting with one-year-old asparagus roots. First of all he selected a piece of red clover sod. If he were doing it today he stated that his choice would be alfalfa sod. He has noticed that it takes good soil and good farming to make a real alfalfa sod.

Just before the sod was turned under in preparation for the asparagus planting, the acre was liberally covered with manure. The rate was 20 tons per acre. The following season a cultivated crop was produced and that fall another 20 tons of manure were applied. This program was repeated the next year. In this way upwards of 60 tons of manure were mixed into the future asparagus seedbed. Rogers believes that well-mixed soil and manure is better than anything else for asparagus.

Neutral Soil

During the second year in a cultivated crop, Rogers put on the acre several loads of limestone. Perhaps his unusual success with asparagus is due to this precaution. Asparagus grows best in a soil which is nearly neutral. An acid soil will not produce a good asparagus bed.

When the one-year-old roots were first planted in this acre of soil, they were in rows five feet apart and the distance between plants 20 inches. Today the planting looks as though it had been made broadcast. All evidence of the row method of planting used has disappeared as the years rolled along.

An asparagus bed an acre in area is a costly piece of property to acquire and will prove a good investment only when properly handled. The record made by Mr. Rogers is evidence enough that the methods he uses are sound and practical.

Half of the one-year-old roots used were purchased and the other half were grown by Rogers. After the planting was well under way he concluded that he might as well have grown all of them for by so doing he could have had more roots to select from. He believes that only the largest roots with the buds well distributed on the crown should be planted.

The years have brought Mr. Rogers a method of justifying his use of large amounts of fertilizer. He saw somewhere a chemical analysis of the elements which are found in asparagus. For example he found in this report that calcium, supplied through lime applications, played a very important part in the manufacture of the fibers found in asparagus. The market favors the large, thick, dark green spears of asparagus and this report told Rogers that nitrogen was of great importance in helping the plants to manufacture this color, as well as proteins, and to promote a fast vegetative growth in the early spring. Iron and magnesium play an important part in the color manufacturing process of asparagus.

The two other important fertilizer elements used by most plants, potash and phosphorus, were also highly profitable in connection with asparagus.

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A valuable type of weed killer.

No Flax Surplus

By W. Carl Dorr

Bedford, Iowa

ONE crop that can be grown profitably in Minnesota, North and South Dakota, Montana, and parts of Iowa and Wisconsin is flax. There is no surplus production in this cash crop which has had an average consumption of 40,650,000 bushels in this country and an average annual production of 21,865,000 less the sowing supply in the period 1924-1928. The July 1 estimate of the 1930 crop was 30,100,000 bushels. The new tariff law raised the rate on flaxseed from 40 cents to 56 cents per bushel, and the old rate of 3.3 cents per pound on all linseed oil imported is still effective.

As long as it is necessary to import millions of bushels of flaxseed each year (20,250,000 bushels in 1929) this crop will continue to increase in acreage, and especially so with the new high tariff now in effect. This cash crop has shown a higher gross income per acre than spring wheat or oats for each 5-year period from 1909 to 1928 in North Dakota, Minnesota, South Dakota, and Iowa.

An effort is being made in Iowa to increase the 1931 acreage materially. Experiments are being carried on at the Iowa Experiment Station, Ames, for the first time in a number of years. The time of planting is being studied with three different dates. The use of a commercial powder for treating the seed has shown the power to double the stand.

Prof. H. D. Hughes of the Iowa Station is of the opinion that flax may be adopted in the rotation system in the place of oats, always a very low paying crop. He says that flax should be planted about the same time as oats on ground that has been worked down to a firm seedbed, in which there are no air spaces. The ground should be as free of weeds as possible. If, on account of weeds or any other reason, one must sow late, from one-third to one-fourth more seed per acre should be planted. Approximately 30 pounds of Buda, Linota, or North Dakota Resistant No. 114, or 35 to 45 pounds of Bison should be planted per acre by means of a drill.

Despite the fact that flax is a crop relatively free from destructive diseases one should secure certified seed of the wilt-resistant varieties, as the ones named above, or Redwing or Chippewa. One should be especially careful to plant only clean, bright seed. If the weeds can be controlled, the earlier plantings usually give the larger yields. The average yield in Iowa has been around 11 bushels per acre, while under the best conditions as much as 20 bushels are secured.

Planting flax as a mixture with

(*Turn to Page 53*)

By
E. K. Walrath
Westminster, Maryland

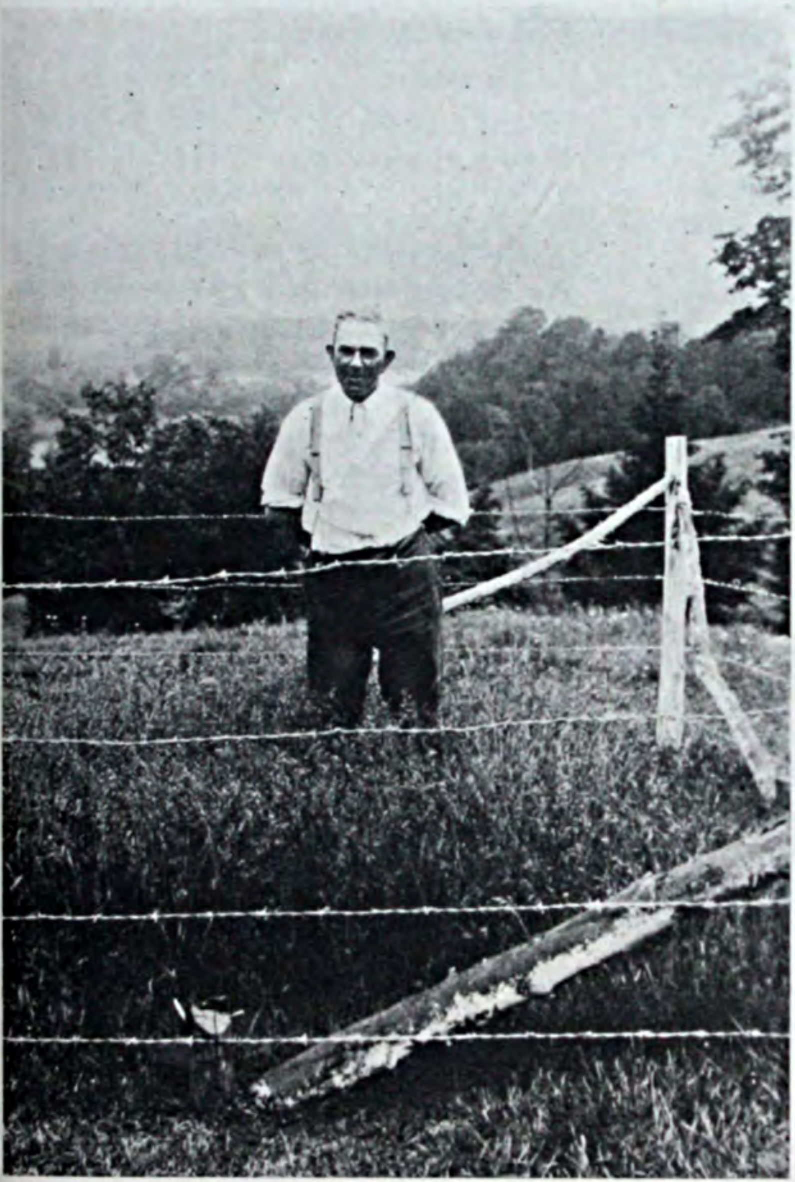
Pasture

THAT pastures can be made highly productive by top-dressing with fertilizer and lime without the expense of plowing and reseeding has been demonstrated by two years' work in Bradford county, Pennsylvania. In the spring of 1929 five sets of fertilizer plots were started on two farms so as to get a range of sod conditions typical of those found on Bradford county farms. Two sets of plots were put on the farm of Enos Granger near Towanda while three sets of plots were established on the farm of L. and I. Brown, at Ulster.

Based on the amount of good pasture grasses and clover, these sods ranged from good to very poor. The good sods were composed of Kentucky bluegrass, bent grasses, and white clover with some weeds. The poor sods were composed largely of weeds such as paint brush, sorrel, cinquefoil, and daisies, and yarrow, yet the good grasses and clover, though small, were still present. In the poorest sod the weeds had practically replaced all grass and clover. This poorest sod was the only one where top-dressing with lime and fertilizer was not effective. Here the land has had to be reseeded to Kentucky bluegrass and white clover.

On the farm of Enos Granger, one set of plots was located on a thin sod composed largely of devil's paint brush (hawkweed), sorrell, and cinquefoil but in which bluegrass and

Top-dressing



This pasture plot was fertilized April 29, 1929, with 1 ton of ground limestone and 1,000 pounds of 5-10-10. April 10, 1930, it received 250 pounds of sulphate of ammonia. From May 14 to June 19 it yielded 8,168 pounds of green weight as compared to 1,513 pounds for the plot on the opposite page which was not limed or fertilized.

white clover, though small, could be found. Limestone at the rate of a ton to the acre was used on part of the plots. Superphosphate was used alone and in combination with lime, muriate of potash, and nitrogen.

Comparison of Treatments

The different plots were fertilized at the rate of 1,000 pounds per acre of the following grades of fertilizer: 0-10-0, 0-10-0 and lime, 0-10-10 and lime, and 5-10-10 and lime. Another plot had 500 pounds per acre of the 5-10-10 fertilizer and lime. Part of each of these plots as well as unfertilized areas were fenced off so the cattle could not graze them. Clippings were made through the pasture seasons in 1929 and in 1930.

Taking the green matter produced on the unfertilized plot as 100, the different treatments gave the following yields in 1929 and 1930:

Plot	Treatment	1929	1930
1	unfertilized	100	100
2	0-10-0	104	123
3	0-10-0 & lime	156	129
4	0-10-10 & lime	262	230
5	5-10-10 & lime*	320	362
6	5-10-10 &lime**	643	542

*500 *pounds* 5-10-10 *per acre, nitrogen only repeated in* 1930.

**1,000 *pounds* 5-10-10 *per acre, nitrogen only repeated in* 1930.

Lime, phosphorus, and potash applied to all plots only in 1929.

The first year of the test, phosphorus alone was no better than the unfertilized area. In 1930 the yield had increased 23 per cent. Lime-phosphorus increased the pasture 56 per cent the first year, the increase being largely clover. In June, 1929, the clover leaves on this plot showed the regularly-spaced white spots which denote potash starvation. In 1930 there was very little clover on this plot, which accounts for the relative drop in production from the first year.

No Sign of Starvation

The plot which received lime, phosphorus, and potash had far more clover and no signs of potash starvation. In 1930 the clover still persisted on this plot and this accounts for the greatly increased yield. The two plots having the complete fertilizer were the only ones on which the Kentucky bluegrass was greatly stimulated. The high production of this grass when adequately fertilized is shown in the figures above. In 1930 the nitrogen was applied again to these two plots and the bluegrass gave a tremendous growth.

The plots on the better pasture at Granger's were not fenced in 1929 so no yields could be taken. In 1930 the fence was not put up until after the cows had grazed all plots closely. The fence was put up on May 14 and yield records were made on June 18.

During this period the unfertilized plot produced 1,513 pounds of green matter per acre, while the complete fertilizer plot produced 8,168 pounds. The unfertilized plot produced mostly weeds, while the complete fertilizer produced practically clear bluegrass. On this sod all of the treatments showed that they were producing results.

On the farm of L. and I. Brown, three sets of plots were established in 1929. The first set of plots was on a good sod composed largely of Kentucky bluegrass. The treatments here were unfertilized, compared with 400 and 800 pounds per acre of a 6-8-6 fertilizer. Limestone at the rate of one ton to the acre was applied in the spring of 1929. The fertilizer was applied in 1929 and 1930. Taking the production of the unfertilized plots as 100 in each year, the following results from the use of the fertilizer were obtained:

Treatment	1929	1930
Unfertilized	100	100
400 lbs. 6-8-6	165	188
800 lbs. 6-8-6	229	290

These results showed that this good sod responded greatly to complete fertilizer. Even with the 800-pound application the point of diminishing returns had not been reached. The fertilized plots also came through the extremely dry year of 1929 in better shape than the unfertilized plots as is shown by the production in 1930.

On the fair sod at Browns' the story is about the same as at Granger's. The plots used were the 0-10-0, 0-10-0 and lime, 0-10-10 and lime, and the 5-10-10 and lime. The 0-10-0 both with and without lime was relatively ineffective. The clover was greatly increased on the 0-10-10 plot while on the 5-10-10 plots Kentucky bluegrass was brought from a position of being merely present to the point where it produced real feed and replaced the weeds. On the very poor sod in which there was practically no clover or good grasses, none of the top-dressing treatments was effective. In the spring of 1930, these plots were gone over with a springtooth harrow and were seeded to Kentucky bluegrass and white clover.

Early Grazing Pays

This work with five sets of plots on two Bradford county farms shows that on all but the poorest pasture sods top-dressing with lime and fertilizer will greatly increase the productivity. The use of phosphorus alone and with lime was relatively ineffective because lack of potash and nitrogen were limiting production

(*Turn to page 57*)

TORNADOES

By Solon R. Barber

Washington, D. C.

TORNADOES are wind, and for more than 50 years different Government agencies have been measuring tornadoes, collecting facts and figures attempting to assemble them in some helpful way. Tornadoes, of course, vary in intensity from the great, swift howlers that sweep across Kansas and Nebraska to the pretty little "whirlwinds" that toe-dance like graceful, tall, grey ladies across the deserts of the West. Tornadoes do incredible things.

Mr. P. C. Day of the Weather Bureau tells of tornadoes that lift iron beams, that raise houses off their foundations, and carry children through the air and deposit them, unharmed, some distance away. These stories, accurate, differ considerably from the ones veteran ranchers used to tell me in a mock serious way. Everyone has heard of the swift wind that blows chickens through barn walls and places donkeys on the towers of churches.

In recent years, climatologists and other scientists have found ways and means of measuring tornadoes more accurately. But it has not always been so, and Mr. Day says that lack of weather-reporting stations in certain districts where these storms occur and an early general lack of population over some of the lately developed territories in the tornado area made it impossible to secure the full facts needed from certain regions until rather recent years.

A General Study

The Signal Service made quite an intensive study of the occurrence of "six hundred tornadoes" during the 87-year period from 1794 to 1881. While the period covered was a long one, still the study was little better than a general one inasmuch as it was by no means a complete one. The figures presented afforded no means of correctly interpreting the comparative frequency of tornadoes over different parts of the country, or in the different parts of a single state.

The Weather Bureau gathered and published the details of tornadoes occuring in the period from 1889 to 1897, but again the data were not

In the wake of a cyclone which covered only a narrow strip near Johnstown, Colorado.

representative of all parts of the country.

In 1916, the Weather Bureau again undertook to collect tornado statistics on a uniform basis for all sections of the country. And by that time, the areas where these storms are most frequent had become more fully populated and means for securing information had become widespread. It was felt then, and is felt now, that it is pretty hard for an important tornado to get by without being seen and measured. Since 1916, the Weather Bureau has worked out a system of presenting graphically the presence of tornadoes by areas of 10,000 square miles each. The Weather Bureau has divided the United States into such areas and within these squares each year is placed the number per year of tornadoes that occur. The Weather Bureau has a map which shows these facts for a 13-year period—1916 to 1929.

A study of this chart shows that most tornadoes occur over extreme northeastern Kansas where the average number of these storms for the period was slightly more than three per year. Numbers nearly as high are found in nearby sections of Nebraska, in central Arkansas, and over the greater part of Iowa. Over the less elevated portions of the country, between the Rocky mountains and the Appalachians, tornadoes are less frequent, but distributed fairly equally. The frequency decreases westward quite rapidly as the Plains rise into the Rockies and tornadoes are much less frequent west than east of the Rocky mountains. The inter-mountain states have had practically none during the period under study. Tornado-frequency also diminishes rapidly as we go northward and tornadoes become somewhat rare near the Canadian boundary. They are mainly less frequent in the East than in similar latitudes of the Mississippi valley. While tornadoes diminish toward the Gulf Coast, they are quite likely to occur in Florida. However, Mr. Day says that any important area east of the Rocky mountains is apt to be visited occasionally.

What is a tornado? Mr. Day defines it as a local wind, whirlwind, of great velocity, generally accompanied by rain, thunder, and lightning. It is almost always characterized by a funnel-shaped cloud that appears to hang from the bottom of a much greater cloud mass above. The wall of the funnel, of 50 to a few hundred feet in diameter, is made up of a mass of violently whirling air with strong ascending components. The whole system travels, in general, from southwest to northeast, in a narrow path which may be from a few feet to a quarter of a mile wide. A tornado generally travels from 30 to 40 miles an hour. The length of the path varies from a few miles up to 200 miles or more.

Where Tornadoes Occur

Tornadoes, says Mr. Day, usually occur in the southeast quadrant of an advancing low-pressure area and seem to be formed at the cloud level by the passing of a cold northerly current by a warm current from some southerly direction. Where these winds meet, a whirl may be set up. When this descends toward the earth, it reaches the ground as a wildly rotating wind column of varying dimensions that moves generally in a northeasterly direction.

What time of year are tornadoes most likely to pay us an unwelcome visit? That is an important question. Fortunately, the Weather Bureau has figures for the period of 1916 to 1928 inclusive. Striking an average for months and years during the period, we find that May and June (with 22.8 tornadoes each, average for the whole period, for the whole country) hold the honors. The average number of tornadoes during the period for April was 20.3. March had 11 and July 9.1. January, 2.1;

(*Turn to page 50*)

New Fruits

by

E. N. Bressman
Oregon Experiment Station

THE old order changeth and we have new styles in fruit as well as in miladi's dress. Plant breeders all over the world are busy producing new varieties which are higher yielding, more hardy, and more pleasant to the taste than the fruits being grown at the present time. It is doubtful that many of our present-day varieties will be grown by the second generation from the present. Valuable new varieties are available at the present time.

There appears to be an insistent public demand for red color in the apple and everyone is looking for a red "sport." Berries of large size and deep color are bringing a premium in most markets. Canners are demanding berries which retain their bright color when preserved. Tourist trade and roadside stands require varieties which ripen early and at the time when folks are on the highways. Even varieties which will not stand shipment are coming into use for the tourist trade.

It must be remembered that all of the varieties mentioned herein are not adapted to all conditions. Under environmental conditions which are similar to those where the varieties originated, it can reasonably be expected that the new fruits are worthy of a trial. In most cases it is best to try out a limited number of plants rather than put out an entire plantation. Growers of tree fruits must be certain of the varieties that they plant.

There are several new apples which are worthy of mention. Some of these are Staymared, Carlton, Newfame, Red McIntosh, Crimson Beauty, Cortland, Melba, Joyce, Milton, Macoun, Early McIntosh, Starking, and Anoka.

The Staymared is a "bud sport" of the Stayman Winesap. It was found at the Moomaw orchard in Virginia. Most of the "sports" in apples are inferior to the parent. The Staymared, however, appears to differ from the parent in color only. The dark, red color of this new variety should bring joy to the hearts of those who are looking for red color in the apple.

The Carlton was originated at the New York Experiment Station at Geneva. It is the result of a cross between the varieties, Montgomery and Red Astrachan. This new variety is characterized by large size and tart taste. The statement has been made that Carlton has all of the good characteristics of the well known Red Astrachan parent but none of its faults.

Newfane was originated by the same station and is of the Delicious type. It is the result of a cross between the varieties, Deacon Jones and Delicious. Newfane is similar to the Delicious but has better color and larger size.

Another red "sport" is the Red McIntosh, which was originated by a prominent New York fruit grower, Isaac C. Rogers of Dansville. It appears to be the first red "sport" of this variety. Recent red "sports" of other varieties are Starking, Rickared, Red Baldwin, Red Spy, and Red

Gravenstein. Surely the market demand for a red apple will soon be met.

Breeding work is being carried on in Oregon, South Dakota, New York, and other places to obtain blight-resistant varieties of pears. Professor Reimers of Talent, Oregon, is well known for his valuable contributions. N. E. Hansen, horticulturist at Brookings, South Dakota, has developed several varieties of pears. Some of these are resistant to blight.

The Geneva station has recently named and introduced four varieties of pears. The newest of these varieties is Ewart, a seedling of the Bartlett type. Its fruits ripen about a month later than the Bartlett and they are of excellent size, shape, and color. It is stated that the trees are resistant to blight. The new variety was named after a fruit grower of Akron, Ohio, Mortimer Ewart, who grew the first cions and fruits.

Three new varieties of peaches have been originated in Canada. All of them are of the Elberta type, but earlier. These varieties have been named Vedette, Valiant, and Veteran. Mikado is another early Elberta type. Much effort has been expended to obtain early Elberta types.

South Haven, originated by A. G. Spencer of Kibbie, Michigan, is a Crawford type. This new peach is about two weeks earlier than the well-known Elberta. For local consumption it is considered one of the best of the recent new varieties.

Two new plums are Albion and Monitor. The former was originated at Geneva from a cross between Golden Drop and Grand Duke. It is of the Grand Duke type, but superior to that parent. The Monitor plum was originated at Excelsior, Minnesota, by the Minnesota Fruit Breeding Farm. It is the result of a cross between Burbank and a native seedling. Monitor is quite winter hardy.

Beauty and Formosa are two of Burbank's creations. These Japanese plums have met with favor for some time. Hansen of South Dakota has grown several thousand plum and cherry seedlings. He has developed numerous varieties, most of which carry Indian names. Stanley is a prune type from Geneva.

The mosaic disease is the limiting factor in raspberry production in many places. Resistance to this disease has been sought for by many breeders. Latham and Lloyd George are two of the newer varieties which have been receiving attention.

The Viking red raspberry is a new creation from Canada. It was originated by Prof. F. S. Reeves of Prince Edward Island, while he was still connected with the experimental farm at Vineland. Professor Reeves states that this variety brings a premium on the market because of its large size and color. The new variety has met with favor in the eyes of growers, pickers, and consumers. Viking shows some resistance to mosaic.

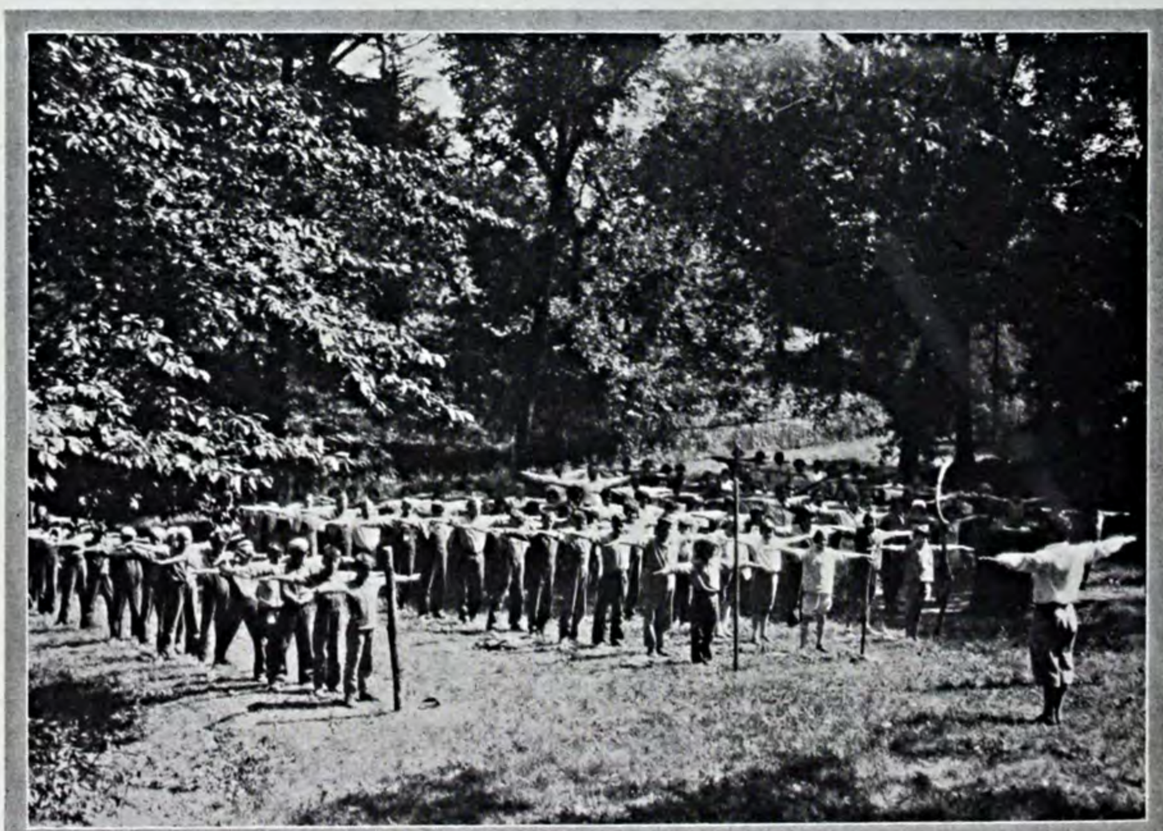
Newburgh was originated at Geneva from a cross between Newman and Herbert. It is about a week earlier than the well known Cuthbert variety. In quality and size of fruit Newburgh is outstanding. It is claimed that this variety is resistant to disease.

The Blakemore strawberry was originated by the U. S. Department of Agriculture from a cross between the Missionary and Howard 17 varieties. It is suggested for trial where these parents and the Klondike are grown, particularly in the South. This variety was named for Marcus Blakemore, first president of the National Preservers' Association. Blakemore is early and superior for both preserving and the market.

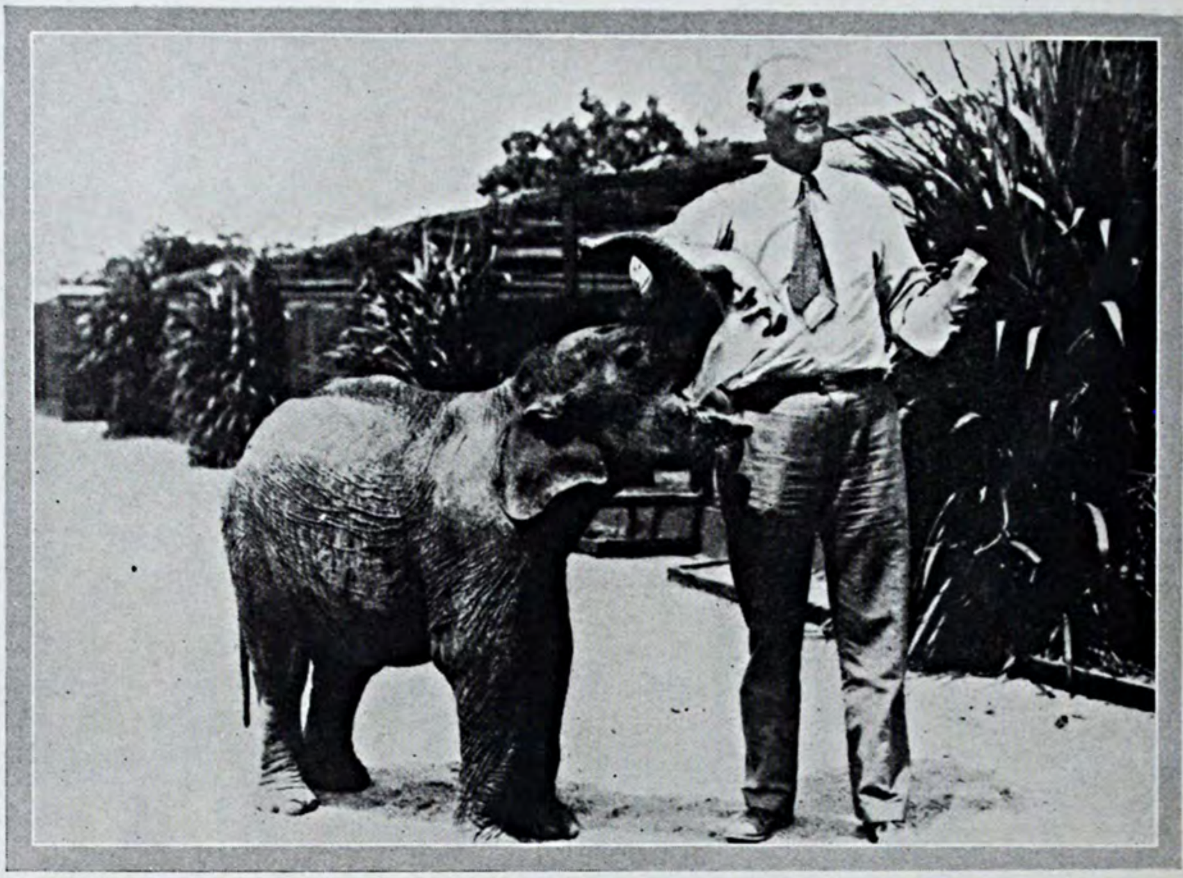
Wynona is one of the best late strawberries. It was originated as a seedling of Gandy by A. S. Johnson of Bedford, Virginia. The excellent appearance of the fruit of this variety is one of its outstanding features.

. . . . Just at the time when he was giving her a big thrill with his new speedster. This is always a tough break but especially so when you are trying to make a hit with your best girl.

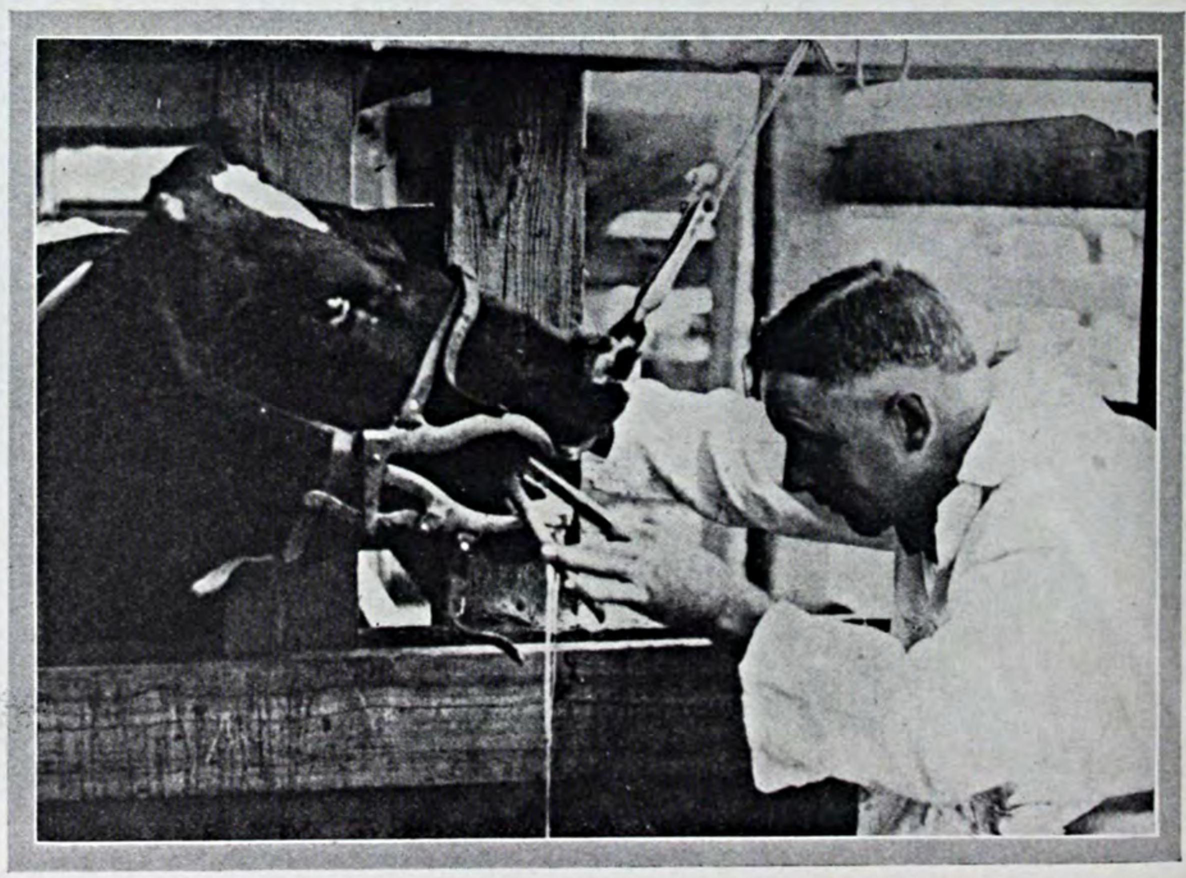
Above: Dorothy Marshall, of Pomona, Calif., the National All-round "Farmerette" Champion, training for the National Farm Girl Championships which are held this month at the Los Angeles County Fair. Below: Boys and girls attending a 4-H Club Camp taking part of their daily calisthenics to keep fit for other activities.

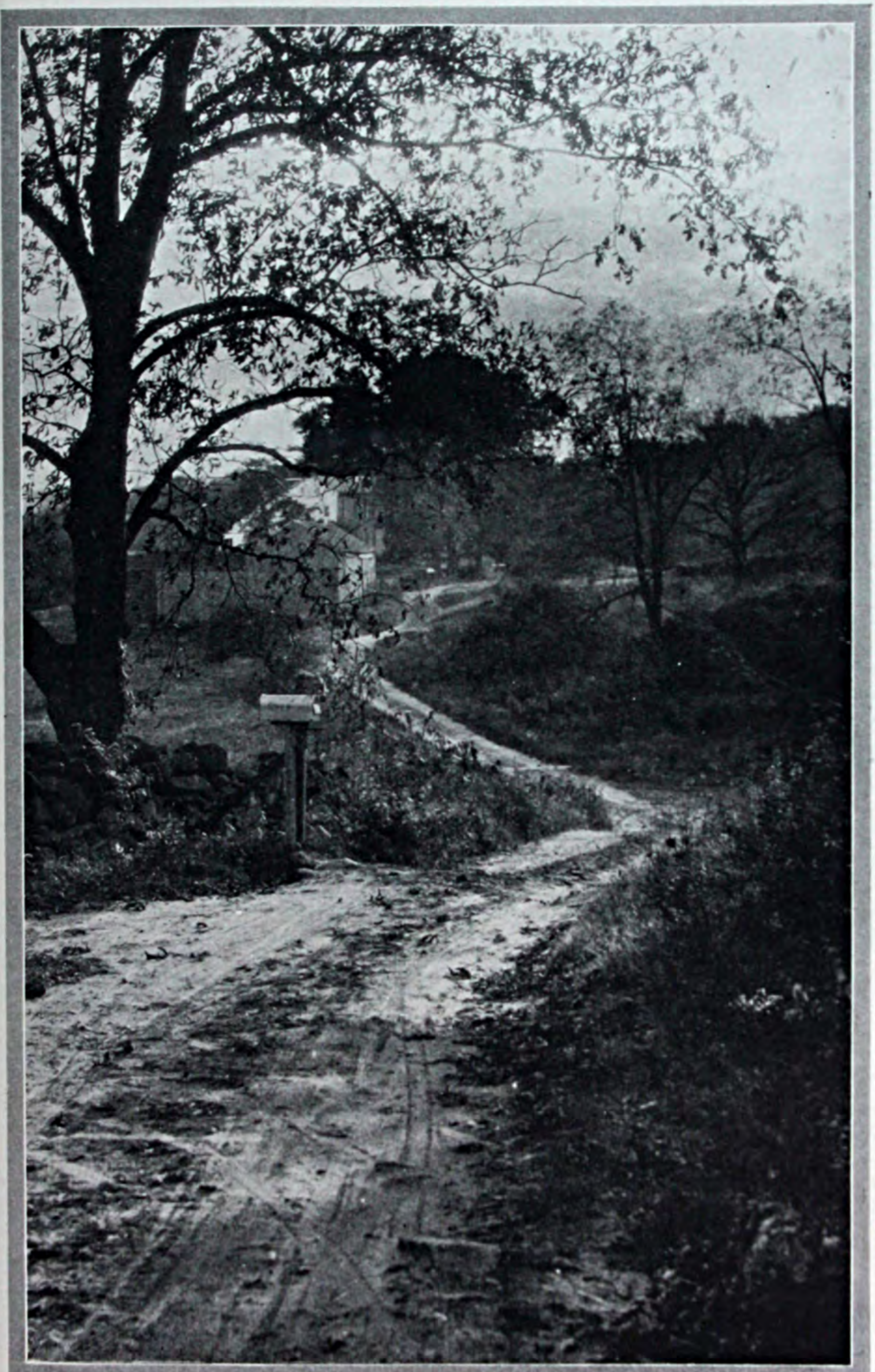


World series material, maybe. But not this year.

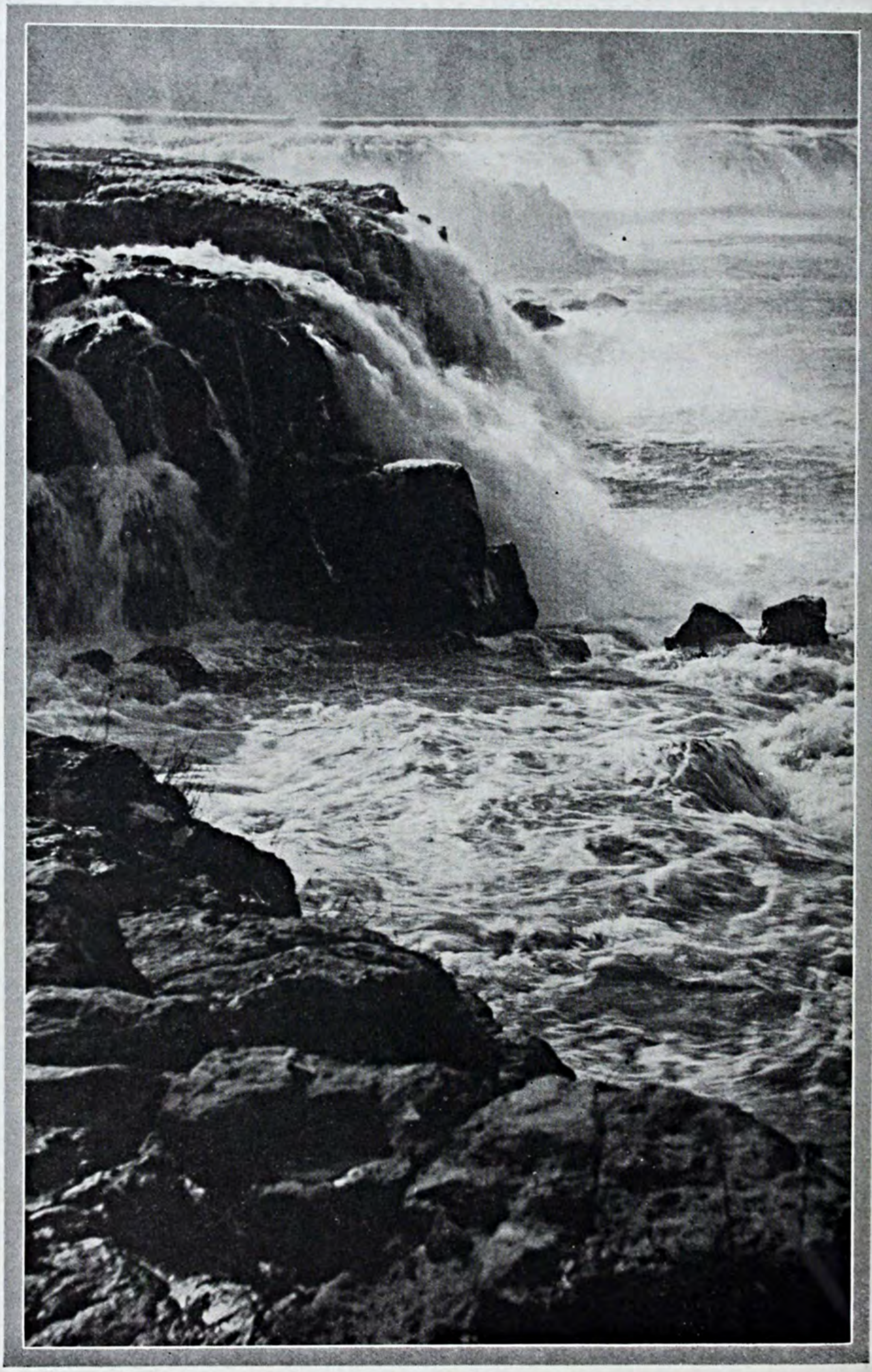


Above: "Tinymite", of Los Angeles, Calif., whose menu consists of six quarts of milk, six heads of lettuce, seven gallons of rice, three loaves of bread, one gallon of raisins, and one gallon of bran. Below: "Open wider please!" Experiments with farm animals are helping scientists to find the cause of tooth decay.





Enough to inspire a poet or an artist.



No! You are wrong; this isn't Niagara . . . It is the Celilo Falls in the Columbia River.

The Editors Talk

The Fertilizer Situation

The recent change of outstanding importance in the present fertilizer situation has been the rapid decline in crop prices, though the situation is quite variable and spotted over the country as a whole. The outlook in some parts of the country is better and in other parts of the country not so good as at this time last year.

The situation appears less favorable in the Southern States. The July 15 farm price of cotton was 11.9 cents per pound. This represents a decrease of 15 per cent from the June price and is 31 per cent below the July, 1929, price. The August 1 condition report of the United States Department of Agriculture indicates a cotton crop of 14,362,000 bales this year. This is 3.1 per cent less than the 1929 crop and 4.4 per cent less than the 1924-1928 average. North Carolina, South Carolina, and Georgia were the principal States reporting prospects of greater production than last year. Alabama, Arkansas, Louisiana, Mississippi, and Tennessee reported the largest reductions in the prospective crop compared with last year. Therefore, conditions are more unfavorable in the Mississippi Valley area where the combination of low crop prices and severe drought damage will apparently result in no returns for this year's crop.

Prices for early marketed tobacco in Georgia and South Carolina averaged about 20 per cent lower than for comparable grades last year. The condition of the crop on August 1 indicated a reduction of 2.9 per cent from last year's crop. A less than normal increase in the indicated supply of flue-cured tobacco improves the prospects for higher prices as the season advances.

In the Midwest, lower prices for wheat, slightly lower prices for corn, and severe drought damage in some areas combined to make the outlook at present somewhat less favorable than a year ago, though a certain amount of optimism prevails regarding fall fertilizer tonnage.

The outlook in the potato-growing sections of New England, New York, and New Jersey appears to be about the same as last year. Except for some areas, yields are expected to be better than the average. The July 15 farm price was 42 cents per bushel above the low price of a year ago, but approximately 10 cents below the price that prevailed throughout the remainder of the season.

Conditions on the Pacific Coast, particularly in the southern fertilizer areas, are good. A continuance of good prices is expected for citrus and other crops. Conditions in Florida are fair to good. In some sections of the Middle Atlantic States with certain crops, conditions are fairly good. In other sections conditions are poor.

The possibilities of increased prices on some crops will tend to offset the decreased prices on others. This will tend to help the purchasing power of the farmer and to favor the use of fertilizer on these particular crops in greater amounts next year. High prices of a crop usually tend to influence favorably the amount of fertilizer used on it the following year.

While crop prices have declined, conditions in certain areas, particularly outside the Cotton Belt are such that the situation would have to be called spotted rather than uniformly bad.

Of course, the season is yet very early, prices later in the year have much more to do with the situation. There is still time for changes, and the present unfavorable indications of the fertilizer situation this year may be materially improved, especially in some sections of the country. Careful consideration and planning of the business rather than undue pessimism should be the order of the day so as to make the most of the bright spots that appear.

The City Man and the Country Boy

A recent development of major importance in Ontario has been the linking up of farm projects with City Service Clubs, Boards of Trade, and Chambers of Commerce. Boys' Potato and Grain Clubs, Calf Clubs and Poultry Clubs have been sponsored, encouraged, and directly assisted by Rotary, Kiwanis, and other urban organizations—and with conspicuous success.

Such gestures on the part of business men toward the farmer and his boy are not at all new. There has always been a keen desire on the part of the city man to help and to advise the farmer, but failure has too often resulted from an entire lack of understanding of farm problems by the would-be benefactor and a wrong method of approach. The farmer does not care to be "advised" by those who don't "know." Therefore the reasons of the apparent success of the present undertakings might be studied thoughtfully.

Two disastrous pitfalls have been avoided. By using the County Agricultural Representative as chief counsellor and go-between, the Service Club members don't give advice. That is left for those who are not only competent to give sound advice, but who have the confidence of the boy and his father.

And next, the approach to the project has not been one of condescending tolerance—the farm boy is not considered to be in the "underprivileged" class, but on the other hand is treated as an equal. He stands side by side with the Rotarian or Kiwanian; talks over in a friendly fashion the details of the project; keeps accurate record of cost and of profits; and makes his report at the end of the year in a businesslike way. Mutual friendships spring up, goodwill and more complete understanding arise. The respect of the farm boy for his occupation increases and he is encouraged by his association with business men to improve himself and his farm practice.

Mr. W. A. Weir, Chairman of Eastern Canada Agricultural District for the Kiwanis Club, and himself a graduate of an Agricultural College, states that the "one and only objective is the development of a better understanding with the farming community." But while this has been the main purpose, the nature and design of the various projects have contributed much information of very direct benefit to the boy, his parents, and the community.

The "Downtown Kiwanis Club of Toronto" sponsored a Boys' Potato Club in Ontario county in 1929, in which 113 boys participated. Their yields were very much higher than the county average. Thirty-eight boys secured an average yield of 240 bushels per acre; ten of them within a fraction of 300 bushels; while one secured a yield of 452 bushels per acre—more than twice the average county yield. It was shown that yields could be profitably increased by the wise use of fertilizers, increased yields as high as 137 bushels per acre being recorded as due to fertilizer alone. Comparative costs of production showed that good seed, proper cultivation and spraying, and judicious use of fertilizer all combined to give greater return for money and labor expended. Other growers in the community are taking advantage of such facts, with mutual benefit to all concerned.

In another potato growing district the Rotarian sponsors, through the medium of their boy proteges in the Club project, encouraged the boys to grade their potatoes before selling. The direct benefit from this enterprise was soon observed by the fathers and neighbors of these boys, and the idea developed to the extent that the whole output of potatoes in that area were put on the market properly graded and in attractive bags under a special brand name. "Tepee" brand now stands as an epitome of quality.

These are some of the results of Service Club activities with the country boy. The method of approach is not—how to *keep* the boy on the farm, but how to make him *want* to stay.

Flax

Everybody should be happy to learn of a crop in which there is no over-production. W. Carl Dorr tells in another page in this issue that there is no surplus production in flax.

The crop is suited to Minnesota, North and South Dakota, Montana, parts of Iowa, and Wisconsin. There is an average flax consumption of something over 40,000,000 bushels in this country and only an average annual production of approximately 22,0000,000 bushels. The July 1 estimate of the 1930 crop was some 30,000,000 bushels.

A new tariff raised the rate on flaxseed from 40 cents to 56 cents per bushel and the rate of 3.3 cents per pound on all linseed oil imported is still effective.

The place of flax in the rotation, some hints on growing flax, the harvesting of the crop, weed control, and other factors are discussed in an interesting manner by Mr. Dorr.

Sinners

We have heard many preachments on the importance of maintaining the fertility of our soils, but none, it seems to us, have had quite the appeal of the two paragraphs quoted below from an address delivered by Clarence Ousley, former Assistant Secretary of Agriculture of the United States, before the recent convention of the National Fertilizer Association at Denver, Colorado. We are hardly capable of selecting classics, but seemingly this should rank with Ingalls' essay on "Grass" or Vest's eulogy on "The Dog", as one of the classics that should appeal to all farmers.

"I always contemplate the earth with reverence. I like the phrase 'Mother Earth'—the source of all our sustenance, the storehouse of all our supplies, our raiment, our shelter, the pathway of our feet, the final resting place of our worn bodies. And of all its elements and attributes, the soil seems to me to be most appealing and vital, and I cannot but regard its depletion as vandalism and sacrilege. The good God gave us but one soil, and He gave it for the use of His children to the end of time. We are but His trustees in the occupancy and preservation of the estate of all posterity. If we despoil it, if we fail to maintain it, if we leave it less fruitful than we received it, we are unfaithful trustees, and I feel that in the sight of God we are as culpable as if we robbed the estate of orphan children of whom we were made guardians by decree of court.

"Spiritual or emotional considerations aside, the first rule of all sound business enterprises is to maintain the physical plant. Allowance for depreciation and for replacing wear and tear is the first charge against profits; it cannot be spent or dissipated without inviting bankruptcy. The soil is the farmer's laboratory plant, and it must be maintained. There was a time when increasing population called for a large volume of supplies, and when the greater demand enhanced land values more than soil depletion depressed them. But we are nearer a state of equilibrium between population and supplies. We now have overproduction of nearly every product and in nearly every agricultural country. Henceforth, the first requisite of profitable agriculture is increased acre yield to reduce unit cost, and the first element of that requirement is soil fertility."

When those of us mathematically inclined begin to figure the amount of plant food removed by annual harvests, that is lost out of our soils by useless erosion, or escapes by preventable leaching, and balance this against the pitifully small amounts restored by legumes, manures and commercial fertilizers, we are bound to admit that we are recreant to the trust imposed upon us by an allwise creator of leaving our soils as good as we found them. In other words, that we have sinned and must sooner or later pay the penalty, if, indeed, we are not paying it now.

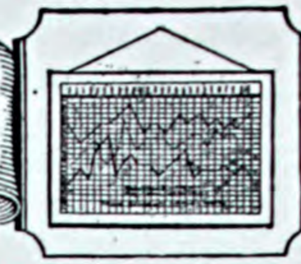
The Capper Award

We were indeed pleased at the announcement that Dr. Stephen Moulton Babcock has been selected as the first recipient of the Capper award in agriculture. Dr. Babcock's unselfish devotion to the advancement of the industry has become a legend in agriculture. In the June issue of BETTER CROPS WITH PLANT FOOD appeared Dr. A. S. Alexander's tribute to the grand old man whose "inquiring mind and seeing eye" have done so much for the farmers of the world.

The award, which will be officially presented to Dr. Babcock in Madison, Wisconsin, at the time of the Country Life Conference October 7 to 10, comes from a fund provided by Senator Arthur Capper of Kansas. It is anticipated that the award will be granted annually "to provide a concrete expression of gratitude to some of the persons who have made contributions of national importance to agriculture and to assist in stimulating public appreciation of unusually fine service to the farming industry." In other words, to function in the field of agriculture much as the Nobel prizes do in the fields of arts, letters, and the fundamental sciences. The annual award consists of $5,000 in cash and a gold medal.

The committee on awards is made up of F. D. Farrell, President of the Kansas State Agricultural College, John H. Finley, Editor of the New York *Times*, Carl R. Gray, President of the Union Pacific Railroad, James T. Jardine, Director of the Oregon Agricultural Experiment Station, Frank O. Lowden, President of the American Country Life Association, H. A. Morgan, President of the University of Tennessee, Walter T. Swingle, Agricultural Explorer, United States Department of Agriculture, and F. B. Nichols of the Capper Press.

AGRICULTURAL DEVELOPMENTS



Turnips or Rutabagas?

By E. N. Bressman

Oregon Agricultural College

IT is surprising to find that a large number of growers are unable to distinguish between many of our common crops. I find that there was a great deal of interest in the article "Squash or Pumpkin?" in the August issue of BETTER CROPS.

Many have asked how to distinguish between turnips and rutabagas, which are common root crops fed to livestock in many sections where the nights are cool and these roots make a large tonnage.

The rutabaga has a short stem on the upper part of the fleshy root which is harvested for feed. On the other hand, the turnip has no stem on the upper part of the root. Just a simple little botanical difference is the distinction between these two crops. It is true that both of these crops are closely related and belong to the botanical group known as Brassica. The common wild mustard and nearly one hundred species of plants belong to this group. Some of them are annuals, some biennials like rutabagas and turnips, and many of them are perennial in growth.

In the field it is fairly easy to distinguish between turnips and rutabagas particularly when they are rather young. The rutabaga leaf has a waxy bloom which may be rubbed off with the fingers. This bloom gives the rutabaga a bluish or gray cast to the green color of the leaf. On the other hand, the turnip has none of this bloom but has a bright or grass green appearance.

Chlorate Sprays

THE use of the chlorates as sprays for killing noxious weeds has spread more rapidly than almost any new agricultural contribution. This spread has been due chiefly to the favorable publicity given to this valuable method by the agricultural press.

There appears to be a difference of opinion in regard to whether or not the spray material must reach the foliage of the plant or whether it can be applied to the soil. There has been some work which shows that sprays on the ground, either liquid sprays or the chlorates as dust give good control. Recently, however, much of the work indicates that if satisfactory kills are to be obtained the spray or dust material must reach the leaves of the plant.

Spraying or dustings of noxious weeds with chlorate material up till the time the plant seeds in the fall are giving good results. In fact some trials show that sprayings late in the fall are the most desirable. At any rate fall sprayings give good results and can be practiced in cases where that time of spraying is the most feasible.—*E. N. Bressman.*

WORK SOIL AROUND TREE ROOTS

In working the soil around the roots no air spaces should be left when the tree is finally planted. The soil should be firmly and carefully packed so that the tree cannot be shaken from its position, says the American Tree Association of Washington. The pointed stick and tamper may be used, but fingers and heel are more efficient for small trees and less liable to bruise the roots. A popular and excellent way to get the soil properly around and among the roots is to soak the soil in the excavation after the roots are covered and, after the water settles, to complete the filling in of the soil. An inch of loose soil or leaf mould should be placed about the tree to prevent the soil from baking. The Association will send anyone, for a stamp, full tree planting suggestions.

WISCONSIN FARM LIFE SURVEY REVEALS CHANGES

That country life in America is undergoing revolutionary changes is disclosed in a survey of some 300 Wisconsin farm families and by a close study of their interest and participation in the activities of various organizations in the local communities, according to E. L. Kirkpatrick, associate professor of rural sociology at the University of Wisconsin.

During the next decade rural America will swing more and more toward an interest in recreation, education, and the artistic side of farm life, according to Professor Kirkpatrick, who notes that the trend in farm life is toward the intangible or nonmaterial things.

In the survey it was found that farm families taking part in the activities of different local clubs and organizations, usually took a fairly large number of periodicals, had books in their home libraries, spent considerable time in reading, and listened to the radio quite often. The results of the survey indicate that if rural clubs and different community groups are to succeed in the future, they must study their place in country life carefully and base their programs on thoroughgoing study.

The American neighborhood, Professor Kirkpatrick points out, no longer holds farmers to the contacts of former days. Farm families are merging with the more complex life of all society. Their range of interests are expanding as never before. The radio, newspapers, good roads, telephone, and better transportation facilities in general are largely responsible for this break-down in the old style farm and village home.

To study these changes in detail and to see how they are related to standards of living on the farm, hundreds of country life leaders will assemble at the 13th annual meeting of the American Country Life association to be held at the University of Wisconsin, October 7-10.

U. W. PROFESSOR HONORED

Professor L. R. Jones of the plant pathology department of the University of Wisconsin received an honorary degree of doctor of science at Cambridge, England, from Oxford university, according to a recent announcement. Professor Jones is now attending the fifth international botanical congress at Oxford university.

RIGHT

Economics Professor: "Name some production in which the supply exceeds the demand."

Student: "Trouble."—*High Tension News.*

Who says sports are harmless? Think of all the unhappy children in this country made fatherless by golf.—*Life.*

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

An interesting and instructive general discussion of factors to be considered in the use of fertilizers is contained in Circular 317 of the California Experiment Station at Berkeley by Dr. D. R. Hoagland entitled, "Fertilizer Problems and Analysis of Soils in California." Discussing the influence of availability of soil minerals on fertilizer needs, the author points out that the kind and fineness of soil minerals, as well as the crop being grown, govern to a large extent the amount of nutrients able to be supplied by the soil and the amount needed to be added as fertilizer. Moreover, it must be kept in mind that the fertilizer materials, especially potash and phosphoric acid react in the soil. The application of a fertilizer to the surface of the soil affords no certainty that roots, especially of trees many feet below the surface, receive the nutrients. The phosphoric acid and potash may be held in the surface soil and never reach the root zone of fruit trees, thus resulting in such trees suffering from a lack of nutrients even though fertilized. Some relationships between fertilization and quality are also presented. This excellent short and clearly written circular offers much food for thought for all who are interested in the use of fertilizers, practical as well as scientific.

The increase in the use of fertilizers in Indiana is strikingly portrayed by H. R. Kraybill and co-workers in Circular 171 of the Purdue Agricultural Experiment Station entitled, "Commercial Fertilizers." In 1883, only 8,000 tons of fertilizer were sold in this state; in 1929, 291,193 tons, an increase of 36 times. The first use of appreciable quantities of complete fertilizer was in 1893, when 18,000 tons or 47 per cent of the total tonnage fell in this class; in 1929, 214,010 tons complete fertilizer were sold comprising 73 per cent of the total tonnage. Another table shows that between the years 1920 and 1929 the average pounds per ton of actual plant food in all fertilizer sold rose from 328 to 417 pounds, while the average cost per ton of plant food dropped from .114 cents to .094 cents. This shows that farmers are buying higher analysis fertilizers and are getting them cheaper per pound of plant food, even though the total average cost per ton of fertilizer has increased slightly.

The most popular fertilizer analysis from 1922 to 1924 was 0-16-0; from 1925 to 1928 a 2-12-2 analysis and in 1929, a 2-12-6 analysis. This trend in the use of nitrogen, phosphoric acid, and potash is further shown by the amounts of these individual nutrients consumed in all fertilizers.

	Nitrogen Tons	*Phosphoric Acid* Tons	*Potash* Tons
1920	1,748	25,129	3,795
1929	5,978	31,760	18,361

These figures shows a marked increase in the use of nitrogen and potash and a moderate increase in the use of phosphoric acid. This relatively faster increase in the use of nitrogen and potash is in line with the trend in many of the Mississippi and Ohio Valley States.

Standard definitions of the various fertiilzer materials, as well as usual tables of fertilizer control data are included in this circular.

"Registration, Labeling, Inspection, and Sale of Commercial Fertilizers; 1929," Agr. Exp. Sta., Columbia, Mo.

"Analysis of Commercial Fertilizers," Agr. Exp. Sta., Clemson College, S. C., Bul. 267, Aug., 1930, R. N. Brackett and D. H. Henry.

Soils

"The Effect of the Amount and Nature of Exchangeable Cations on the Structure of a Colloidal Clay," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 129, Oct., 1929.

"Reconnaissance Soil Survey of Lake of the Woods County, Minnesota, U. S. Department of Agriculture, Washington, D. C., No. 8, Series, 1926, Mark Baldwin, J. Ambrose Elwell, and W. W. Strike.

"Soil Survey of Kossuth County, Iowa," U. S. Department of Agriculture, Washington, D. C., No. 19, Series 1925, T. H. Benton, D. S. Gray, F. R. Lesh, and J. E. McKeehen.

"Soil Survey of Clayton County, Iowa," U. S. Department of Agriculture, Washington, D. C., No. 20, Series 1925, T. H. Benton and A. L. Gray.

"The Base Exchange Property of Organic Matter in Soils," Univ. of Ariz., Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 30, June 15, 1930, W. T. McGeorge.

Crops

The Delaware Agricultural Experiment Station has published the results of their pasture improvement work in Bulletin No. 164 recently released. The author, George L. Schuster, has presented the four years' investigations clearly and with enough illustrations to quickly conclude which fertilizer treatment brought best results. The best grazing turf produced was on the lime, superphosphate, and muriate of potash plot. Anyone interested in pasture improvement will find this bulletin a valuable reference.

"Maintenance of Moisture-Equilibrium and Nutrition of Plants At and Below the Wilting Percentage," Univ. of Ariz., Tucson, Ariz., Tech. Bul. 29, Mar. 15, 1930, J. F. Breazeale.

"The Climate of Arizona," Univ. of Ariz., Tucson, Ariz., Bul. 130, Apr. 1, 1930, H. V. Smith.

Monthly Bulletin of the Department of Agriculture, State of California, Sacramento, Calif., Vol. XIX, No. 6, June, 1930.

"Progress Report of Prune Storage and Maturity Studies," Univ. of Idaho, Moscow, Idaho, Bul. 167, August, 1929, C. C. Vincent, Leif Verner, and E. C. Blodgett.

"Alfalfa on the Cut-over Lands of Northern Idaho," Univ. of Idaho, Moscow, Idaho, Bul. 169, Mar., 1930, J. H. Christ.

"Soybean Production in Kansas," Agr. Exp. Sta., Kansas State Agr. Col., Manhattan, Kan., Bul. 249, Feb., 1930, J. W. Zahnley.

"A Report of the Tribune Branch Agricultural Experiment Station," Agr. Exp. Sta., Kansas State Agr. Col., Manhattan, Kan., Bul. 250 Mar., 1930, T. B. Stinson, and H. H. Laude.

"Abstracts of Papers Not Included in Bulletins, Finances, Meteorology, Index," Agr. Exp. Sta., Orono, Me., Bul. 353, Dec., 1929.

American Potato Journal, Potato Association of America, East Lansing, Mich., Vol. VII, No. 8, July, 1930.

"Time of Harvesting Soybeans," Univ. of Mo., Columbia, Mo., Bul. 279, Feb., 1930, R. E. Uhland.

"Legume Inoculation," Univ. of Mo., Columbia, Mo., Bul. 282, Mar., 1930, W. A. Albrecht.

"A Classification of Soybeans," Univ. of Mo., Columbia, Mo., Res. Bul. 131, Dec., 1929, W. C. Etheridge, C. A. Helm, and B. M. King.

"Legume Bacteria with Reference to Light and Longevity," Univ. of Mo., Columbia, Mo., Res. Bul. 132, Jan., 1930, Wm. A. Albrecht, and Lloyd M. Turk.

Forty-third Annual Report of the Agricultural Experiment Station of Nebraska, Univ. of Nebraska, Lincoln, Neb., Feb. 1, 1930.

Fortieth Annual Report, Agr. Exp. Sta. of the N. M. Col. of Agr. and Mechanic Arts, State College, N. M., 1928-1929.

The Bimonthly Bulletin, Ohio Agr. Exp. Sta., Wooster, Ohio, No. 145, July-Aug., 1930.

"Irrigated Pastures for Dairy Cattle," Agr. Exp. Sta., Ore. State Agr. Col., Corvallis, Ore., Sta. Bul. 264. May, 1930, I. R. Jones and P. M. Brandt.

Bul. 271, July, 1930, Dept. of Agriculture-Immigration of Virginia, G. W. Koiner, Commissioner, Richmond, Va.

"The Production of Cereals Under Irrigation in Washington," State Col. of Wash., Agr. Exp. Sta., Pullman, Wash., Bul. 240, June, 1930, H. P. Singleton.

"Lettuce Growing in Greenhouses," U. S. Dept. of Agr., Washington, D. C., Farmers' Bul. 1418, May, 1930, Revised, James H. Beattie.

"Growing Cucumbers for Pickling," U. S. Dept. of Agr., Washington, D. C., Farmers' Bul. 1620, Apr., 1930, J. H. Beattie.

"*Varieties of Hard Red Spring Wheat,*" *U. S. Dept. of Agr., Washington, D. C., Farmers' Bul.* 1621, *May,* 1930, *J. Allen Clark.*

"*Growing Black Locust Trees,*" *U. S. Dept. of Agr., Washington, D. C., Farmers' Bul.* 1628, *May,* 1930, *Wilbur R. Mattoon.*

"*Steam Sterilization of Soil for Tobacco and Other Crops,*" *U. S. Dept. of Agr., Washington, D. C., Farmers' Bul.* 1629, *May,* 1930, *James Johnson.*

"*The production of Hyacinth Bulbs,*" *U. S. Dept. of Agr., Washington, D. C., Cir.* 112, *Apr.,* 1930, *David Griffiths.*

"*Timber Growing and Logging Practice in the Northeast,*" *U. S. Dept. of Agr., Washington, D. C., Tech. Bul.* 166, *Mar.,* 1930, *Samuel T. Dana and William B. Greeley.*

"*Breeding Tobacco for Resistance to Thielavia Root Rot,*" *U. S. Dept. of Agr., Washington, D. C., Tech. Bul.* 175, *Mar.,* 1930, *James Johnson.*

"*Agricultural Education—Organization and Administration,*" *Federal Board for Vocational Education, Washington, D. C., Bul.* 13, *Agr. Series No.* 1, *Rev. edition, May,* 1930.

"*Analysis of the Management of a Farm Business,*" *Federal Board for Vocational Education, Washington, D. C., Bul.* 88, *Agr. Series No.* 16, *Revised June,* 1930.

"*Analysis of the Management of a Corn-growing Enterprise,*" *Federal Board for Vocational Education, Washington, D. C., Bul.* 101, *Agr. Series, No.* 24, *Revised June,* 1930.

"*Methods of Teaching as Applied to Vocational Education in Agriculture,*" *Federal Board for Vocational Education, Washington, D. C., Bul.* 103, *Agr. Series, No.* 25, *Revised April,* 1930.

"*Supervised Practice in Agriculture Including Home Projects,*" *Federal Board for Vocational Education, Washington, D. C., Bul.* 112, *Agr. Series, No.* 29, *Revised Edition Apr.,* 1930.

Diseases

"*Researches on Potato-Virus Diseases in Montana,*" *Univ. of Mont., Agr. Exp. Sta., Bozeman, Mont., Bul.* 231, *June,* 1930, *P. A. Young and H. E. Morris.*

"*The Symptoms of Spindle Tuber and Unmottled Curly Dwarf of the Potato,*" *Univ. of Neb., Lincoln, Neb., Res. Bul.* 47, *May,* 1930, *R. W. Goss.*

"*The Bacterial Diseases of the Bean,*" *Cornell Univ., Agr. Exp. Sta., Ithaca, N. Y., Memoir* 127, *Apr.,* 1930, *Walter H. Burkholder.*

"*A Chemical Control of Sweet Potato Scurf,*" *N. C. State Col. of Agr. and Engineering, State College Sta., Raleigh, N. C., Tech. Bul.* 38, *May,* 1930, *R. F. Poole.*

"*Raspberry Disease Control,*" *Pa. State Col., State Col., Pa., Cir.* 133, *June,* 1930, *George L. Zundel.*

"*Chlorosis—Yellowing of Plants,*" *Agr. Exp. Sta., Utah State Agr. Col., Logan, Utah, Cir.* 85, *May,* 1930, *F. B. Wann.*

Insects

"*Surface Tension, Surface Activity, and Wetting Ability as Factors in the Performance of Contact Insecticides,*" *N. H. Agr. Exp. Sta., N. H., Tech. Bul.* 39, *Feb.,* 1930, *W. C. O'Kane, W. A. Westgate, L. C. Glover, and P. R. Lowry.*

"*The Bean Leaf Beetle,*" *S. C. Agr. Exp. Sta. of Clemson Agr. Col., Clemson Col., S. C., Bul.* 265, *May,* 1930, *C. O. Eddy and W. C. Nettles.*

"*The Rice Weevil and Associated Insects in Relation to Shuck Lengths and Corn Varieties,*" *S. C. Agr. Exp. Sta. of Clemson Agr. Col., Clemson Col., S. C., Bul.* 266, *June,* 1930, *O. L. Cartwright.*

"*Notes on Miscellaneous Insects of Utah,*" *Agr. Exp. Sta., Utah State Agr. Col., Logan, Utah, Bul.* 216, *April,* 1930, *Herbert J. Pack (Compiled by George F. Knowlton).*

Economics

The importance of fluctuations in agricultural production as a cause of business cycles in this country is demonstrated in a study published recently by the University of Michigan entitled, "The Rôle of Agricultural Fluctuations in the Business Cycle." This study by Dr. V. P. Timoshenko does not pretend to explain business cycles by the single factor of fluctuations in agricultural production alone, but rather to show the importance of agricultural fluctuation in initiating business cycles.

Cycles of varying length and amplitude are shown to exist in agricultural production and in the ratio of agricultural to industrial prices. It is found that a low ratio of agricultural to industrial prices generally precedes or coincides with a business revival, while a high ratio often precedes or coincides with business recessions. Large crops do not regularly increase the purchasing power of farmers, but they do generally increase the purchasing power of railroads and of dealers in agricultural products. Large crops also tend to result in large volume and high value of agricultural exports which brings purchasing power from abroad in monetary form and acts as a stimulus to business activity.

"Credit Problems of North Carolina Cropper Farmers," N. C. Agr. Exp. Sta., State College Station, Raleigh, N. C., Bul. 271, May, 1930, H. H. Wooten.

"Factors Relating to the Price of Idaho Potatoes," Dept. of Agr. Economics, Univ. of Idaho, Moscow, Idaho, Bul. 166, June, 1929, R. B. Heflebower.

"Farm Land Values in Kansas," Agr. Exp. Sta., Kansas State Agr. Coll., Manhattan, Kan., Cir. 156, Jan., 1930, Harold Howe.

"Types of Farming in Nebraska," Neb. Coll. of Agr., Lincoln, Neb., Bul. 244, May, 1930, Harold Hedges and F. F. Elliott.

"Variations in Crop Production Costs in Medina County, Ohio," Ohio Agr. Exp. Sta., Wooster, Ohio, Bul. 453, June, 1930, F. L. Morison.

"The Market Situation and Outlook for the Oregon Canned Fresh Prune," Oregon Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 263, May, 1930, Milton N. Nelson and W. H. Belden.

"Cost and Efficiency in Pear Production in the Rogue River Valley," Oregon Agr. Exp. Sta., Corvallis, Ore., Sta. Bul. 267, June, 1930, Ralph S. Besse, W. S. Brown, and L. P. Wilcox.

"Land Utilization and Farm Management in Wyoming County," Pa. State College, State College, Pa., Bul. 257, May, 1930, P. I. Wrigley.

"Cost Reduction in Dry-farming in Utah," Utah State Agr. Coll., Logan, Utah, Bul. 215, Mar., 1930, P. V. Cardon.

"Economic Aspects of the Washington Fruit Industry," Wash. Agr. Exp. Sta., Pullman, Wash., Bul. 238, April, 1930, Neil W. Johnson.

"Economic Aspects of Apple Production in Washington," Wash. Agr. Exp. Sta., Pullman, Wash., Bul. 239, April, 1930, Neil W. Johnson.

"Analysis of the Management of a Cotton-growing Enterprise," Federal Board for Vocational Education, Washington, D. C., Bul. 105, Agr. Series No. 26, Revised June, 1930.

Tornadoes

(*From page* 32)

December, 2.6; and October, 2.9, are the months of lowest frequency. The year 1928 was a great tornado year. The Weather Bureau recorded 203 in that year. In 1919 there were only 65. During the period, 1916 to 1928 inclusive, the United States was visited by 1,481 recorded tornadoes. The average number per year for the period is 113.9.

Says Mr. Day:

"The chief concern is the fact that tornadoes will occur in the future. Moreover, their destructive effects will continually be augmented, not by increased severity of the storms, but as a result of the growing population and the building of larger factories, schools, or other places where people congregate."

The Weather Bureau's study indicates that the largest loss of life and property from tornadoes usually occur when a storm passes over a city or a number of thickly inhabited areas. On June 28, in 1924, such a storm caused great damage in and near Lorain, Ohio, resulting in a loss of nearly 100 lives and property damage amounting to about $12,000,000. In 1925, on March 18, a tornado of unusual length and severity passed from southeastern Missouri, across Illinois, and into Indiana, (more than 200 miles), and left 689 persons dead and a property damage of more than $16,000,000 in its wake. In 1927, on September 29, a $25,000,000 tornado caused the death of 79 persons at and near St. Louis, Missouri. Aggregate property losses from tornadoes were more than $43,000,000 in 1927—more than $26,000,000 in 1924—and more than $24,000,000 in 1925. Other years show varying losses in lives and property.

These freak storms have strange physical effects. Instances are on record where tornadoes have lifted heavy iron beams, offering little resistance to

"Ah's got to go to school."

safety-first and life-saving pointers, specialists studied the storm path of one of the most destructive tornadoes of recent years, that of March 18, 1925. This storm passed for more than 200 miles in a nearly straight line from near Annapolis, Missouri, across Illinois, and disappeared in Pike county, Indiana. They discovered that steel and reinforced concrete buildings withstood the force of the winds without much damage. It was hard to say, in all cases, however, whether or not the buildings had been directly in the path of the strongest wind. It appeared also that frame structures strongly braced with sheathing offered a lot of resistance to the wind. All brick buildings as well as ordinary frame buildings, in the direct path of the storm, suffered greatly.

the wind, and carried them considerable distances. In one case, two iron-frame cultivators standing side by side in a field were picked up and carried some distance and dropped. One was torn apart. The other was dropped unharmed. One temperamental wind picked up a nest with an egg in it, carried it away with the wreckage of a barn, and dropped the nest and egg unbroken. Another wind carried a child some distance and dropped it uninjured—but a horse nearby was mangled. A man was alone in his house at night. He noticed that a door opened strangely. He went to investigate—stepped outside the door—and dropped a considerable distance to the ground.

In the hope of securing valuable

Tornado-proof Structures

Mr. Day says that it seems possible to build structures that will stand the force of tornadoes. But whether the chance of a certain area being hit by a tornado is great enough to justify the increased cost of building is up to the builder to decide. Mr. Day feels that schools and other public buildings, as well as factories and other buildings where many people gather, should be built with a view to tornado resistance.

Tornadoes usually move from west to east. That being the case, Mr. Day says that one's first thought, in case of a threatened tornado, should be to get out of the way, traveling at right angles to the storm. A position on the north side of the storm's track is safer than one an equal distance to the south.

The storm cellar is a classical retreat in danger in the tornado country. But in the absence of a storm cellar, one may run to the basement or cellar of a frame house. It is best to choose the side from which the storm is approaching, especially the southwest corner, close to the wall, where, if the house moves or breaks apart, the debris will ordinarily be carried away from the position.

In a brick house, however, the walls may fall in and the cellar prove a death trap instead of a refuge. If there is no protection below the ground level, it is best to find some hollow or depression in the ground and lie flat, face down, and hold to anything handy.

In schools of one story, Mr. Day recommends strongly fastening the desks to the floor. In such cases, they will offer quickly available refuges to the pupils in case of tornado, and under which the students may crouch, thus greatly lessening the danger of death or injury.

Boost Corn Yields

(*From page* 17)

Pierce county soils. Next year, says Mr. Seyforth, we plan to run demonstrations with fertilizers producing the best results this year only using different amounts.

We will also conduct demonstrations on corn in other sections of the county where the soil is of a different type. In addition to test plots for corn, we are conducting fertilizer demonstrations on grain and pasture improvement. The time will come when the fertilization of all pastures in the county will undoubtedly be a common practice.

Already applications of fertilizers on old pastures have been found in some instances to be responsible for a 400 per cent increase in yields.

A scene at the Mississippi Experiment Station.

No Flax Surplus

(*From page 27*)

spring wheat seems to be a method favored by many farmers in southern Minnesota. Weeds, especially lamb's quarter and wild buckwheat, are almost completely eliminated by this method. Professor Hughes believes that this method of raising flax will become more popular in northern Iowa. The mixture rate recommended by the Minnesota Station after much experimentation is that of 42 pounds flax and 45 pounds of spring wheat per acre. This mixture should be mixed thoroughly in the granary before planting.

Careful experiments have shown that, despite the ideas of some, flax is no harder on the land than wheat or oats as far as the removal of plant nutrients from the soil is concerned. Spring wheat and oat crops remove slightly more phosphoric acid and considerably more potash than the flax crop. Flax, on the other hand, takes about four more pounds of nitrogen per acre.

The harvesting of flax may be carried on like that of oats either with a binder or a combine. If it is bound, it may be threshed by the ordinary threshing machine. Last year approximately 80,000 tons of flax straw were used in the manufacture of insulating material, tow for upholstering, and coarse wrapping cord. The length of the straw determines the grade to a great extent—10 inches in length will usually grade 1 if dry and under 5 per cent of chaff—6 inches long to grade 2, the price ranging around $11 down last year. In Iowa a company in Des Moines guarantees $1.89 per bushel for the seed plus more if the Minneapolis price justifies. It is also graded on oil content. The farther south flaxseed is grown the lower the oil content usually.

Many farmers plant wheat and oats on the better land and plant flax later on poorer land. Authorities maintain that flax will show up proportionately better as the soil fertility increases. Weed control seems to be the main problem to overcome in Iowa. By following corn or legumes, or being planted with spring wheat, flax may have a better advantage, and especially so if the soil is plowed in the spring and then harrowed consistently and packed down.

Tons of Asparagus

(*From page 26*)

Seed development and root development are associated with phosphorus. The production of sugars by asparagus plants is speeded up when there is plenty of potash in the soil. Of the three elements in a complete fertilizer, nitrogen is most important. Potash is next in value, and phosphorus is in last place although very necessary.

These sugars manufactured by the asparagus plant are stored up in the roots during the period immediately after the end of the cutting season and the killing of the foliage by frost that fall. When plenty of potash salts, supplied either in the muriate or the sulphate form, are present in the soil and the foliage growth is normal, this sugar storage goes on rapidly. The proteins manufactured during the same time, under conditions of available nitrogen salts in the soil and normal foliage growth, are also stored in the roots. It is from this stored-up supply of sugars, made possible through the use of potash salts, and from the stored-up supply of proteins, made possible through the use of nitrogen carrying salts, that the early spring supply of spears or "grass" is produced. The roots in which these sugars and proteins are stored are made possible through the utilization by the plant of the element phosphorus.

The best time to apply nitrogen salts under normal conditions is about one week before the end of the cutting season. Everything possible needs to be done to aid the growth of the foliage after the cutting season and under no condition is it ever practical to remove the tops before they are completely dead. For 30 years Mr. Rogers has removed the dead top growth and burned it. He feels that there is very little value left in it. The only use the foliage is to the Rogers' asparagus patch is that of storing sugars and proteins in the roots. His observation is backed up by the work of many successful growers. The presence of tops in the surface soil makes it difficult to cultivate asparagus, and in a planting which produces as vigorous a top growth as this one, it would be difficult to work them in anyway. During the winter they are raked up and burned.

If growing conditions are not normal and if the grower feels that the supply of proteins stored up in the roots is less than normal, it might pay to give the planting a top-dressing of nitrogen-carrying salts about a week before the cutting season is expected to start. Since this is a more or less new feature connected with the fertilization of asparagus, it might be well to test it out on a part of the bed the first time.

200 Pounds of Potash

In this same chemical report Rogers found that an acre of asparagus removed annually about 200 pounds of potash, 160 pounds of nitrogen, and 80 pounds of phosphorus. This fact, together with the knowledge that nitrogen-carrying fertilizers are either used by the plant roots, leached out in the drainage water, or escape into the air in the form of a gas and that the other two main elements are retained by the soil until used by the plant roots, will enable the grower to formulate his own fertilizer program. Phosphorus and potash do not work up or down very readily in the soil and so it is well to attempt at least to place these salts as near to the root system as is possible.

Mr. Rogers applies the same investigating type of mind to the control of weeds. Weed control is just another name for cultivation to this successful grower. In observing over a period of 30 years, Mr. Rogers has come to the conclusion that a young weed is easily killed if even slightly disturbed while it is still very young. So early in the spring, the spring tooth harrow is run over the acre, and in more recent years the weeder has been used to control the weeds. Since shallow workings will do the job and since deep workings as with a disc type of harrow might injure the crowns, Mr. Rogers has selected the light, shallow, level method of cultivation.

Perhaps the long and profitable life of this acre of asparagus lies in the fact that at no time has the cutting season ever been extended to a point which might result in a killing of the weaker roots. Care is used in cutting the "grass." Injury to buds and growing spears not yet above the surface is prevented by slipping the knife down parallel to the shoot and then using a twisting motion to complete the job. Recently the "grass" has been broken off by grasping the shoots near the ground and giving them a quick sidewise jerk. This recent development has the advantage of allowing the puller to carry the basket without setting it down every time a spear is harvested.

A special effort is made to harvest and deliver the asparagus to the local market the same day. Rogers has found that asparagus held over from one day to the next becomes bitter and hence much less desirable. He has found that people eat more of the fresh product and that the repeat orders are more plentiful as a result.

For many years he wondered what caused certain spears to grow crooked. He noted that this condition was usually worse early in the cutting season. Objects in the soil through which the "grass" could not grow caused certain of them to develop abnormally. The greater abundance of the crooked spears during the early season could not be accounted for in this way. Rogers thought that the temperature of the surface soil might be responsible for this condition. He was correct. When the temperature drops to near the freezing point during the cutting season, there are usually a good many crooked spears produced.

Tons of asparagus can be produced on an acre of soil over a given number of years, but only when the requirements of the crop are met. As with other intensive crops it pays well to use correct handling methods on asparagus. Proper fertilization, liming, cultural methods, and harvesting systems are especially valuable.

Moisture

(*From page* 24)

Depth, Feet	June 1910	June 1911	April 1912	November 1912	April 1913
1	8.5%	8.5%	21.0%	11.6%	21.6%
2	8.2	8.5	15.0	8.7	17.3
3	8.2	8.4	8.4	8.2	16.5
4	8.0	8.7	8.4	8.1	9.1
a	a	a	a	a	a
9	8.9	9.1	10.1	9.4	9.7
10	10.6	9.7	13.7	11.6	14.1
11	10.3	9.8	12.2	11.3	12.3
12	10.8	9.6	12.7	10.1	12.1
13	10.8	15.0	15.7	11.2	16.9
14	12.8	17.2	21.3	14.4	22.2
15	21.0	21.0	24.8	20.5	27.6

a—Samples 5 to 8 feet practically uniform throughout the period at from 8 to 9 per cent.

at most be of no practical benefit to an annual crop."

Add water to a body of uniform soil, says one authority, and allow it to percolate downward through the soil mass. A condition of distribution will be reached at which the moisture content at any depth will be approximately the same except in the lower five or six inches of wetted soil. Here there will be rapid decrease in the moisture content.

Conclusions reached from studies in dry-land regions are that the roots of plants in semi-arid regions go to the stored water in the subsoil. Water is not elevated to the surface by capillarity.

Comparatively little water which has once passed below the first foot is lost by evaporation.

The significance of subsoil moisture in alfalfa growing was made clear in a report that alfalfa grows well for four to five years when first seeded on certain Nebraska soils. Then yields rapidly decline due to the depletion of available subsoil moisture. "The alfalfa drew upon the subsoil moisture to a depth of 33 feet in a 6-year-old meadow and 25 feet in a 2-year-old meadow. After once having the subsoil moisture exhausted, it is replaced very slowly under ordinary cropping. During 15 years of cropping after alfalfa, but little water had entered the soil below 7 feet. After six years cropping to alfalfa, it would require 225 years under crop rotation to restore the subsoil moisture."

A Summary

As a summary, Professors Hughes and Henson add to their compilation the results of study by H. L. Shantz on distribution of moisture:

"In arid and semi-arid regions, soil moisture has been the subject of extended investigation. In such regions moisture is the chief limiting factor and the plant growth exhausts the total available moisture almost every season. Following a rain, the surface soil becomes moist. If the soil we may consider would have a moisture equivalent of 20 per cent and a weight of say 84 pounds per cubic foot, a rainfall of 2 inches would wet it only 9 inches, if it were entirely dry. But under field conditions it would probably contain 10 per cent when dry to the plant and a rain of 2 inches would moisten about 18 inches, if none were lost by run-off. This soil would contain about 21 per cent water. This 18-inch blanket of moist soil would remain permanently dry. By dry here is meant a soil with 7 to 10 per cent moisture, depending somewhat on the condition under which the moisture was reduced. In other words, no moisture can be added to this soil to make it less than about 21 per cent, and under field conditions, not much more than about 21 per cent can be added.

"Above a water table, moisture rises in the soil to form the capillary fringe. In the soil considered, the top of the fringe might have about 21 per cent water, and this would increase until just above the water table the water content might be 52 per cent, while just below the water table all pore space would be filled with water.

"We know pretty clearly what the conditions are and the upper and lower limits of moisture content in a region where the surface is temporarily moist, the subsoil down and the capillary fringe permanently dry, and the water table at a permanent level, or in other words, the moisture condition when the rainfall is not sufficient to moisten the soil below the reach of the plant roots. But most of the agricultural production takes place under very different conditions when the amount of rainfall is in excess of the field carrying capacity of the first few feet of soil and where moisture passes through the subsoil to the water table below, in other words, where the whole soil mass is leached and where the water is available throughout the whole depth of the soil.

"The conditions here are not well known, but there seems little reason to suppose that the field carrying capacity in the root zone should be higher when the subsoil is moist than when the subsoil is dry, provided the water table in the former case lies so far below that the top of the capillary fringe does not reach the root zone. The moisture content at the surface of the soil here considered should be about 21 per cent, and as we pass down remain about the same until the top of the capillary fringe is reached, unless there should be perched water tables. If the moisture in the surface soil is evaporated or absorbed by plants, there should be no movement upward to take its place. In fact, the whole mass of soil moisture should remain stationary until water is again added above, when it would move down until the moisture content had fallen to the field carrying capacity. This is probably the condition in most of the crop areas of the U. S."

Pasture Top-dressing

(From page 30)

fully as much as lack of phosphorus.

On pastures where only a moderate increase in pasture is needed the use of lime, phosphorus, and potash will give desired results. However, this mineral treatment does not give results as early in the season as the complete fertilizer. By applying complete fertilizer such as the 6-8-6 on the pasture early in April, the pasture is in shape to turn into from 10 to 14 days earlier than unfertilized pasture. The dairy farmer who is short of hay and silage in the spring will find that this early grazing will completely pay for the entire cost of the fertilizer when pasture is credited with the value of the barn feeding it replaces.

The Inquiring Mind

(From page 22)

Following the self-raking reaper came the Marsh harvester which carried the cut grain on a canvas belt to a platform on which two men stood at side tables on which they bound it into sheaves. I well remember binding with another man, 22 acres of light oats on such a machine out in Iowa in 1882 and it was a hard job. One's thighs were bruised black-and-blue against the jolting binding table, and I remember that by night the straw became so brittle that it could not be used for bands.

The manufacture of Marsh harvesters was undertaken by Mr. Gannon, of Chicago, and in 1870 he took into partnership the famous pioneer William Deering, founder of the Deering Harvester Company, to whom a large share of credit belongs for producing a practical twine binder. Later the Deering Company merged with the International Harvester Company.

Until 1878-9 self-binders that tied sheaves with wire were in vogue, but wire proved objectionable. In 1878 John F. Appleby solved the prob!em of binding sheaves with twine, and with his partners, Charles H. Parker and Gustavus Stone, at Beloit, Wisconsin, built and sold the first twine binder and shipped it to Travis county, Texas. Later they made 115 twine binders and in 1879 Gannon and Deering began manufacturing such binders under a license from Appleby's firm. In 1881-2 the McCormicks followed, having bought a right to make the machines. For years Appleby was associated with Deering, who capitalized the production and after many trials and vicissitudes perfected a twine binder that was a success and quickly became popular.

From the time McCormick began building twine binders "all manufacturers have been making harvesting machines of practically the same type of construction, which includes the McCormick reciprocating knife and the Appleby binding attachment on the Marsh type of harvester.

Late Developments

The latest developments in this line are the harvester-thresher, the new McCormick Deering windrow harvester, and the pick-up device designed for use with the harvester-thresher which promises to bring about a greatly increased use of that machine.

According to its manufacturers, the windrow method of harvesting is especially advantageous where grain is weedy or ripens unevenly or the weather is unfavorable. The windrow harvester is similar in design to a right-hand header. It deposits the grain, from about the center of the cutter bar, on top of the stubble, in a continuous windrow. The stubble is cut high so that it holds the cut grain and allows air to circulate underneath and thus quickly cure the unripened grain and dry out any weeds that are present. After two to four days of good drying weather, a harvester-thresher equipped with a pick-up device is brought into the field and run in the same direction as the windrow harvester. Frequently a farmer begins his harvest by windrowing his grain, and then later, when conditions are right, removes the pick-up device, from the harvester-thresher, replaces the reel thereon, and then cuts his grain and threshes it in the low-cost "once over and it's all over" fashion.

And so, step by step, with the brain power, will, and perseverance of many eminent men, reapers have been perfected to cut, bind, and thresh grain. The sickle, scythe, and cradle, and loose-sheaf depositing machines have gone into the discard, and toil has been materially lessened. The farmers of the world therefore owe much to the research men of the inquiring mind and seeing eye who have lightened the work of harvest, and are happy and ready to bestow the credit where it belongs.

Make Wheat Pay!

(*From page* 15)

plication of 400 pounds of 2-12-12 in the fall and a spring dressing of 100 pounds per acre of nitrate of soda in April have increased the yield to 18 bushels per acre. The increases in corn, soybean, and clover crops have paid a large share of the heavy fertilizer cost and a return of about $2.00 for each dollar invested for fertilizer has resulted. This is on droughty, sandy soil. The dark colored sandy soils of the northern portion also need the extra proportion of potash for best results.

On the sandy and sandy loam soils both in northern and southern Indiana, 100 pounds per acre applications of nitrate of soda, sulphate of ammonia, and various synthetic nitrogen carrying materials have been producing increased yields of wheat of 5 to 8 bushels per acre during the past four years. The materials have been broadcast when the wheat was from 3 to 4 inches high and have given better results than the same applications applied later.

Fertilizer drilled with wheat should not be considered for the wheat crop alone, but also for its benefit to the clover and other crops that follow. Clover failures are often prevented by the wheat fertilizer. The wheat crop itself gives a consistent response to adequate fertilization and in years when winter-killing is severe the crop is sometimes saved from almost total failure by such treatment. With lower prices for nitrogen, complete fertilizer costs are tending downward so that it is justifying its use on most of our wheat soils. The 2-12-6 is the most popular wheat formula in the state and it deserves its popularity. Where used liberally the 3-18-9 and 4-24-12 analyses are good. When the crop has come through the winter with a good stand 100-pound applications of some nitrogen carrier may be broadcast in April with the assurance that increases of 5 to 8 bushels per acre will result.

Whatever may be said for reduction in wheat production there is no justification for reducing the yield per acre. Intelligent fertilization, combined with other good wheat growing practices will help keep acre yields of the Midwest up to a profitable level.

Peppermint

(From page 13)

side delivery rakes, and hay loaders are often seen in the mint fields to get the mint hay to the distillery in good condition and with the least labor.

A Simple Process

The process of distillation is simple though the cost of a plant on some of the large mint farms represents a big investment. A large boiler is set in a brick furnace to provide large quantities of steam with little fuel cost. Two steam pumps are used, one to pump cold water from well over a condensing coil and one to pump hot water into the boiler as it comes from the condensing coils. Two or four tubs, eight feet deep and six feet in diameter provided with tight lids, are used to hold the hay during distillation.

A steam hoist is used to fill the tubs with hay for distillation and to empty them after the oil has been extracted. The whole plant is covered with a tight roof to protect it from the weather. On other farms the equipment is smaller and set out in the open. The hay is pitched into tubs. A team or tractor often provides the power to operate a hay fork for emptying the tubs.

After a tub is filled with the cured mint hay from the field, the lid is clamped down tight enough to hold from 40 to 75 pounds steam pressure. Live steam, turned into the bottom of the tub, passes through the hay and out the top of the tub, thence through the condensing coil to the receiving can. The hot steam as it comes from the tub carries the mint oil over with it. The oil is collected by condensing the steam in the coil before it reaches the receiving can.

In the can the oil and water quickly separate. The oil collects on top of the water and the excess water is drawn off from the bottom of the can by means of an overflow pipe which controls the height of the liquids in the can. After several pounds of oil collect on top of the water in the can, the overflow pipe is closed. This raises the water and forces the oil through an outlet in the top of the can into a container. The peppermint oil is then placed in large steel drums for safe shipment to market.

Rebuilt Soils

(From page 7)

corn belt farmers are rapidly getting fertilizer-conscious is evidenced by the growth of fertilizer distributor sales. A dealer at Bloomington, Illinois, told me that he sold 50 corn planter fertilizer attachments this spring which was double his prior year's sales.

This is an encouraging situation, for in a survey of the cost of producing corn recently made by the agricultural department of one of the corn belt states, it was found that farmers who obtained yields of 120 bushels to the acre grew the crop at the low cost of 22c per bushel. On the other hand, a class of farmers who harvested only 60 bushels to the acre expended 38c a bushel to produce the crop. In an analysis of the methods employed by those who had the low and high cost of production respectively, it was found that the soil treatment was largely the governing factor. Eighty per cent of those who grew their corn for 22c a bushel preceded the crop with a legume, while only 60 per cent of those whose bushel cost was 38c planted the crop on a legume sod. Again, those who harvested 120 bushels to the acre plowed their land 7.6 inches deep, while the 60 bushel farmers plowed only 6.9 inches deep.

It is safe to predict that as farmers increase their annual investments in commercial fertilizer, the prosperity of the nation will mount proportionately. At present, farmers spend $108.00 a year for gasoline and oil and only a tenth as much for fertilizer per capita.

When the story of how Hilgers of Wisconsin used fertilizer to make his acres carry twice as many dairy cows is such a common experience that it no longer is news; when land holding companies duplicate the practice of Strickler of Iowa, who makes money building worn farms into highly productive acres; and when those who would farm discover how George of Nebraska made fertilizer pay for his truck farm, the phrase "Agricultural Depression" will be only a memory of an age in the evolution of this nation when we had the tools (plant foods) but had not yet learned to use them.

$100 per Acre

(*From page* 10)

per ton, and the 0-21-9 fertilizer at $44.00 per ton, the costs of each treatment per acre would be as follows:

3 tons lime delivered at Armstrong at $1.75 per ton	$ 5.25
3 tons lime hauled and spread at $1.00 per ton	3.00
200 lbs. of 2-12-2 fertilizer at $33.00 per ton	3.33
125 lbs. of 0-21-9 fertilizer at $44.00 per ton	2.75
Total	$14.33

Deducting $14.33, the total cost per acre of the soil treatments, from $100.00, the value of the yield from the five cuttings the past two years, one still has a nice return of $85.67 per acre. In addition to this, Mr. Alexander still has a good stand of alfalfa which, if seasons are anything like normal and it is properly fed with fertilizer high in phosporus and potash, should continue to produce at the rate of around 3 tons per acre each year for at least the next five or six years.

This County Agent Job

(*From page* 9)

miles away has found about them. The demonstration type of county agent will give the inquirer the results of last year's demonstrations and suggest the questioner visit the nearest farmer who grew the crop as a demonstration.

In the first named type of extension large numbers of people are brought together to watch hens culled, on the assumption that many or most of them will go home and cull their own flocks. On the demonstration plan, farmers at strategic points over the county are aided in making their flocks pay maximum profits, and when neighborhood culling is done, the meeting is held at the farm of the demonstrator. Culling features the program, but the demonstrator explains all the changes he has made in his flock, management, and gives his records for the benefit of the rest.

The two types of extension have much in common. Contests, rallies, tours, school-house meetings, fair exhibits, etc. may be spotted in every nook in rural America. The demonstration type county agent gives much advice, too, but he doesn't place the faith in that method of improving matters that his brother of opposite faith does, and certainly he doesn't make it the bed-rock of his work. Both agents write news stories, the one telling farmers what and how to do, the other what and how farmers have done. Both are high-minded and earnest individuals who believe the millenium is just around the corner.

Some of these characterizations will be stoutly denied in part by both sides. In reducing the situation to simple terms, minor factors have been ignored to bring the underlying philosophies into sharp relief. True it is, too, that a certain amount of prejudice has intruded itself on both sides. It is likewise interesting to observe that the zeal for demonstrations burns brightest south of the Mason and Dixon line, because it was there that Dr. Knapp carried on his epochal work.

There is enough of the demonstration idea of agricultural education existent and working to furnish in a few years a fair comparison of the two fundamentally opposite theories as they work out in practice. It is to be hoped that nothing may prevent a full trial of the older, more unique, but less tried demonstration method, for all in all extension work probably offers the American farmer more actual relief than any other agency.

Harvest

(*From page* 4)

of this age have worshipped finance and mechanics so blamed sedulously that we have pitted the one against the other in a race leading us all up a blind alley.

The old wheeze used to be as follows: "to buy more land to raise more hogs to buy more land, ad infinitum." Now it may be paraphrased to run: "to get more funds to buy more mechanical contrivances to ease up on time and labor to release more funds to try out some new inventions and contraptions." Each new addition to the mechanical wonders of the age requires new laws and regulations, new public set-ups and safeguards, new facilities, and *new revenues*. So our thin check-books get dog-eared with usage in paying for our mechanical mania and settling public expenses thereunto appended.

As a matter of fact, neither you nor I, if we are average mortals, clearly understand one iota of the cause and effect of half the mechanical luxuries we enjoy. We just use them and pay for them, all at once or in driblets. Then we scan the papers looking for more marvels that somebody else has conquered with more brains that we have—but which our children will regard as necessities before we have the mortgage paid.

In the old hot harvest fields they used to take time off with the jug for a rest. In our day we can't stand for a recess from unending invention and unending refinance measures.

The harvest field used to be the center of the universe. The harvest hands were the lords of creation and the scanty crew of professional men catered to them with little competition and slight compensation. Nature never paid in slow installments, but she dumped the whole horn of plenty in a heap for ox-teams, cradles, dash churns, flails, and sweaty pioneers to wrestle into a meal of victuals. The field and the harvest hands are no longer the crux of the situation. It's the tractor and the combine, the electric motor, pedigreed grains, and soil treatment.

Instead of the question "Who is the mother of the chick, the laying hen or the sitting hen?" let me propose one equally innocuous. "Is it the inventor or the boy who left the farm who is responsible for the *greater* surplus produced by *fewer* farmers?" Is the boy who left the farm earning enough to nibble up his share of the surplus left on Dad's 40 acres, or is somebody somewhere obstructing the flow of food at fair prices and his share of good wages and steady work?

STILL I feel that my best answer lies in the race between finance and mechanics. The same thing would happen in a harvest field where two grain binders began a contest. It would be thrilling while it lasted, but tough on the horses. Finance and mechanics make a great team in a harvest field or in any enterprise, if they don't get to yanking in the tugs.

After all, one real trouble is that our industrial harvest field is so much larger than it was back when the Master Farmer's sire tackled the prairies with his oxen. In some spots we are using great combines in both agriculture and industry, speaking in metaphor. In other places we are using cradles and scythes. The farmers and the factorymen using the best tools can't quite see the finances in the same way that the smaller fellows do. Even President Hoover had to do some tall figuring to get them into the same denominator, and then he found they didn't have the same cube root or something. Every new immigrant landing among us and every new infant out in the hospital adds to the jargon in our wide-spread harvest fields.

We need some kind of industrial Esperanto language to make us understand each other. We need it because we are trying hard to make democracy safe for Americans.

We imagine that because we are supposed to speak one language that the schools teach as official that this gives us the key to a thorough understanding of the playing signals. The trouble is that too many of us talk in "hog Latin." We must learn that prosperity means something besides more money and new thrills. There is something golden in the harvest field besides lucre and something musical out there besides gears and sprockets.

This should not be construed as a diatribe against machines. None of us would turn back the clock. However, this much I do subscribe to heartily until disproven: that the machine age has brought into play selective forces in farming which reject the mentally unfit, and so machines reduce the *quantity* of farm labor and increase the average *quality* of thought put into the job.

Abraham Lincoln once spoke at our state fair and stated that the time was coming fast when educated men must work and workers must be educated. Along with it he predicted the coming of the mechanical age that would make the harvest field a battle ground for perspicacity as well as perspiration. I hope we have arrived.

Returning again to the theme of the farm which has been in crops for 90 years, I would take a different tack along a mellower route and one more familiar and satisfying.

Martin Everett's father secured the title to the land in government patents in fee simple, six of them from the nearest land office after payment of $1.25 an acre. Each patent granted 40 acres to this pioneer as a reward for leaving the stony and storied East. Two of them were dated 1840 and signed by Martin Van Buren. Four of them were dated 1844 and bore the scrawl of John Tyler. As we scanned the faded parchments, I seemed to hear echoes of old-time campaign songs: "Van, Van, the Used-up Man," and "Tippecanoe and Tyler, too."

Then I glanced up at the aged maple grove and the glittering grain on fertilized meadows. A thought struck me, and I repeat it. Here was probably the *only* type of industry in my state that had the highest testimonials of inherent right and title that could be bestowed by Democracy and Providence. Not a store or a factory that I knew could show such proof of eminent domain. Smiling nature in its harvest splendor for the ninetieth season had rejoiced in its bountiful ability to render this estate a happy and congenial spot in which to live. Tucked away in the bureau drawer along with the wills and family heirlooms were these documents signed by two presidents when the act of 1820 first opened the great western country to the adventurous settlers.

Here, then, we had mute proof of the Permanence of Agriculture. True, there are farms in the valley of the Somme or along Flanders fields which date back nearly 800 years in the same families. But this was a farm in my own state, a somewhat new and crude place, a region of but three generations dating to the backwoods.

ANOTHER evidence of the Permanence rendered by man came to me when the Master Farmer showed his row of account books, kept regularly by lamplight for 40 years. No broker or banker could have made more careful entries than he in noting such items as "bought two rolls of fence wire for $2.25;" or "sold 10 pounds of butter for $3.00." The herd books were marvels of neatness and regularity. The daily milk production of every cow each night and morning was recorded since the year I was born. "I bought a Babcock tester in 1899 and was one of the first men hereabouts to learn what fat my cows were making." Out we went to the tool shed, where he fumbled around and located the battered old Babcock centrifuge, one that worked on the friction system. Painstaking method has brought its reward to him, for his herd of less than 20 cows made more than 450 pounds of butterfat last year.

His philosophy is like unto the dictum of many a man who has stuck to the place he loves, while the rest of the world went mad after financial goals. He chased no ruby rainbows, but quietly followed the seed time and the harvest for three score and ten years, happy in the situation that brought him an opportunity to meet and solve problems akin to the oldest things in the universe.

If I had said to him in the language of the sentimentalists, "Oh, the country life is good because it is the simple one," he would have promptly taken me back to the depot in his useful Ford. But I am far wiser to the land than that.

He and I knew without mentioning it that it is far simpler to pick up a milk bottle on your front porch than it is to milk a herd and nurse the garget and the scours. We knew without referring to it that one can buy a can of peas or corn without studying soil fertility or legume inoculation.

No Master Farmer, or his kith and kin remaining unsung to history, ever sought the farm because it was simple. Maybe on a *poor* farm, but not on a good one. And what is more to the point as I have said before, this present era only adds to the complexity of agriculture and gradually weeds out the unfit and the feeble willed persons —despite telephones, motors, and radios. The essence of the hold that farming has on these generations on the land lies in its perplexing problems and the challenge it throws at red-blooded Americans.

In some old country agricultural regions generations stick to the land because of sordid chains or slothful inertia. In America the succeeding generations remain because they like to solve puzzles amid pleasant surroundings.

Next to that spirit of Permanence lingering in every nook and cranny of the farm, including the sugar bush that had been operated for 80 years, I found comfort in Good Citizenship and Progressive Content.

THERE are two kinds of ordinary citizens among those who stick to work and keep out of jail. One kind is like the brake on a car and the other resembles the accelerator. One extreme is the ultra-conservative, the other extreme is the radical. Hence I have spoken of this Master Farmer as a good citizen because he embodies "progressive content."

He used a new variety of barbless barley this year, warranted to be reasonably resistant to stripe disease. When the harvest came there was over 10 per cent stripe in the grain. Did he rant at the experiment station or cuss the seed treatment practice as a fraud and a burden on the tax payers? Hardly, for he studied a little and found out that when his son took the barley for seed treatment with formaldehyde at a neighboring farm, the mixture had been used so often that it was too weak.

When his mower broke down in the hay field before a thunder storm, did he shout maledictions at the dealer? No, for he found that his cutter bar was not in perfect alignment and something ailed the pitman. His years of experience have taught him the law of cause and effect, plus the tolerance permissible in cases of human error. The inquiring mind in everyday practice is just as helpful as it is in the laboratory.

His brand of contentment is not the easy-going, lack-lustre kind of existence that accepts anything and everything. His mind is always right up on the firing-line with the rest of the sharpshooters, but he isn't sniping all the time at things he believes might be "regulated." He keeps his powder dry and his castle secure from invaders. I have reason to feel that of such material were the Minute Men of Concord, who would rather farm than fight, but could do a little of both if necessary.

So there he stands in his seventy-second year, possessing indisputable government grants to his homestead, reinforced by the largess of each recurring harvest. He has not lived unto himself alone, for his life has taken into it certain small tasks of a township nature and a few school duties. As an example of sturdy American courage and hope his life has been of some value outside of the measure that mankind is wont to use.

Likewise he is fully aware that the city approaches closer to the fringes of his eminent domain. He sees this in evidences of trespass on his property and regulations as to his milk house and milk delivery. He is beseiged with organizers for this or that co-operative because the market conditions are changing and agriculture must forge chains or be bound with them. To all this he is not indifferent, but he resembles an old owl in the rigid, unblinking manner in which these facts fail to shake him from his perch.

Who knows? Possibly in a score of years in the future scroll we should not have selected him or his kind for the title of Master Farmer. The safety razor is not the only thing that is altering the countenance of agriculture. But in all times and in most places under the sun the philosophy of optimism and courage will serve to stabilize farming more than anything drastic will do, simply because it works best and stays longest in the hearts of those who have inherited it from the soil.

BUDDING NATURALIST

Little Albert came home from school with a new book under his arm. "It's a prize, mother," he said. "A prize? What for, dear?" "For natural history. Teacher asked me how many legs an ostrich had and I said three." "But an ostrich has two legs." "I know that now, mother, but the rest of the class said four; so I was nearest."—*Boston Transcript.*

"Since I bought a car I don't have to walk to the bank to make my deposits."

"Ah, you ride there?"

"No, I don't make any."

ORDERLY PROCEDURE

John had become the proud owner of a pig, and insisted on caring for it himself.

After a few weeks, his father noticed that the animal did not appear to thrive, and remarked:—

"John, you are not feeding your pig enough. It doesn't seem to be fattening at all."

"I don't want to fatten him yet," answered John. "I'm waiting until he gets as long as I want him, then I'll begin to widen him out."

AS WE WERE SAYING

A local newspaper recently said that scientists have invented an earthquake detector that goes off like an alarm clock. What most of us need is an alarm clock that goes off like an earthquake!—*Lehigh Burr.*

EMOTION

A man was discovered by his wife one night standing over his baby's crib. Silently she watched him. As he stood looking at the sleeping infant, she saw in his face a mixture of emotions—rapture, doubt, admiration, despair, ecstasy, incredulity. Touched and wondering alike at this unusual parental attitude and the conflicting emotions, the wife with eyes glistening arose and slipped her arms around him.

"A penny for your thoughts," she said, in a voice tremulous. He blurted them out:

"For the life of me, I can't see how anybody can make a crib like that for three forty-nine!"—*The Pitchfork.*

A college professor and his wife were entertained at dinner a few weeks ago. In the midst of the gayety at the table a child's voice was heard coming from the floor above.

"Mother!"

"What is it, Archie?" she asked.

"There's only clean towels in the bathroom. Shall I start one?"—*Fyr-Fyter.*

A pastor, fond of figures of speech, was making a funeral oration.

"Friends," he began in a lachrymose voice, "we have here before us only the shell of the dear departed. The nut is gone."—*Chicago Tribune.*

Modesty, like a blue serge suit, is always becoming.

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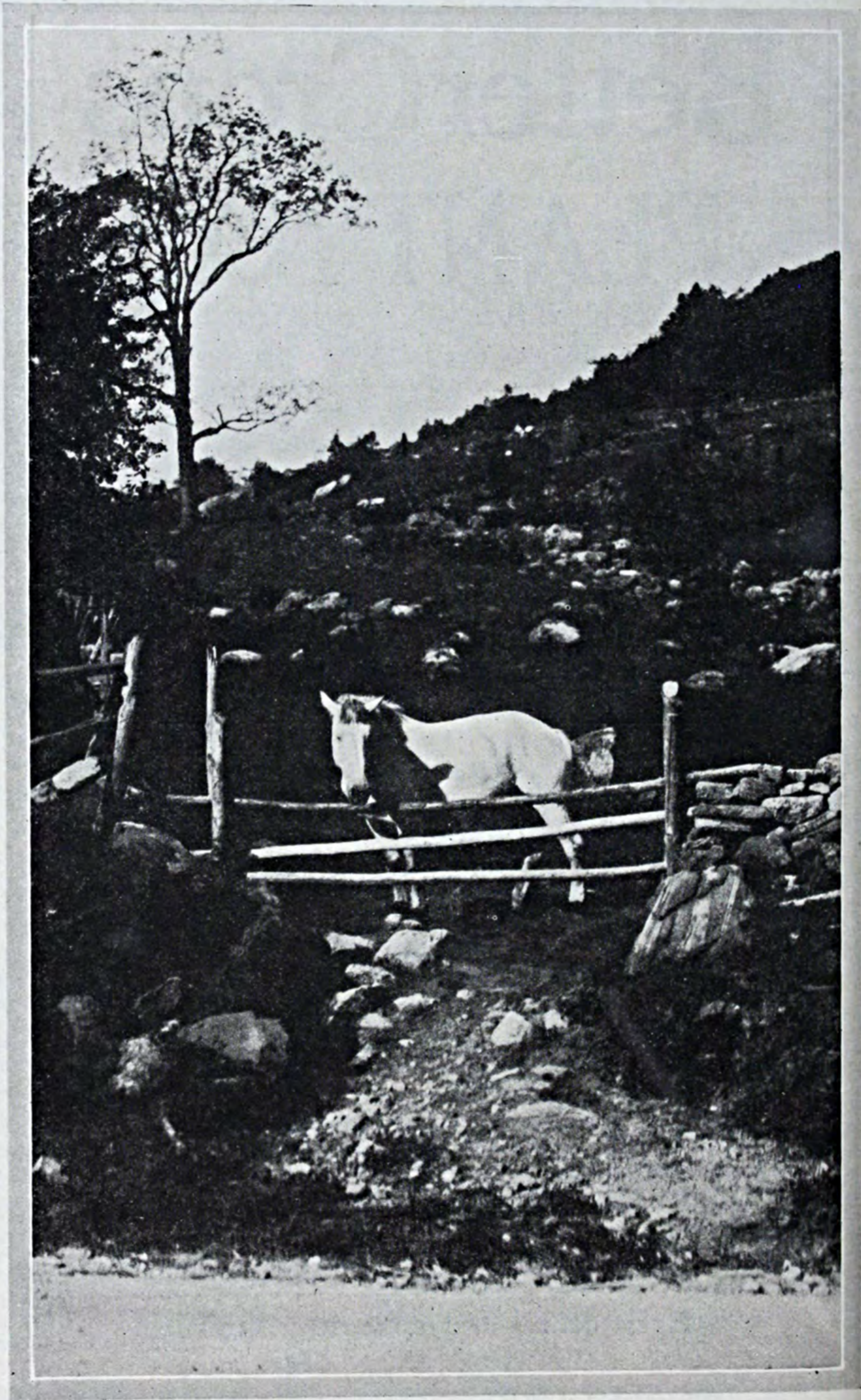

SUNSET ON COOL FALL NIGHTS FINDS THEM READY FOR A COZY BARN.

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Hardscrabble Grit

By Jeff McDermid

THERE are Master Misfits as well as Master Farmers. At my last appearance I related something of the background and the experiences surrounding an old acquaintance of mine who had earned the title of Master Farmer on an estate that had been in his family for three generations.

Perhaps you recall that the Permanence and Stability of Agriculture was the motif I discerned woven into the fabric of his career. Since then I have discussed many phases of his recent distinction and have learned that the maintenance of the title of Master Farmer is quite as touchy a job as the earning of it in the first place. That is, he acquired the honor by a slow and unconscious process which was as much a part of his life as the seed time and the harvest; while now that he has won the medal with all its real and fancied glory, it sets him up as a sort of universal target for all the critics of Christendom to aim at.

Yet he bears up under the load of enforced obligation decidedly well for a man past three score and ten years.

If I were choosing Master Farmers as a steady occupation, probably I should pick the elderly gentlemen of the profession. They have usually gone far enough on the road to get a true sense of values, and they have too short a span ahead of them to threaten the community peace of mind by many years of insufferable egotism.

AT this time I am changing the theme to stress for awhile the case of the unsophisticated, patient, primitive Master Misfit, the kind of submarginal land farmer who adds to the surplus in years of universal plenty and suffers with woe in the seasons of drought and want. His spirit may seem on the surface to be broken and his aspect timid, but deep down below the crust of his misery there is a kind of pitiful nobility, an echo of things that might have been.

I have called my theme the story of Hardscrabble Grit, because no other combination of phrases seems to fit the peculiar instance I have selected from my store of actual examples. It occurred in my own state and seems worth relating in some detail.

I have taken it out of the dusty files because it points to a childish faith in the future that many of the powerful Master Farmers themselves entirely lack. It embodies hope when the reasons for it were indeed slim and illusory. Although my primitive friend lives in an age of blase sophistication and modern turmoil, he has charted his course along the pathway of the covered wagon instead of tying himself and his ambitions to a tri-motor plane.

At the age of forty-nine years this Master Misfit hero of mine resided on a farm of seven acres situated on a bluff that would have made fine pasturage for the joker's "side hill cattle." He sold honey, apples, and broilers, but the well water gave out finally and he lacked the price of a drilled well. Sickly and rather bent for his years, this primitive hero proposed to his family that they seek government land somewhere so as to get away from the beetling bluffs and the stagnant water.

Uncle Sam's generous land office mailed him a budget of information. He found that there was a parcel of unoccupied homestead land right within our own state, a state all nicely skimmed over and snugly settled by provident Germans and Norse. This delighted the family for could they not return sometimes to gossip with old cronies? Thereupon he took a five-cent school tablet and wrote to the surveyors in the adjacent county where this vacant land was located.

Finally on one momentous morning Mother ironed his shirt and tied his faded neckband, packed his Victorian valise and waved him a confidential farewell. Here he sallied forth, a knight of the unbelievable romance, aged forty-nine years, with failure behind him and unblasted courage in his heart, as keen for the primitive adventure as any of the braw lads who founded an empire.

Arrived at the pickle station where the county court house was located, our friend first sought the surveyor, who found him a driver who would take him to the potential farm at a price within his means. Had he not really needed a guide who knew the sand dunes well, our friend would have walked and saved the difference for a tid-bit for the kids. Anyhow, he jogged out in a decrepit Ford with his talkative native driver, who informed him that there was no land there which was vacant unless there was a reason for it.

OUT of about two forties, with plenty of wood and water, he found that at least thirty acres might be plowed. It is significant to note that he, like scores of our own pioneering ancestors, sought wood and water as the first requisites of a home. Back home went our hero, reported to his

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Some members of the Soil Congress inspecting experimental plots of the Institute for Fertilizers, near Moscow. Director Erhard Britzke is the center of the group.

Better Crops in Russia

By A. B. Beaumont

Head of Department of Agronomy, Massachusetts Agricultural College

THE Union of Socialistic Soviet Republics has recently entertained its first international congress. From the four corners of the earth came representatives, more than 600 in all, of those nations which are most interested in the advancement of soil science. Our own country, having at present no official diplomatic relations with the U. S. S. R., had no official representatives, but, strangely, had the largest number of delegates from a foreign country. Moreover, we were welcomed as cordially and treated with as much consideration as any other group of foreigners.

The Second International Congress of Soil Science was opened July 20 in the Academy of Science, Leningrad. Professor N. I. Vavilov, in extending the welcome of the Soviet Government, said in part:

> "Science is international. Russia and science are inseparable. The chief task of the Government is to increase the prosperity of the country. Experiments have shown that big state farms and collective farms are the only real solution of the agricultural problem. The possibilities of agricultural development are enormous.

Sir John Russell, of Rothamsted (England) Experiment Station, finishes the inspection of a soil profile.

worth and what he has done."

The character of the papers presented to the Congress by the Russian members, personal interviews with them, and the inspection of their laboratories left no doubt in the writer's mind as to the high quality of Russian agricultural science. Particularly in that branch of soil science known as the genesis and morphology of soils, the Russian workers are acknowledged leaders. This fact was emphasized by the wonderful collection of soil monoliths which formed important parts of the fine exhibits both at Leningrad and Moscow. In soil chemistry and plant nutrition, the Russian scientists have made noteworthy contributions.

The writer holds no brief for the present Soviet economic policy, nor does he venture any prediction as to the future of the Soviet government, but he does know that in Russia there is a group of well-trained, enthusiastic scientists who are prepared to give the best of the world's science to Russia's gigantic agricultural enterprise. Further, there was strong indication that the Soviet government intends to leave no scientific stone unturned in order to make its agricultural enterprise a success.

Let us notice some details with reference to the policy toward agricultural science. For example, there is the Institute of Applied Botany, headed by Professor N. I. Vavilov, a member of

Only about 5 per cent of the whole country is under cultivation. It is not difficult to double this area."

Sir John Russell, director of the famous Rothamsted agricultural experiment station of England, and the newly elected president of the International Society of Soil Science, said in response:

"Science knows no boundaries, either by nation or by class. A man is judged by what he is the Leningrad Academy of Science. Director Vavilov, a man of striking personality, has travelled widely in connection with this work and even now is on an extended tour in our Southern States for the purpose of studying our sub-tropical agriculture. The institute has a far-flung program regarding the introduction and breeding of crop plants of all kinds, best adapted to the soils and climatic conditions of Russia. It was here that I met Professor T. A. Krasnosselsky-Maximov, and over a cup of "chaij" served in the Director's office, discussed with her the work which she and her husband are doing on the problem of drought and cold resistance of cereals. This institute has its headquarters in Leningrad, 200 branch stations in different parts of the Union, and a staff of 900 technical workers. The budget for the present year is 4,000,000 rubles, and next year it will be 11,000,000 rubles.

Then note the extensive Institute for Fertilizers with headquarters at Moscow. This institute, said Director Erhard Britzke, who was educated in Germany and speaks German fluently and English fairly well, was organized three years ago and housed in a building designed to accommodate a staff of 170. The building actually houses now, during the winter months when the field men are in Moscow, a staff of 800. A new building with a capacity six times that of the present one is being built in Moscow. The Institute for Fertilizers is a comprehensive organization, embracing four sub-divisions: 1. Mineralogical-geological. 2. Chemical-technical. 3. Agricultural-technical. 4. Economical. All activities concerning the mining, manufacture and use of commercial fertilizers are here organized under one administration. Theoretically, there will be perfect coordination of the various branches of the service. For example,

A group of soil scientists inspects the profile of a podsolized soil near Moscow.

there will be no overproduction of any particular kind of fertilizer, each being produced as needed. As an example, di-calcium phosphate has been found to give better results than other phosphates on the sour, podsolized soils. Therefore, it is planned to make certain quantities of di-calcium phosphate for the zone of podsolized soils, and to distribute only this kind in that zone.

Russia is very fortunate with respect to natural supplies of raw materials for the manufacture of fertilizers. She has extensive deposits of phosphorites which, however, are in general of not so high a grade as those of the United States. On the other hand, she has what we have not yet found in this country, commercially workable deposits of potash salts. The full extent and nature of these valuable stores of phosphates and potash are not known. Fifty to sixty prospecting parties are kept in the field for the purpose of securing additional information as to the nature of fertilizer resources.

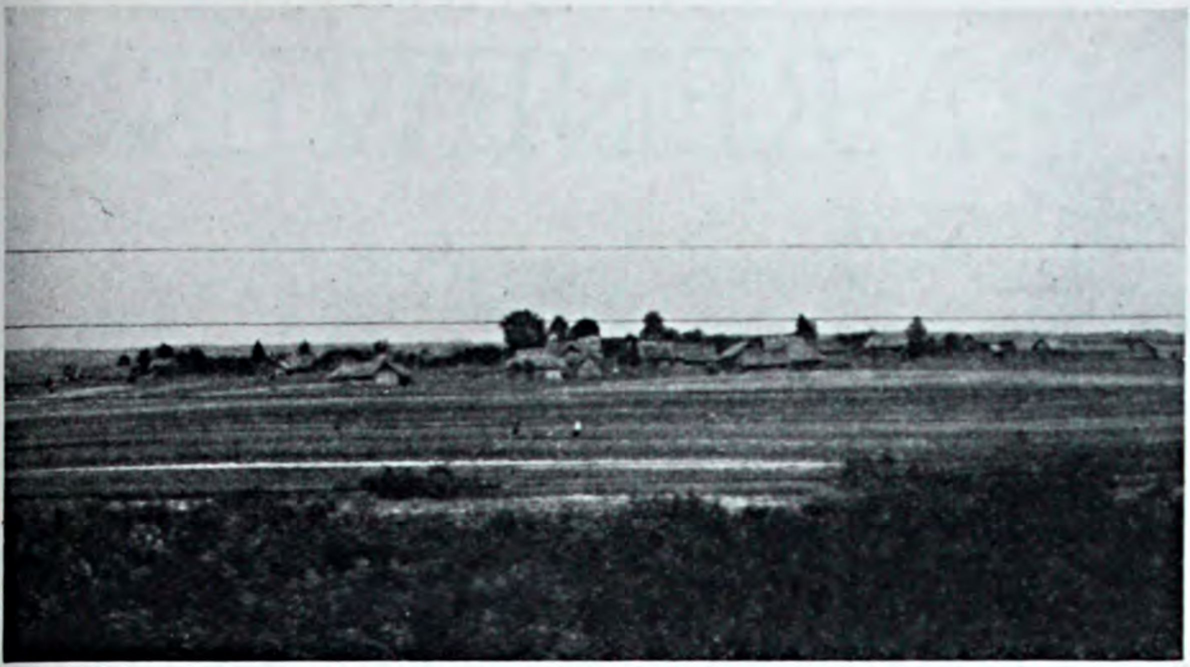
According to Director Britzke, it has been estimated that 21,000,000 metric tons of fertilizer are needed to furnish only a light application to land expected to be cultivated in the near future. At present, Russian fertilizer plants have a producing capacity of 3,500,000 tons, and the five-year plan calls for a production of 12,000,000 tons in 1933. The budget of the Institute for Fertilizers was 5,500,000 rubles in 1929, 10,000,000 in 1930, and 18,000,000 to 20,000,000 rubles are expected in 1931.

Thus agricultural research and experimentation are going ahead in Russia to an extent and degree of thoroughness unsurpassed in any country of the world. The Soviet Government has projects for agricultural research that would stagger our State and Federal research institutions. Further, the Government appears to be unreservedly supporting its scientific institutions on which rests the burden of correct guidance of the agricultural program.

The Five-Year Plan

In Russia one hears a great deal about the Five-Year Plan, which was approved in May, 1929. According to this plan, all major activities of production and industry, including agriculture, are to be coordinated and regulated. On paper at least, such a plan is ideal from many standpoints, but no one knows how it will eventually work out. There is consider-

Headquarters of the Soil Congress at Hotel de Europe, Leningrad.



Typical Russian village of northern Russia. Note thatched roofs and "strip" farming.

able enthusiasm back of it, and no doubt a degree of success has attended it within the two years it has been under way. In fact, it is now claimed that the major agricultural goals will be attained in four years instead of five.

There are, of course, many difficulties in the way of the execution of such a Gargantuan plan for the management of a great nation's business, difficulties which to some seem insurmountable, and which are well recognized by the Soviet leaders. Not the least of the obstacles, possibly the most stubborn, are the human problems. These become especially acute when dealing with the enormous peasant class which in some sections is only semi-civilized, in others leads nomadic lives, and speaks many languages and dialects but reads almost none. But it is important to have a plan for agriculture, even though it be faulty in some respects.

Collectivizing Farms

One of the principal handicaps to profitable Russian agriculture is the "strip" farming of the peasants. A typical farm contains only 15 to 20 acres, and this small total area is often divided into small narrow strips adapted mainly only to hand labor. Practically, the Government intends to collectivize these small units into large units known as the "kolhoz" or collective and introduce the use of machinery on a scale equalling if not surpassing anything of the kind done in our West. The gasoline tractor is the idol of the Soviets. With the tractor they expect to turn farming "upside down." They expect to "out-America America," and in the course of 5 or 10 years accomplish by orders from Moscow what our farmers have worked out through two or three generations.

The Soviet Government has prepared the way for a legal approach to the problem of collectivizing the farms by nationalization of the land. Quoting from M. M. Volf, Chief of the Agricultural Section of the Gosplan (Planning Board): "Soviet law knows no other land owner but the State. . . . This law, according to the conception of the Communist party, has to become the fundamental condition of the socialistic reorganization of agriculture—of the transformation of minute, atomized peasant farms into vast socialized agricultural enterprises."

Further, states Volf: "The per cent of collectivized rural population now

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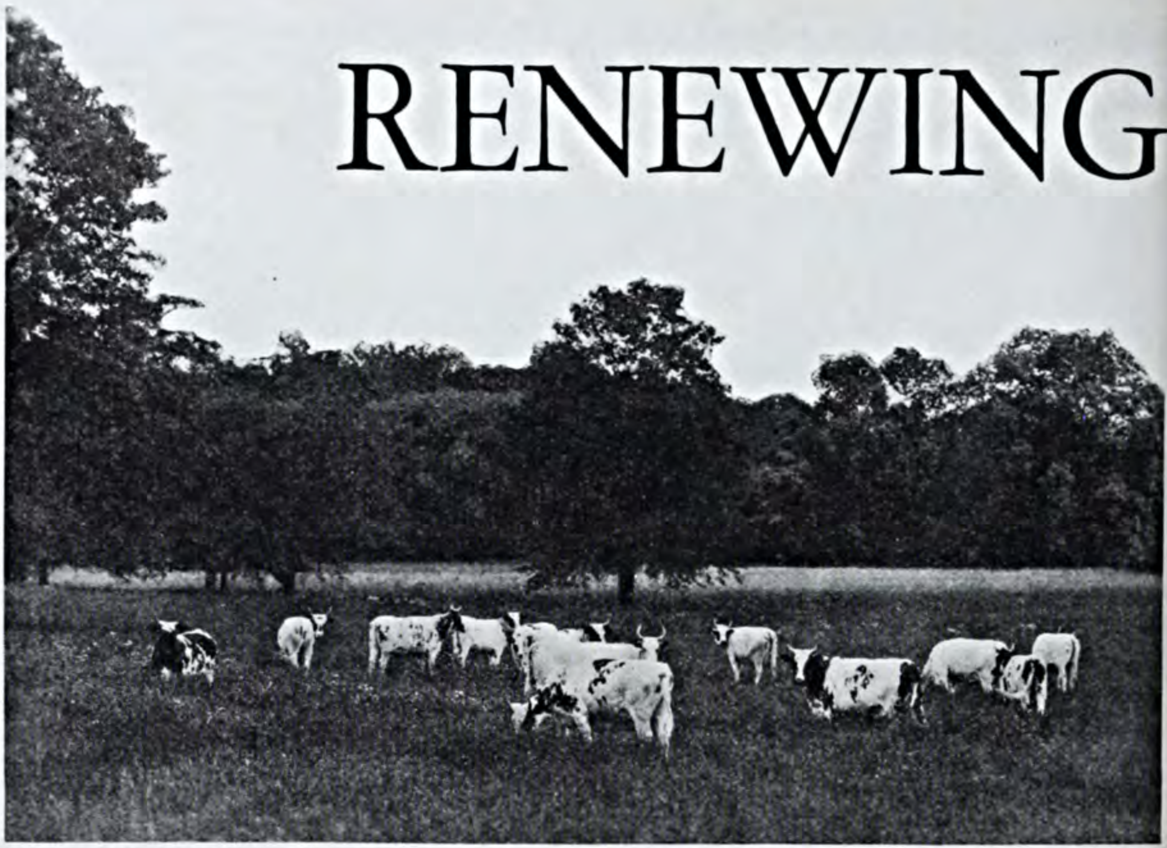
RENEWING



Both herd and pasture express contentment.

PLANTS like humans and animals must be fed. That, today, is almost a self-evident truth to any schoolboy. In the course of time crops deplete the manger of soil fertility in the same sense that a herd of cattle depletes the store of harvested feeds through the longer winter months.

There must be a living wage provided for both livestock and the crops they consume, if each is to prosper. Successful cropping of the soil has always been the prelude to profitable livestock management. The one must feed and maintain the other, and because of this relationship there may be deduced the primary truth,—food for crops means feed for livestock. In short, a living wage paid to crops guarantees the same for the herds. This principle has always been the backbone of winter feed production. Lime, legumes, and manure have long been the pioneer, soil fertility slogan. From these three servants there has been reaped a bountiful crop prosperity.

But even these, the "big three," have failed to maintain the level of soil fertility sufficiently high and well balanced to keep production costs of many crops within practical limits. The use of commercial plant foods for arable crops is getting to be a well-known necessity over a wide stretch of country. The "big three" are now giving way to the "big four." The lesson of rotational cropping and soil fertility for machine-harvested crops has been pretty well learned. Lime, inoculation, and manure used to be the only alfalfa sermon preached. Today we find a phosphate-potash chapter has been written for this crop.

I wish it could be said that all of the crop servants were managed as carefully as alfalfa. We have taken mighty good care not to arouse her spunk, for it is only too well known the penalty would be a low production peeve. She stated her demands emphatically at the time she hired out, and several salary raises have already been granted since first she started to serve the dairy industry. Her royal majesty has ruled with a firm hand.

PASTURE LEASES

By George B. Mortimer

Professor of Agronomy, Wisconsin College of Agriculture

And similar recognition has been accorded her sister, the corn crop. The morale of these two servants has been maintained at high levels, and today they are serving the livestock interest better each year.

The most neglected crop servant on the average farm is the natural pasture. Browbeaten into an inferiority complex, until now too anemic even to protest intelligently, she has unjustly been dubbed the Cinderella on the stage of crop actors. Patience and long suffering have been her virtues. Destitute and poverty stricken, she hides shamefacedly between her haughty sisters in a stubborn attempt to maintain the only domain she has now long known,—the ash corner of the farm. Tortured beyond endurance, bewildered by hunger, weeds, and all sorts of vagrants, trampled and eaten to death, she has dutifully bided her time for the dawning of the day when the fairy prince would arrive to again fit to her royal foot the jewel studded slipper of fertility, and to proclaim to all the world her return to the throne of pioneer days.

Such is the picture of a major portion of our natural grass lands. From the time they were snatched from the hands of our predecessors, their very life-blood has been drained to the point of exhaustion, until now nothing short of several fertility transfusions can ever hope to effect a permanent recovery from the hands of death now hovering over them.

Like many of her neighbors, the shoulders of Wisconsin's landscape are draped with thousands of acres of these sick pastures. It is estimated that at least 50 per cent of her summer milk production is produced from natural grazing lands. Can we afford

Learning to put the "Come-back" into pastures.

to continue to hasten their abandonment from the realms of grazing lands,—to be returned in the course of long years to brush and timber? For the majority the answer is no. It is now being realized that they may easily be returned to the magnificent verdure of their early history. All they need is a square deal. There isn't another farm crop that has suffered as much abuse as natural pastures. No other institution could last as long as permanent pastures have, if conducted along the lines of a "checking out method." Any machine will wear out, and pasture soils, like all others, are working machines and must be kept in constant repair.

Hunger Sickness

The only thing that ails the majority of them is hunger sickness. Anyone can tell that by watching the slow, stubborn, sickly growth of early spring quickly running into stemminess and seed heads with a minimum of vegetative growth. It is but a feeble attempt to conserve what energy there is left in propagating its kind. That is the way Nature works.

There are two sound remedies for this ailment; one, the return of life-giving properties to the soil through the magic wand of commercial plant foods, and the other, controlling the grazing of the herds. These are the two measures that must be incorporated into a program for managing pastures generally.

To be sure, there are many acres of these old pastures that never were worth much from the beginning. They do not have the natural setting for making good pastures. Thin soils, steep, rough hillsides that are severely afflicted with drouth, and low, swampy areas never have and probably never can produce good grass. I wouldn't recommend an ounce of fertilizer for such areas, for the natural setting they occupy makes it impossible to get returns for money invested. Fortunately however, these constitute a minority, for by far and wide the majority of these natural grazing lands are worthy of attention. Here in Wisconsin, we have some counties, 50 per cent of whose area is in permanent grass lands, and for many reasons had better be kept so than to be rotated in harvested crops.

In the spring of 1927, the writer started work with a decidedly worn-out pasture. It was platted into eightieth acre plats for fertility studies. Some notion of how poor it was may be had from the yields of the untreated or check plats at the close of that season, the average for all of them being but 807 pounds of dry matter an acre. This yield is extremely low when it is known that a good permanent pasture in a normal season is capable of yielding from 4,000 to 6,000 pounds of dry matter an acre. All plats were run in duplicate, excepting the checks which were replicated six times.

In the beginning of the experiment fertilizers top-dressed at these acre rates were used:—lime as ground limestone, 2 tons; 20 per cent superphosphate, 375 pounds; muriate of potash, 150 pounds; nitrogen as ammonium sulfate, 100 pounds; stable manure, 6 tons. Determinations for soil acidity and available phosphorus were made before the fertilizers were applied. The acidity reaction showed that two tons of lime would amply take care of natural pasture plant requirements. In all the readings taken, the soil showed but a trace of available phosphorus. The results for the first two years were quite disconcerting. While good percentage increases were had with some of the treatments, the total yields remained too low to be of significant value.

Consequently in the early spring of 1928, some of the treatments were repeated. Nitrogen was raised to 300 pounds of ammonium sulfate; phosphate again 375 pounds; and potash, 200 pounds. The table of data following gives the results to the close of the 1929 season, covering a three-year pe-

THE PASTURE LEASE MUST CONTAIN A FERTILITY CLAUSE

Yields of Dry Matter an Acre

Treatment	1927	Per Cent increase	1928	Per Cent increase	1929	Per Cent increase
Checks	807	...	982	...	1381	....
P	647	...	898	...	1377	....
P-L	926	14.7	1139	16.0	1963	42.1
P-K-L	863	7.0	1536	56.5	3484	152.0
P-K	990	22.7	1397	42.2	3502	153.5
N	886	9.8	1112	13.2	1422	3.0
P-K-L-N	1299	61.0	1630	66.0	3580	159.2
P-L-N	1206	49.4	1319	34.3	2091	51.4
Lime	569	...	1003	...	1591	15.2
Manure	926	14.7	1472	50.0	2066	49.6

riod. The yields are expressed in pounds of dry matter an acre.

As already stated and as shown by the data, renewed leases on our pastures must contain a fertility clause. Many of them have gone about as far as they can with what they originally had. They have run their race well and have earned thousands of dollars, and putting back what has been removed will enable them to enter the race again.

The Need for Potash

Most everyone who has been working with pasture problems has come to regard phosphates and lime as fundamental treatments for them. This I think is quite generally true. Reasonable increases are commonly obtained wherever they are used. Lime may not always be as essential as phosphate for pastures, but it is commonly found to be needed in varying amounts. There are, however, cases where lime and phosphates will not turn the trick for maximum returns. Such is the case of the pasture in this study.

Throughout the three years, phosphate alone has given no increase. With lime, however, there shows a 42 per cent increase for the third year. By the addition of potash, there has been 152 per cent improvement, and even without lime, phosphate and potash have given the same high return. The case for potash fertilization on this pasture is clean cut. Wherever it has been used, tremendous increases accrue. Take the case of phosphate, nitrogen, and lime. The increase at the end of the third year was 51.4 per cent, contrasted with 159.2 per cent where potash was used with them.

I suspect that this is typical of more cases than we are aware of. The assistance lent by potash to the encouragement of clovers, and the general beneficial tone it gives to the entire pasture vegetation, in my judgment, warrants its use in pasture fertilization. Liming alone when needed will effect some improvement, usually limited, however, and not felt before the third or fourth year following its application.

One might read from these results that there is not a good case for nitrogen on pasture lands. However, this would not be a fair interpretation, judging from results obtained on other pastures. This particular pasture was so very poor in mineral fertility that nitrogen has not been capable of showing much marked effect in yield increases. In fairness though, a larger percentage of the vegetation was grass wherever nitrogen was applied, while with mineral fertility, there has constantly been a preponderance of clover. Furthermore the distribution of feed throughout the season has been more uniform, when nitrogen was used.

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Selling an Idea

"Seeing Is Believing" Is Again Demonstrated

By F. H. Jeter

Agricultural Editor, North Carolina State College of Agriculture and Engineering

Tobacco like this was seen throughout the Angier section.

DOWN the road came a string of cars. Since eleven o'clock that morning they had made their way along tortuous plantation trails, now in sand, then in clay, sometimes with the road sunken under over-hanging banks of yellowish, red soil, and again merging into the turn row of fertile fields. Mostly the cars were adapted to such roads for in them were about 300 farmers who had come to see and learn.

"I want you to join us next Friday," was a brief invitation given me by S. K. Jackson, one of the field representatives of the N. V. Potash Export My.

"What are you going to do?" I inquired.

"If you can spend the day on an interesting trip, be over at Patterson Hall at 10 o'clock Friday morning. We want to show your agronomy folks some interesting tobacco and we would like to have you go along," he replied.

"That doesn't mean anything to me," I answered. "I can see interesting tobacco any day and I am not going anywhere until I know what it's all about."

Mr. Jackson then took the trouble to explain. There is no better tobacco growing section in North Carolina, he said, than in the territory about Angier, located near the junction of Wake, Johnston, and Harnett counties. The farmers are wide-awake and energetic. They are good tobacco growers and they grow good tobacco. This season he had located quite a few fertilizer demonstrations in that territory and since the results were showing how a well-balanced fertilizer would pay good returns, he had planned a field day. A committee of local citizens had mapped a route through some of the best farms and at the close of the trip, the party would enjoy a barbecue dinner. Where the dinner would be, he did not say, and no one knew until the grove was reached at late mid-day.

One was hardly prepared for the crowd at Angier. Not only were there College and Government research men present, but there were practical growers from at least a half-dozen counties. Dr. J. N. Harper and his entire southern staff were guests. After some waiting, the group separated into the various automobiles and the tour began. Stops were made at interesting points. Sometimes individual cars stopped and threw the whole caravan out of control, but this was not minded since there was something new and striking to see at nearly every point.

At the scheduled stops, the owners were present to tell how they fertilized their crop; what they thought of top-dressing with potash; and what they thought of the high potash content in fertilizer mixtures prepared according to the College recommendations. According to my notes, farms belonging to N. V. Stephenson, Dr. C. R. Young, D. F. Collins, J. E. Williams, W. O. Altman, J. M. Griffin, J. B. Upchurch, D. W. Denning, R. W. Lee, S. B. Currin, D. F. Adams, J. P. Gardner, J. P. Jones, E. M. Currin, C. J. Mabry, E. R. Mabry, and E. M. Stone were visiteu.

Along the route, the visitors could be heard making exclamations of interest and wonder. The one thing that impressed all apparently was the magnitude of the planting, the cleanliness and quality of the crop. Great fields containing up to 100 or more acres would be seen on some farms. In nearly every case the plants were of such uniform size that the ripple of a breeze would cause a play of leaves half upturned like the wavelets which play across the level surface of a lake in the quiet of evening. In some places, the owners had begun to prime the lower leaves, and constantly the tour passed tobacco barns shaded at one end with freshly cut branches of trees under which laborers or the families of the growers were tying the leaves to sticks for immediate curing. Throughout the area the pungent smoke of burning wood and the mellow aroma of yellowing leaf told of

The pungent smell of curing tobacco hung over the section and gave promise of the market days to come.

tobacco curing barns in operation.

Turning abruptly at a curve in the road, the caravan found spread before it such a sight as few will forget. Stretching out to the low-lying woods on each side were 100 acres of tobacco. There was no need to say "halt." The cars had stopped. Dr. C. R. Young, owner of the field, had planned to make a speech at the barbecue, but so insistent was the demand for explanation that he clambered aboard a truck and told the group how he and his tenants grew tobacco. The field immediately before him, he said, was farmed by the Owens brothers who have a reputation for producing quality leaf. One secret of their success lies in handling the plant bed. One bed prepared last winter contained three acres of land. Before planting, the seed were carefully treated for disease and tested for germination.

He explained the large seedbeds by saying that he liked to go right through with planting once he had started setting. The field is first well prepared and from 1,000 to 1,100 pounds of fertilizer are used. Each tenant usually has only 10 acres of tobacco because the more rapidly the crop is worked or cultivated, the more rapidly it will grow. Dirt is always thrown to the plant until it is on a good ridge which protects the roots from wet feet.

He explained that tobacco cannot stand dampness about the roots. Those hearing him were invited to discover any signs of plant food deficiency or crop disease in the field, and reported none. Dr. Young said he always followed carefully the recommendations of the North Carolina Experiment Station, especially the new facts about fertilizer, ridge cultivation, and seed treatment. This probably made the crop a little more expensive to grow, but the returns had always justified the expense.

This was really the high spot on the trip. At the conclusion of the tour, the group met in a grove on Dr. Young's farm where short talks were made by Dr. W. W. Garner of the United States Department of Agriculture, J. N. Harper, and others. A deliciously prepared barbecue dinner was then served and the group disbanded.

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No peasantry here, but sturdy, upstanding, intelligent farmers sharing profits with Dr. C. R. Young, who stands at the extreme right. This group shows tenants on the Young farm.

Mr. French Gilman of the United States Department of Agriculture beside a cluster of Ammobroma which has been exposed by removing the sand from around it. It grows like huge asparagus stalks, tastes delicious, and is good food.

A New Food Plant

By U. V. Wilcox

Washington, D. C.

PLANT scientists of the U. S. Department of Agriculture, always on the alert for new foods to grace the tables of American homes, have discovered a new food plant growing in quantity in the desert hills of southeastern California, Mexico, and elsewhere, where the rainfall is as little as two to six inches a year.

Strangely enough, only a few specimens of this odd plant, known as Ammobroma, or "sand-root," had been seen by white men before 1928, when Frank T. Thackery and M. French Gilman found it growing on an area of about 200 square miles on the east side of the Colorado desert. It was also found growing in a large area in Sonora, Mexico, and may perhaps be found in other dry, sandy regions.

It has been learned that from time immemorial the Pagago Indians, a tribe living in the southwestern regions, had been digging it and eating it either fresh or dried.

Ammobroma, or "sand - root," flowers, but has only rudimentary leaves. It saps most of its food from the roots of a small desert shrub and grows 10 to 20 times as large as its host but does not stunt the host. Apparently it cooperates with its benefactor by providing water in exchange for pre-digested nourishment.

The ammobroma is able to endure the hot suns by growing three to five feet into the soil, with only the flowers appearing above the surface of the ground. The long stems, resembling enormous stalks of asparagus, are both appetizing and nourishing, according to Carl Lumholtz who studied this plant in northern Mexico. It has the further value of being able to produce an annual crop with a rainfall of only four or five inches, which is a record for food plants even in American deserts.

It is believed by these specialists of plant life that the strange plant can be introduced into dry sandhill regions of this and other countries and can be cultivated for a regular harvesting. At

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The Inquiring Mind *and the* Seeing Eye

By Dr. A. S. Alexander

University of Wisconsin

JOHN F. APPLEBY

FEW boys rack their brains and strain their eyes trying to solve knotty problems in mechanics; but John Francis Appleby was an exception. He was an inventive genius—a boy born with a vision and a mission which, in time, he realized and fulfilled.

When but 15 years old he got the idea that the back-bending toil of bundle binding in the hot harvest fields might be done away with if some practical device could be perfected to automatically tie the sheaves with wire or twine instead of bands of straw. Then as he sat on the old rail fence and thought the thing over, I fancy he hummed a jingle such as this, in time with the bumblebees, as he whittled away at a bit of apple-tree wood:

In this wheat bye and bye
Strong twine bands I shall tie
Chewing crickets to defy,
And men's backs keep straight and spry
Or my name's not Appleby.

And so he did, for on the Houghton farm near Whitewater, Wisconsin, in 1858, he made a bird-bill knotter from that bit of apple-tree wood, and it worked. The next year he made a similar one of steel in the little gun shop of Harvey Pierce at Palmyra, Wisconsin. He was but 18 years old at that time and 20 years were to pass before his invention—which he did not patent—came into practical use.

John F. Appleby was born in New York State in 1840, and when five years old was brought by his father to Wisconsin. Taking part, at an early age, in all procedures of the farm he also watched with interest the making of grain headers and other farm implements in the small machine shop of George Esterly, who afterwards manufactured self-binders.

Prompted by Experience

An informative article by F. B. Swingle, in the Wisconsin Agriculturist of July 14, 1923, tells us that young Appleby disliked the slow pace and back-breaking process of binding sheaves by hand and dreamed of a practical binding machine day and night until, in 1858, he made the steel knotter which, probably, was the first to tie a knot in cord. This old knotter may be seen today in the museum of the State Historical Library at Madison.

When the Civil War broke out, Appleby had no opportunity to attempt manufacture of a binder, but he carefully preserved the original knotter.

After serving throughout the war he associated himself with Charles H. Parker and Gustavus Stone and in 1874, at their little shop in Beloit, Wisconsin, turned out an excellent wire binder which was largely his device. It was tried out in a field owned by John Dates, on the old stage route to Madison, and did satisfactory work. Dates liked the work of the new binder, but dismayed its makers by asserting that the wire bands in the straw would be likely to kill the livestock. That objection proved true, for wires swallowed by cattle, transfixing the wall of the stomach, the diaphragm, and sac of the heart cause that form of heart disease which technically is called *traumatic pericarditis* and usually proves fatal.

After the firm had made some wire binders, many users complained that their cattle were killed by wires swallowed with the straw. Bits of binding wire also caused explosions in flour mills by friction in the machinery. Appleby and his partners, therefore, decided that a twine binder would have to be substituted and at once tackled this new problem.

In two months Appleby had the working parts in order. The knotter employed was of the same bird-bill type as the one he made when a boy in Harry Pierce's gun shop.

That was wonderful progress in the desired direction, but, as Appleby said to Mr. Swingle: "The task remained of mounting the binder in such a manner as to take the cut grain and use the power applied from the wheels of the harvester. This took more thinking and planning than the making of the knotter itself. I hit upon the U-frame, planned elevators to carry the grain to the binder, packers

Steel fingers like these knot the bands around millons of sheaves every hour of the harvest season.

to keep the bundle in shape, and a butter to form the square base of the bundle. The needle was so shaped as to compress the bundle before tying. The tripping device gauged the size of the sheaf, and all parts received power from one gear wheel. This took a tremendous deal of planning, but after I had seen the needs of the entire scheme, I set myself to carrying them out, and little real change has been made to this day, except in the way of small improvements."

For months Appleby plodded away alone at his invention, in a garret above the shop, and his associates feared he was accomplishing little; but that was a wrong impression. Progress was steady and at last the new machine was completed. It was tried out in Parker and Stone's rye field near Beloit and, as eye witnesses declared, "worked perfectly and cunningly, not missing a bundle."

Success Assured

Next year the little Beloit shop turned out 115 twine binders and sold them for use in Idaho, Illinois, Iowa, Kansas, Minnesota, Texas, and Wisconsin and the threshermen who threshed the grain first cut were loud in their praises of the manner in which the machines had done their work.

The new twine binders created a furor of excitement wherever they were used and their fame quickly spread throughout the land. Naturally, therefore, the makers of wire binders sent scouts into the fields to watch the wonder-working twine binder in action, with the result that wire binders soon went out of fashion.

In his interview with Mr. Swingle, Appleby stated that the splendid records of their early twine binders proved their durability and, although partisans of the wire binder declared that the crickets would eat off the twine bands, that did not prove true. The makers triumphed, and in four years binder manufacturers turned to the pioneer Wisconsin firm for the rights to build twine binders. That was the natural result of the dictum by farmers that they were through using wire bands and must have those of twine.

Gammon and Deering of Chicago became most interested and in 1879 began manufacturing twine binders under a license granted them by Appleby and his partners. At first there was difficulty in obtaining material of the best quality for the making of the necessary small, smooth, strong type of binding twine, but when William Deering put his million dollars into the manufacture of twine binders and gave his personal attention to the problem, it was solved and suitable twine produced.

In a publication by the International Harvester Company we find it stated that "the idea of flashing a cord around the bundle of grain, tying a knot, cutting the cord, and flinging off the sheaf, stand practically as it was nurtured under Deering's direction." It was also on the recommendation of William Deering, as stated by Appleby, that their first shop-right for the manufacture of twine binders was granted to Hoover, Allen, and Gamble of the Excelsior Harvester Works, at Miamisburg, Montgomery county, Ohio.

In his historic interview Mr. Appleby further stated that his firm built a twine binder each for several other firms and sold licenses to manufacture under a royalty of six dollars on each machine.

In 1882, the McCormicks of Chicago paid Appleby and his partners $35,000 for the right to manufacture twine binders. "Finally," said Mr. Appleby, "we sold out our entire plant to one of the larger firms and laid the foundation of what later grew to be the International Harvester Company." Then Appleby worked for the Deering for many years, but when the larger firms consolidated, he concluded that his life's work was done and therefore retired from active work in

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Fertilizer made the difference. Left—lime only; right—lime, phosphate, and potash. (Douglass Field, Kalamazoo county, Michigan)

The Critical Point

By George M. Grantham

Research Associate in Soils, Michigan State College

THE legume in the ordinary crop rotation gives the farmer more concern than any other crop. So true is this that we may call the year when the legume is supposed to appear the "Critical" point in the rotation. In fact I have come to believe that I can rather accurately judge a sandy soil farmer's chances for success when I know his ability to grow legumes.

The chief reason for this is, I believe, that the sandy soil farmer has access to the same large stores of atmospheric nitrogen as has any farmer anywhere so if he grows the legumes, their mutual friends, the bacteria in the nodules on their roots, are working night and day for him building up a cashable product.

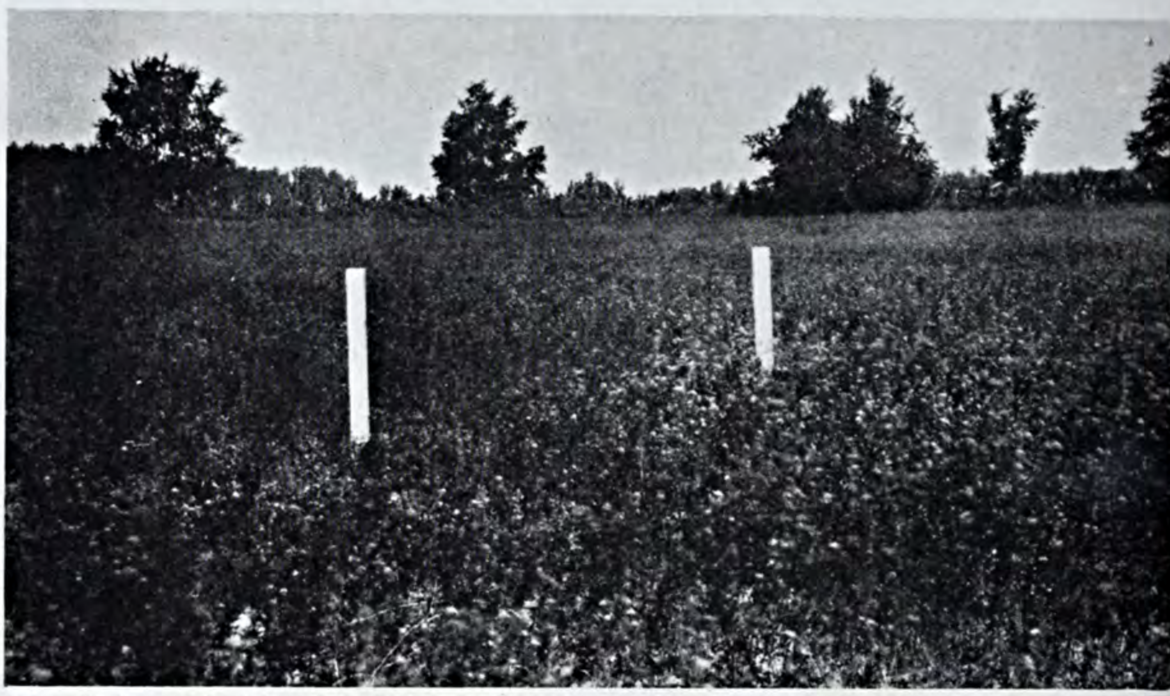
And so a long and complicated organic process, to which science thus far has only discovered the grandstand plays and sidelights, is briefly sketched. The legume crop invites the nodule bacteria to take the free nitrogen from the air and revamp it into food suitable for legumes, and in turn, the legume takes this and reworks it into the much needed proteins of the livestock farmer. Not content with this important work, the legumes are the most active group of plants in adding organic matter to the soil; and organic matter is very important for sandy soils.

Michigan contains within her borders some 10 or 12 million acres of sandy soils out of a total of 37 million acres in the entire State. I would go a step further though and say that the sandy soil area of the Wolverine State is one of its most important crop-producing areas. On these sandy soils, the famous Michigan peach crop is fabricated, and the great Glad Hand vineyard is growing, not to mention the vast areas devoted to general farming.

Realizing the economic importance of this sandy soil area, the Soils Department started a group of experimental fields here and there over the State 13 years ago. In addition to these experimental fields located up and down the west side of the State, many fields have been given various fertilizer treatments from year to year. It has been my good fortune to have been connected with this research work on sandy soil since the beginning. In that length of time, the legumes—alfalfa, sweet clover, and red clover—have been given that particular attention which befits their prominence in the crops program of the man who is farming sandy soil.

It would not do to omit saying that for the production of these legumes on sandy soil, it is generally necessary to put on lime in some form. True, there are restricted areas where it is necessary to put on from four to six tons of lime materials, but on the general run of sandy soils, it takes from two to two and one-half tons to correct enough acidity to successfully and profitably grow the legumes.

The point I stress is that the sandy soil farmer should make a test for soil acidity, then act upon it. Soiltex, which my colleague, Professor C. H. Spurway perfected, gives an acidity test that is a reliable guide.



The alfalfa at the left received lime alone; that at the right lime plus 186 pounds of muriate of potash per acre. (Isabella sandy loam—Mecosta county, Michigan)

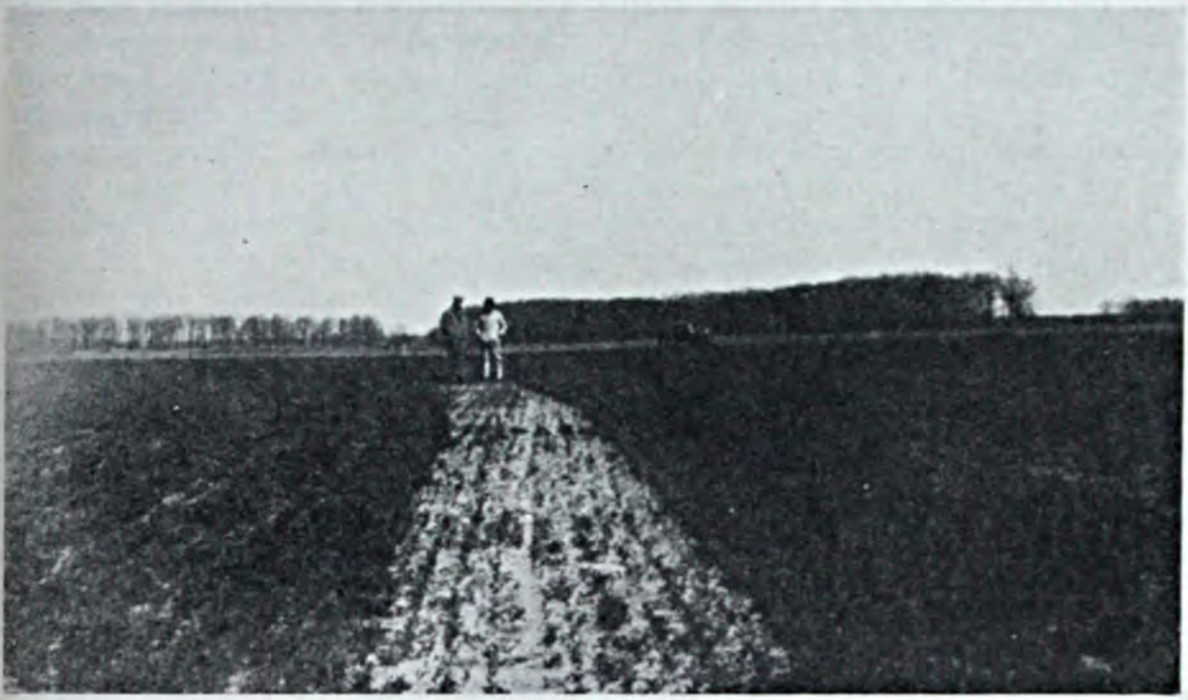
One of the first jolts we got in our sandy soil experimental work was the relative importance of lime for the legumes. Lime had long been heralded as the one and only steppingstone necessary to alfalfa on sandy soils. Naturally, in our layout of soil treatments we had applied lime alone, then lime with other plant food, but when the hay weights began to accumulate, it was apparent that the right combination of fertilizers was almost as essential as lime.

For instance, with eight cuttings of alfalfa grown on a Fox sandy loam in Cass county, the average for lime alone was 1,308 pounds of dry hay, but where we used phosphate and potash with the lime, the average cutting made almost a 50 per cent jump, or 1,948 pounds of hay per cutting. Two and three cuttings per year were taken which means that even this sandy soil will produce from two to three tons of barn-dry alfalfa hay if it has the right treatment from the start.

The effect of nitrogen, phosphoric acid, and potash used singly and in combination on many sandy farms over Michigan brought out very interesting facts. There was considerable speculation as to what nitrogen would do for the legumes because the sandy soils are generally lacking in this element. Nitrogen alone would almost invariably produce a nice stand of dark green plants in the spring, but as the harvest came on, the yield was disappointingly low. The average of 13 cuttings on a low-fertility Fox sandy loam in Kalamazoo county was not enough greater than that of the checks to pay the cost of the material. And we noticed one other thing as well that will interest alfalfa growers. We observed that wherever we put on these nitrogen carriers, bluegrass was the quick sequel. This is objectionable anywhere, but even more so in alfalfa on sandy soils. Bluegrass came snapping at the heels of all the nitrogen-carriers, with manure the worst offender in this respect. This has caused us to look askance at top-dressing alfalfa with manure.

It fell within our study to observe and weigh the results which phosphate alone brought to the mighty legumes. In some cases, it gave an increase; in others, it gave nothing; and in some others, it even decreased the yield mainly through decreasing the stand.

The ideal combination for alfalfa seems to be lime, phosphate, and potash. The following figures are the pounds of dry hay per cutting taken from a Fox sandy loam in Kalamazoo county and the average is for 15 cuttings. Lime alone shows 1,533 pounds; phosphate added to the lime brings the figure up to 1,849 pounds; but where phosphate and potash were added to the lime, the average is 2,125 pounds.



In this alfalfa seeding one drill width was left without fertilizer. The strip was easily found when the young plants began to cover the ground. (Fox sandy loam—St. Joseph county, Michigan)

As a result of these many experiments on our various soil types, we have come to recommend for the legumes a generous application of phosphate and potash, say 250 to 300 pounds of an 0-20-20, this to be put on before the alfalfa is sowed. The ideal way to apply this mixture is to use a grain drill and set it to dribble the phosphate and potash just as deep in the soil as the drill will penetrate.

There are, to be sure, many sandy soil farmers who have a fair start of alfalfa and they seriously inquire if there is any way to prolong its usefulness. To this, our answer, is "*yes*" although our results show that top-dressing an old stand does not produce the wealth of hay that fertilizing a new stand does. If it is advisable to top-dress, the same ratio of phosphorus and potash is advised in about the same rate applied right after the first crop has been taken off. A disc drill used before the soil has dried out does a creditable job of getting the phosphate-potash mixture into the soil.

Here are a few generalizations from our results with potash on the legumes on Michigan sandy soils. A sweet clover crop grown for green manure on a light soil in northern Michigan yielded one-third more where potash was used as compared to an area receiving no potash. The following year, the area which received the 100 pounds of potash yielded 62 per cent more potatoes than the other.

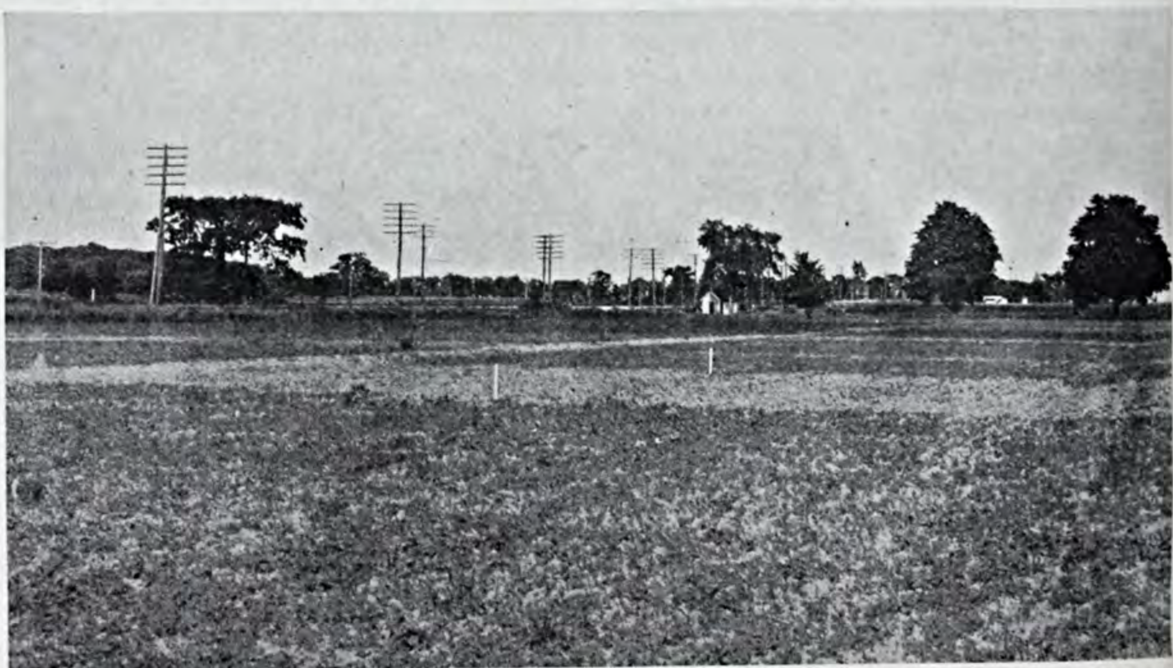
Small grains do not show such marked increase where potash is used as do the legumes. However, when once a leguminous green manure has been turned down, the yields of small grain are about proportional to the amounts of green manure plowed down. This says—apply the potash for the legumes in your rotation.

Potash seems to have quite lasting qualities in the soil. It is rather common to see marked results on legumes three and four years after an application of potash. On a Cass county field in 1921, a plot receiving potash four years previous yielded 3,160 pounds more of green sweet clover than an adjacent plot receiving no potash.

The heaving of sweet clover, alfalfa, and red clover is a serious problem in our latitude. Where potash has been applied, the heaving takes place just the same as it does on any soil, but the plants on potash-treated soil seem to have more resistance and survive the hardships better than plants on soils receiving no potash.

On a sandy loam soil in southern Michigan growing sweet clover in the spring of 1928, where no potash had been applied, 57 per cent of the original stand was killed by heaving; where potash had been applied, only 8 per cent of the plants failed to survive.

It should be understood that the results set out are for the legumes only, but because these constitute the "critical" point in the cropping program of the sandy soil farmer, fertilizing them merits very serious consideration.



Between the two white stakes, lime only was applied for this young seeding of alfalfa. The other area received lime, phosphate, and potash. Other check areas can be noticed in the field. (Fox sandy loam, Kalamazoo county, Michigan)

The Unseen Half

By E. N. Bressman

Associate Professor of Farm Crops, Oregon Agricultural College

THE root is one of the most important parts of the crop plant and in many cases it makes up more than half of the total bulk of the plant, still there has been less attention directed to the root of the plant than to any other part. This is true because the root is invisible and "things out of sight are out of mind."

This is the root of "Man-in-the-ground," also called wild cucumber —a common weed.

Another important reason for apparent lack of attention to the root system of a crop plant is that it is no easy task to find out things about the root system. There has, however, in the last few years been some work done on roots, both native and cultivated plants. Most of this work has centered around the activities of Dr. J. E. Weaver at the University of Nebraska. Dr. Weaver and his associates have been working steadily on crop plant roots and have revealed some astonishing things about this part of the plant.

The roots of a plant take on different sizes, shapes, and characteristics under various soil conditions. It is, therefore, important to know something in regard to soils when studying roots. On the other hand, it is important to know something about the roots of plants in a study of soil conditions. Most of the good work on roots has been done under natural soil conditions and not in the laboratory or alongside of a bank where roots are growing rather artificially. Many roots have been traced 15 to 20 feet in depth and innumerable ones such as our common crops, like wheat, have been found to grow nicely at a depth of 6 feet. Many soil conditions such as alkali, acidity, drainage, and fertility, have a marked effect on root systems and so must be taken into consideration in such a study.

The wheat plant, similar to all other grasses, has two root systems. The first one to come out is known as the seminal or seed root system. This root system develops from the seed. The second root system which develops is known as the adventitious or secondary, or called by some folks the permanent root system. This latter term is not desirable because quite often the seminal root system is the only one which develops. Many times under the wheat-growing conditions of eastern Oregon only the seminal or first root system develops. This is due, more than likely, to unusual moisture conditions during the fall and winter season.

Ordinarily the working level of the root system of wheat is somewhere around 3 or 4 feet in depth, but quite often under favorable conditions the root system reaches a depth of 8 or 9 feet. This depth can be varied greatly by soil conditions and particularly by fertilizers and moisture. Under heavy clay soil conditions roots do not penetrate deeply but are rather superficial and the plants are subject to injury from lack of moisture. Rye has a root system very similar to that of wheat, the only difference being, maybe, that the roots of the rye plant are branched to a greater extent.

In general oats and barley do not have as extensive a root system as wheat, particularly fall sown wheat. However, the extent of the root system depends greatly upon the variety. It is not uncommon for oats and barley to have root systems which reach to a depth of 6 feet.

Depth of Planting Is Important

The relation of the type of root growth to cultural practices is of interest. Anyone who has dug roots will quickly find out that the upper layers of the surface soil are completely filled with the roots of cereal crops; therefore, one can readily see there is no room for weeds or other plants in a field. In addition, this extensive root system emphasizes the necessity of proper rate of planting, particularly under dry conditions where moisture is limited. The necessity of producing an extensive root system in fall grains before cold conditions stop the growth of the plant is apparent. There is no doubt that wheats with well developed, extensive root systems are not so apt to winterkill. Therefore, well-prepared seedbeds with grain sowed at a proper depth and a proper rate are of great importance to the development and type of root system. The time is not far off when plants will be selected because of their particular type of root system which may be adapted to certain conditions. Possibly many of the varieties which are adapted to certain growing conditions owe their adaptation to their particular type of root system.

The root system of corn is of great interest because of its distinctive lateral spread. It is the usual thing for the corn root to spread from 3 to 4 feet in all directions from the plant. It is apparent, therefore, that the corn plant uses all of the available moisture and fertility in the ordinary field even though the plants are spaced at a considerable distance. Without a doubt too many growers are afraid of not using all their available fertility and moisture and plant corn too thickly. It is not unusual for the corn plant to send its roots down to a depth of 6 or 7 feet in the soil.

In all of the cereals, which include corn, wheat, and barley, the root systems are not affected greatly by depth of planting except in the case where no secondary root system is formed In the latter case the depth of planting is of importance because the seminal or primary root system comes out where the seed is located in the soil. Ordinarily seeds of these crops should be planted no deeper than to get them into moisture. The permanent root systems come out about an inch below the surface of the soil under ordinary moisture conditions. Of course if the ground is extremely dry, this depth may vary considerably.

Roots of Grasses Grow Deep

The many different grasses such as bluegrass, orchard grass, bent grass, the fescues, and others, have extremely interesting root systems. Although the root systems are fibrous and fill the surface soil, making a heavy sod, the root systems of these grasses penetrate quite deeply into the soil. Although the grass above ground may dry during the summer time, the roots from the extreme depth are able to carry considerable moisture, and at the first rains in the

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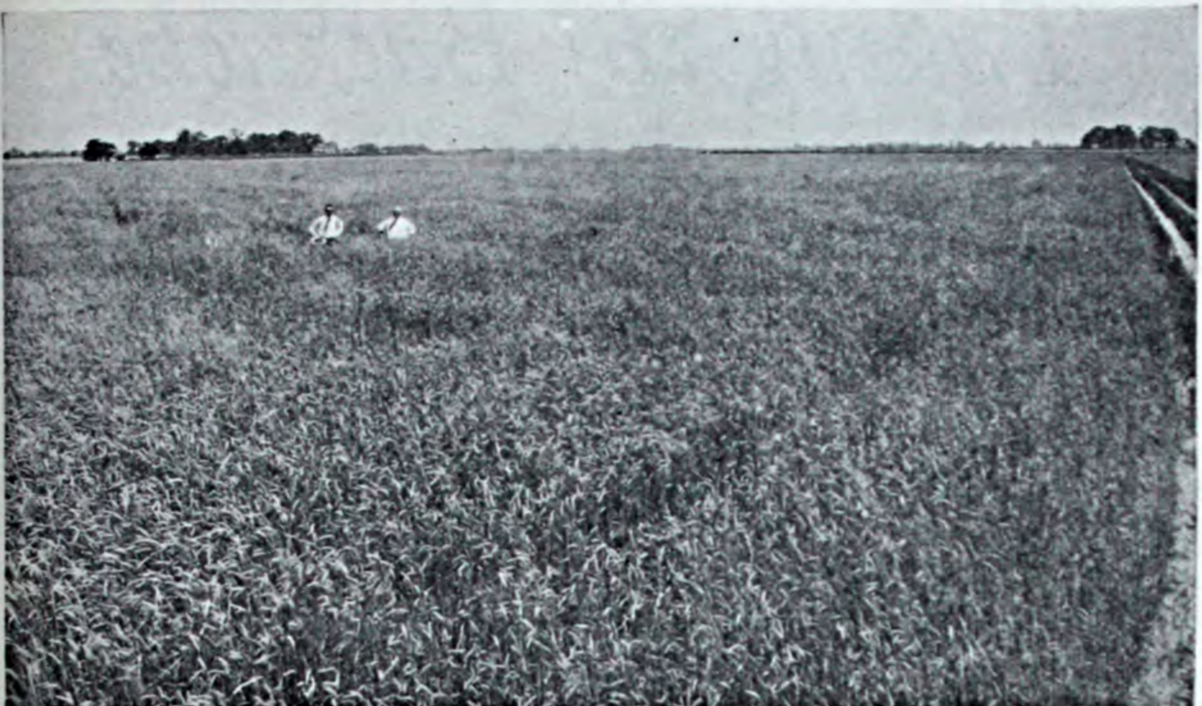

The total acreage of wheat on Mr. Baird's Edgewood Farm in 1930 was 500 acres. This field threshed out approximately 40 bushels of wheat per acre.

From Peaches to Wheat

By Henry T. Maddux

Atlanta, Georgia

THE Hale Georgia Farms Company at Fort Valley, Georgia, used to have the largest peach orchard in the world. For several years prior to 1930 practically all Georgia peach growers lost money and, therefore, Mr. John H. Baird, president and general manager of the company, changed from peaches to other crops, one of which was wheat. He planted a small acreage of wheat in 1927 and this was gradually increased from year to year. In 1930 he grew 500 acres which averaged 32 bushels per acre and practically all of which was of No. 1 grade.

The average yield of wheat in Georgia is about 9 to 10 bushels per acre, and most of this is of No. 2 grade. How Mr. Baird produced 32 bushels of wheat per acre rather than 10 bushels per acre is an interesting story.

Mr. Baird came to Georgia from New Jersey, but he has lived at Fort Valley so long that he is now considered a "Georgia cracker." He is a keen student of farming and in his beautiful home at Edgewood Farm he maintains an office just like that of the average business man. He has a very complete agricultural library.

In the preparation and planting of his 1930 wheat crop Mr. Baird used tractors, and the crop was harvested with a combine. The fact is that Fort Valley and Peach county have changed a considerable acreage from peaches to wheat in recent years and there are now a number of combines in opera-

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Taking the Backache out of LAWN CARE

By

O. C. Lee

Agricultural Extension Department of Purdue University

A beautiful green lawn is a setting for all plantings.

WHAT is a greater asset to a home and its surroundings than a beautiful green lawn? How many times we have admired certain homes, not because of the neat house or the shade trees, but because of the beautiful setting which can be attributed to a well-kept lawn. Perhaps the caretaker has spent many long days cutting and digging out weeds and replanting these areas to grass. It may be also that he is up-to-date, using the new method of preventing the growth of weeds by encouraging a heavy turf.

The old theory was that weeds cause poor lawns, while the newer idea is that poor lawns cause weeds. Weeds come in merely because they find an ideal place to grow when the turf is thin. A lawn properly cared for has a thick, heavy turf and leaves no room for the intruder. To get a weed-proof turf, it is necessary to have sufficient humus and plant food at the surface of the soil, to use pure seed, and to continue to fertilize the lawn. Grasses like any other crop must have plant food to live and grow.

Hand weeding rarely destroys the pesky weeds since most of them, particularly dandelions and plantain, have the habit of sprouting after cutting. You might come back to the old argument that plants cannot live without leaf growth. That is perfectly true, but foliage develops rapidly and keeping all leaf growth from forming is a long and tedious process that is impractical on the average lawn. And even if the roots are starved out, new weed seeds are constantly being introduced into the turf either during the reseeding process or when the wind blows dandelions, dock, and other pests from nearby lawns and waste places.

In other words, the best way to maintain a weed-free lawn is to develop a condition not favorable to weed growth. A thick, heavy turf will leave no room for the weedy intruder.

The best way to encourage the grass is to use fertilizer. Extensive tests have shown that equal amounts of a complete fertilizer and ammonium sulphate are the best to use. There are two reasons for this:—first, ammonium sulphate is rich in nitrogen and it is nitrogen that produces leaf growth; second, it produces an acid reaction that is detrimental to practically all weeds and not harmful to common turf grasses. In addition the complete fertilizer supplies the elements phosphorus and potassium as well as additional nitrogen, all of which are essential for plant growth.

Ammonium sulphate must be used with caution, however, or it will burn the grass. Burning can be prevented if this material is not applied at a greater rate than five pounds per 1,000 square feet or 10 pounds of the mixture per 1,000 square feet. Thorough watering to wash the material off the grass is essential. Furthermore, sulphate of ammonia can safely be applied during spring and early summer, also during the cool fall months, but it ought not to be used in the heat of the summer season or disaster may follow.

There are some lawns that fertilizer will never make perfect. The fault here is in attempting to grow grass on the infertile, clayey subsoil cast up when the house foundations were excavated. Mixed with this subsoil are masses of waste building material. About the only thing that can be done to produce a good turf on such an area is to add a layer of good topsoil and start all over again. This layer of soil need not be more than three or four inches deep, as grasses do not root deeply.

Anyone contemplating the erection of a new home should profit by the experience of others and specify that the rich topsoil be saved and used later for surface dressing of the lawn. This is an important step as it will save the work of later transporting soil, perhaps from a distant field.

Another common error in lawn maintenance is the use of lime. It encourages weed growth and has no place on the average home lawn. City water usually contains lime, sufficient to supply the grass with this element. Turf grasses, on the other hand, are quite tolerant to acidity, particularly when abundant plant food is available.

It may seem rather difficult to account for the army of weeds that infest the lawn. It is true that weed seeds blow in from nearby lots or roadsides. More often, however, weeds are introduced as impurities in lawn seeds, and once started they readily reseed and persist. Use good, clean seed to do away with endless trouble. Experience has shown that for most lawns bluegrass is the best all-around grass. It is true that bent grasses make beautiful lawns, but the seed is expensive and the grass grows so rapidly that it is an endless job to keep it properly mowed.

Common and buckhorn plantains are two of our worst lawn pests.

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Due to Details

By A. E. Wilkinson

Vegetable Gardening Specialist, Connecticut Agricultural College, Storrs, Connecticut

A POTATO yield of 1,119 bushels of 61 pounds from 2½ acres is "some yield." This is not an estimated yield, nor is it figured by digging a row here or there in the patch. It is the total yield harvested by Mr. Horace Pease of Somers, Connecticut, during the dry year of 1929. In fact, it is what he sold from his crop after it had been stored, and includes any shrinkage that might have taken place in storage as well. The total yield might have been larger if there had not been any shrinkage. The average yield per acre was 447.6 bushels. This includes hard lands, ends of rows, poor rows, skips, and everything else in the crop, as the records have been taken from one field devoted to this crop.

Considered All Factors

There are some interesting facts that can be obtained from the methods used and other items in growing this crop. The soil on which the crop grew is known as a triassic stony loam. This loam is a reddish to red-brown silty type with a depth of 12 to 14 inches. The subsoil is a medium heavy sandy loam of reddish color. The material ranges from a sandy loam to a heavy silty loam—the latter has a much darker red color. Both topsoil and subsoil contain a number of angular boulders of all sizes and with some small stones. The greater portion of these consist of the red and brown sandstones of the Triassic period. The surface of this type is hilly or rolling; the outline of the hills is usually gently rounded. The prevailing red color is due to the presence of compounds of iron.

The soil was spring plowed—part of it being a turf and the balance used for tobacco growing in 1928. The soil was harrowed with a tractor harrow and thoroughly fined and smoothed. It was not marked out for planting.

The variety used was Green Mountains. One-half of the seed was certified and obtained from Prince Edward Island; the other half certified and obtained from a good source in Maine. This seed was stored in the northern locality during the winter and was shipped to Somers in the spring.

The seed was cut with a machine as needed for planting. Care was exercised to have at least one good eye on each piece but the number of eyes on each piece was variable. Planting took place between May 25 and May 31. Seeds were planted with a two-man planter, one man driving the horses and the other seeing that the seed pieces dropped at regular intervals and also that the machine marked out the next row.

The rows were three feet apart and the seed pieces 12 to 13 inches apart. The seed was put in deep, about six inches, because the machine was set to throw a furrow or ridge over the seed piece. The real depth was only two inches.

A 5-8-5 fertilizer was used at the rate of 3,000 pounds per acre. One-half of this fertilizer was broadcast

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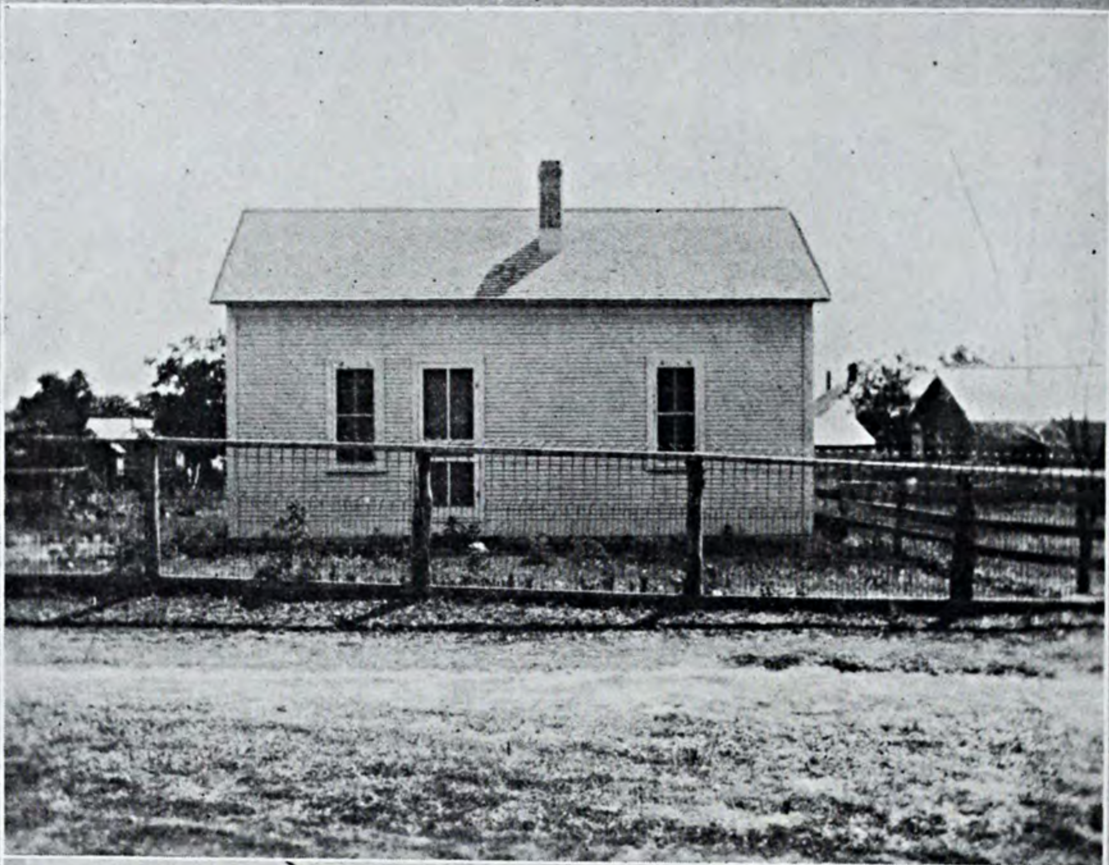
The price of gas may or may not be the subject of conversation here. At any rate, the big fellow seems happy in giving service to the fair lady.

PICTORIAL



Above: In the little German town of Fredericksburg, Texas, are to be found a class of houses unknown elsewhere. They are called "Sunday houses," and solve for many ranchmen and farmers the problem of week-end trips to town for shopping, trading, and attending church. The houses are furnished, but few of the nearly 100 of them in the town contain kitchen utensils. The owners bring enough food to last them from Saturday to Monday, thus freeing the women from cooking and saving the expense of stocking two kitchens.

Left: This mail-box, located in San Miguel county, Colorado, was made out of the back of an old Ford roadster. It is located in an unoccupied territory, where the only thing raised on the land is a little grass for sheep. The people using this box have to travel many miles to get their mail.

Right: Homer Lapp won first place in the annual wheatland plowing contest, recently held in Illinois. He drove a three-horse team instead of a tractor, proving that the old-fashioned method is still good. This is the third time that he has won the contest, and he is shown here with the trophy.

Below: Having outlived its usefulness as a refuge from hostile Indians, this old blockhouse in Minnesota has been converted into a silo.

Above: When Uncle Sam finds that his bees are suffering with stomach-aches or sprained ankles, he doesn't treat the ailments as he would if the sufferers were human beings. Instead of examining the patient, he examines the honey that the bees have been making and then prescribes accordingly. Two workers in the bee culture laboratory of the U. S. Department of Agriculture are shown here making diagnoses from the hundreds of samples placed before them.

Below: A typical scene at this time of the year in Aroostook county, Maine. Consistently large yields and good quality of potatoes are obtained as a result of applying the right kind and quantity of fertilizer.

Above: The young lady, second from the left, is Miss Lucille Gates of Pomona, California, who won the American Farm Girl Championship at the recent Los Angeles county fair. She excelled at milking, churning, corn-husking, raking, and tractor driving. The young pigs shown in the picture were disinclined to appear before the judges until the fair farmerettes made their appearance and bribed them with milk in baby bottles

Below: This quaint cottage with the forbiding looking cannon is the birthplace of General Ulysses S. Grant located on the Ohio River a few miles southwest of Cincinnati, Ohio.

Above: In Porto Rico, a soft drink is served from cocoanuts fresh from the palm. The gentlemen in the picture, left to right, are: Mr. Kerr, San Juan Ginneries; Mr. Leonard, Porto Rico Experiment Station; Mr. Jimenez; Dr. Forbes, Cornell University; and Mr. Rorke, San Juan Ginneries.

Left: Mrs. Leland Booth, wife of Leland Booth, Editor of The West Virginia Farm News, was one of an interested audience when Charles Gapen, Chief of the U. S. Department of Agriculture's Press Service, explained how the department keeps the nation posted with regard to its activities, at the recent convention of agricultural college editors.

The Editors Talk

Paul Wagner 1843-1930

Professor Dr. Paul Wagner passed away on August 25th. His was a long, active, and fruitful life. We are indeed fortunate to be able to present to our readers, in another section of this issue, an appreciation of Paul Wagner and his work written by Professor Dr. O. Eckstein of Berlin.

While Paul Wagner lived and worked in Germany, the exact methods introduced by him into agricultural research work have had a marked and stimulating effect on research work in this country. In fact, as Professor Eckstein points out, the researches of Paul Wagner with other workers are the foundation upon which our present fertilizer theory has been built.

Following Professor Eckstein's article are some extracts from "Die Ernaehrung de Pflanze" of March 15, 1923, which give further incidents in the life of Professor Wagner. They were published at the conclusion of fifty years of activity at the agricultural experiment station of Darmstadt and just previous to the celebration of his eightieth birthday.

In these days of depression and possible confusion, we may well learn with profit what Paul Wagner said in an address when he was eighty-five years old:

"I praise the spirit of our time."

Second International Soil Congress

The Second International Congress of Soil Science was held this year in Russia. The Congress was opened on July 20 in the Academy of Science, Leningrad.

Several workers from the American experiment stations attended this Congress, among them Professor A. B. Beaumont of the Agricultural College, Amherst, Massachusetts. We are now very pleased indeed to publish in another part of this issue an account of the Congress and a report of Professor Beaumont's impressions of experimental work and agriculture in Russia. Everybody will be pleased to note that while the United States could have no official representatives, America was still represented by the largest number of delegates from any foreign country. Further than that, they were welcomed as cordially and treated with as much consideration as any other group of visitors to Russia.

There is much difference of opinion regarding Russia, of course. Opinions undoubtedly depend upon our viewpoints and on how much or how little we know. Such differences make it all the more interesting and desirable to know as many viewpoints as possible, especially when they come from scientific workers trained in making impartial observations wherever possible.

At the opening of the Congress it was the international note rather than the national note that was sounded at the very beginning. Professor N. I.

Vavilov in extending the welcome to the delegates said: "Science is international." Sir John Russell, Director of Rothamsted Agricultural Experiment Station in England, and the newly elected president of the International Society of Soil Science, also said in response: "Science knows no boundaries, either by nation or by class. A man is judged by what he is worth and what he has done." With these sentiments everybody will heartily agree.

But whether everybody will agree with Professor Vavilov when he says that, "big state farms and collective farms are the only real solution of the agricultural problem" is quite another question. Undoubtedly, there will be many "ayes" and many "nays" and some who entertain grave doubts of this cure. Even assuming that the economists are right when they tell us that the larger the unit, within reason, the cheaper the cost of production and the greater the profit, there are still other considerations. An agricultural policy founded on this concept, immediately presumes the setting up of relatively large organizations which will be capable of going ahead in good time, but apparently rather difficult to back up in times of depression without throwing large numbers entirely out of work. Urban industry seems to be learning this right now. Is it well to go ahead too rapidly on the same principle in agriculture?

Agriculture after all, in addition to being an economic proposition, is a way of life that produces a virile, strong, and individualistic humanity. Are we yet certain that the third generation of highly specialized workers in mass production units will in any measure be equal to people that at present come from the farms? Undoubtedly, this is a question for which many able minds will find plenty of material to study for years to come.

The writer was very much impressed with the high quality of agricultural science, particularly in the genesis and morphology of soils. Of great interest to workers in the field of fertilizers will be the account of the Institute of Fertilizers in Moscow. The Institute houses during the winter months a staff of eight hundred. A new institute with a capacity for six times that of the present one is being built. The Institute for Fertilizers embraces different subdivisions. Apparently it is the purpose to control the production and distribution of fertilizers in forms and amounts where they are needed. For instance, only di-calcium phosphate will be distributed in certain soil zones. This is certainly a very idealistic plan. The institute also carries on work in research regarding fertilizer materials and sources. The last part of the article gives an interesting account in a broad way of future plans for experimental and practical agriculture in the U. S. S. R. They are on a large and impressive scale.

Certainly the solutions of scientific and practical agricultural problems as they are being planned in Russia will be watched with keen interest.

Practical Optimism

It is very refreshing to find a national publication that is not afraid to face the facts, even though they may be very unpleasant. The paper is "The Annalist" of Friday, September 26. It says:

> "With various indices failing in turn to indicate the exact turn in the present depression, most business forecasters who really try to make unbiased forecasts and are not trying to add to the excess supply of manufactured optimism have fallen back on the old reliable forecast that the business curve is bound to turn upward in the course of time, but that it is idle to attempt to pick the exact month."

In another place in the same article, the author points out regarding manufactured optimism:

> "Reports of a beginning of forward buying and other indications of the beginning of a fresh deluge of manufactured optimism have featured the non-statistical news items of the last week or so, but these indications have been repudiated with astonishing promptness by the stock market and by a long list of commodity markets. We are still suffering from overproduction of optimism, but the fact that no one any longer takes it seriously is an encouraging sign, although a bad feature of it is that when these reports eventually turn out to be real, as eventually they must, no one will believe them."

Obvious and superficial optimism, merely because it is the right thing to appear optimistic, will undoubtedly get us nowhere, and as "The Annalist" points out, do some harm. Facts are facts and cannot be ignored. Certainly economic facts of fundamental importance cannot be overlooked.

What is needed possibly more than optimism is facing the facts, hard work, and courage.

Guesswork vs. Knowledge

The following submitted by Mr. Ray L. Hahn, Instructor in Vocational Agriculture at the Windham High School, Willimantic, Connecticut, contains so much good food for thought that we are presenting it upon our editorial pages.

In his letter accompanying the article, Mr. Hahn says, "The Federal Farm Board, controlled production, the increased stress on economics of production, and the increased demand for institutional research give me a felt need for calling attention to the individual research in production that every producer can best do for himself. Increased attention to this phase of production is not likely to give a false stimulus to an already troublesome production and it may ultimately afford producers of farm products more genuine relief than all our nation-wide legislative programs."

His article follows:

"Controlled production ought to be synonymous with wise production, but is more apt to be confused with legislative control or control based on guesswork. Experience teaches me that the producer needs knowledge not only of specific practices, but also of specific results.

Agricultural students in particular and farmers in general can not be too careful of the exactitude with which practices and results are measured. Inaccurate or partial accounting are quite likely to show a profit from uneconomic practices. Overhead costs are ignored or are charged too low. In such cases an actually high cost product is offered the market for awhile, following which come the years when the equipment, housing, and other overhead investments require renewal or repairs for which no financial provision has been made. Distress, failures, and unregulated production of this sort could often be lessened by proper accounting.

"I am not thinking solely of the curbing of production in speaking of controlled production. Decisions based on inaccurate measures are quite as likely to overlook opportunities. For illustration, I shall cite three experiences with students of vocational agriculture, a group in which I am particularly concerned as an agricultural instructor.

"One of my students used for his potato project a home lot always rated as a half acre. On that basis he had a yield of 91 bushels to the acre! The care of the crop had been thorough so a natural conclusion would have been that there was a soil unsuited to the crop. Yet, actual measurement showed the plot contained only one-fifth acre with a corresponding yield of 225 bushels per acre, which was a good beginning.

"In another instance, a student produced, in a poor year, 78 bushels of potatoes on his half acre at a cost of $1.24 per bushel. That year at harvest time the market offered $1.75 to $2. a bushel for good stock. He sold 23 bushels and decided to hold the remaining 55 bushels for a rise in price. Inventorying the crop held at the price offered gave him a return of practically seventy cents an hour for his labor in producing the crop. Note the distinction between producing and marketing as revealed by his accounting.

"His storage and marketing project began with the inventory of $90 and accumulated $9.27 in further costs. He finally sold 35 bushels (rats and shrinkage took the remainder) for $61.25 leaving a loss of approximately $38 on the storage venture. Producing potatoes paid a profit, but faulty judgment in marketing cancelled it. It may be aside from the immediate subject, but it is worth adding that he has profited from that experience in subsequent years.

"The experience of another student showed him that on anything less than a very large scale many significant differences may easily escape notice. The average difference of three to five ouncets per hill of potatoes was imperceptible without a careful measure of the crop. Yet, such a difference constitutes a difference in yield of 40 to 60 bushels per acre!

"Restriction is easier to apply than wise direction in either education or production. Judging from educational experience, the wise direction of activities is a more effective control than an indiscriminate restriction on all activities. Control of production by guesswork is a fundamental weakness that restricted production conceals but does not cure."

Electricity on the Farm

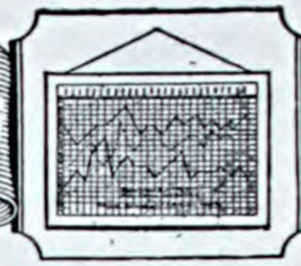
The widening use of electricity, especially in lightening the burden on farms, is the subject of much interest to all of our agriculturists. What is happening along this line in other countries is, therefore, worthy to note.

In Canada, for instance, nearly $1,000,000,000. was invested in central electric power stations at the end of 1928, according to the official report issued by the Canadian Government Bureau of Statistics. This amount was a larger capital expenditure than the railways of Canada reported for 1928.

The number of customers who purchased power from the central electric power stations in 1928 was 1,464,000, or an increase of 82,000 over 1927. Only 1.6 per cent of the electric power produced in central stations is from fuel plants. Water power is one of the principal Canadian natural resources. Compared with other countries, Canada stands second only to the United States in turbine horsepower installation and above the United States in turbine horsepower installation per 1,000 of population. On a per capita basis, Canada has about five times the installation of the United States. There is now scarcely a village in Canada that does not enjoy the advantages of electric power.

Assuming that a household is 4.63 persons, over two-thirds of the homes in Canada, both rural and urban, are using electricity for lighting and other domestic purposes. The Canadian people are fortunate in having this power developed for them from water power, largely on a service basis.

AGRICULTURAL DEVELOPMENTS



TRENCH SILOS

The practicability of constructing trench silos for storage of a reserve supply of succulent feed is being stressed by the Colorado Agricultural College. Trench silos can be built at little expense, according to the college, and will serve two purposes. First they will give farmers a reserve supply of succulent feed that may be held for feeding during the next few years, since silage improves with age. Second, such silos will take care of a large forage surplus this winter that otherwise might have a disastrous effect on forage prices. The College invites anyone interested in trench silos to write for information concerning their construction and use.

FRESH VEGETABLES

In order to insure consumers who patronize roadside markets that they are getting strictly fresh vegtables, 22 farmers operating roadside markets in Bergen county, New Jersey, have organized under a plan of standardization and certification of their markets. This is an important move toward winning consumer confidence and patronage which has suffered through the practice of hucksters setting up roadside markets in which they offer inferior produce brought from city markets. These hucksters posing as bona fide producers have been condemned by the press, yet there has been no means for a consumer to tell the difference between a huckster and a farmer offering his own produce for sale.

W. Raymond Stone, Bergen County Agricultural Agent, worked out a plan of standardizing roadside markets so that the reliable farmer-owned ones could be identified. The cooperation of the Bergen County Chamber of Commerce was secured to the extent of accrediting the stands of farmers who would conform to the rules. Suitable signs by which accredited markets could be readily identified for motorists were prepared. These signs are rented to the farmer for $5, but remain the property of the Chamber of Commerce with the understanding that any violation of the rules governing market standardization is sufficient cause for removal of the sign.

The farmer in order to have his roadside market accrediated must agree to produce at least 50 per cent of all products offered for sale and to display on his stand only well-graded products of high quality. Furthermore, he agrees that products bought for resale must come directly from a nearby farm and be carefully graded before selling.

The new plan was put into operation in 1929 and stand operators report that they have been doing an increasing volume of business because of it.

POTASH PAYS ON GRAPES

GROWERS and others interested in the grape industry were given a good opportunity to study the effects of proper fertilization in the growing of quality grapes at the Eighth Annual Grape Tour of Kent county, Delaware, which took place on August 21. At the home of C. A. Schmid, located four miles north of Dover, the starting point of the tour, the party saw 11 acres in vineyards. Mr. Schmid is one of the most progressive growers of the county and uses for his grapes 400 pounds per acre of a mixture composed of two-thirds phosphoric acid and one-third muriate of potash. To secure nitrogen, he sows crimson clover between the rows of vines. He applies the fertilizer to the clover before turning the crop under in the early spring.

One of the prettiest vineyards in the State according to other growers is that of John M. Roe, residing one mile east of Dover. This vineyard is about six years old and is a pretty sight with its cement posts, accurately spaced and aligned, clean tillage, and careful training of the vines. Mr. Roe has cut as high as 5,700 baskets (jumbos) from this 10-acre vineyard. When one realizes that each basket holds about 15 pounds of grapes, it can be seen that Mr. Roe knows his business. He uses 600 pounds per acre of a mixture composed of 1,600 pounds pure raw bone and 400 pounds muriate of potash.

Incidentally this combination, 1,600 pounds of bone and 400 pounds of muriate of potash, seems to be the most popular mixture used by growers in this grape area. This may be the result of six years' experimental work where PK gave increased yields and N was not a limiting factor. In fact the NPK plots gave less yields than did the PK plots during all of the six years.—G. R. Cobb, Salisbury, Md.

FUNDS FOR FALL AND WINTER PASTURES

FIVE hundred and fifty thousand dollars of the unexpended balance of the $6,000,000, appropriated by Congress last March for loans through the farmers' seed loan office of the U. S. Department of Agriculture to relieve distress in 15 States from storms, floods, and drought in 1930, have been allotted to farmers seriously affected by the summer's drought in Alabama, Oklahoma, Virginia, and Missouri, for the purchase of seed and fertilizer for fall and winter pastures.

Applications for these loans must be backed by the farmer's promissory note and a mortgage on his crops, and must be approved by a county committee before they can be accepted in Washington, according to G. L. Hoffman, who is in charge of the Federal Seed Loan Office. Loans can not be made for crops to be harvested in 1931, he says.

Approximately 2,000 applications for loans have been received to date, and Mr. Hoffman expects as many more by October 15, the final day for accepting applications. Of these 1,732 have been approved as follows: Alabama, $8,548.00 on 180 loans; Oklahoma, $27,853.45 on 859 loans; Virginia, $24,990.00 on 368 loans; and Missouri, $16,469.25 on 325 loans.

VITAMINS IN SWEET POTATOES

Sweet potatoes are a good source of vitamins, say chemists of the United States Department of Agriculture. This vegetable contains as much vitamin A (the antiophthalmic vitamin) as the leafy vegetables. It contains more vitamin B (the antineuritic vitamin) than many other root crops. As a source of vitamin C sweet potato juice has an antiscorbutic value equal to about one-third that of orange juice and one-half that of peach or pineapple juice.

WHAT IT COSTS TO PRODUCE CROPS

Ottawa, Canada.—Some interesting experiments concerning the cost of producing farm crops have been made by the Canadian Government Central Experimental Farm, Ottawa. For example, it cost $30.62 to produce an acre of oats having a value of $33.08; the cost of producing hay in 1929 was found to be $19.60 an acre for hay valued at $34.06; ensilage corn cost $4.38 an acre more to produce than it

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Foreign and International Agriculture

PAUL WAGNER

1843-1930

By Professor Dr. O. Eckstein

Berlin, Germany

Translated from the German by G. Brate

THE last survivor of the classic period of growth of agricultural science, Paul Wagner, passed away on August 25th after an active and fruitful life. The exact methods introduced by Paul Wagner into agricultural research work added a great deal to the elucidation of fertilizer problems and to their development into a science. The works of Paul Wagner, beginning with his thesis written in 1869 on nitrogen as plant food and followed in quick succession by numerous treatises on fertilizer research and with the researches of Liebig, Lawes, Maercker, and others, are the foundation upon which our present fertilizer theory has been built. One of the monuments giving evidence of his activity is the Agricultural Experiment Station at Darmstadt directed by him from 1872 to 1923, where the majority of his best works originated.

Professor Dr. Paul Wagner

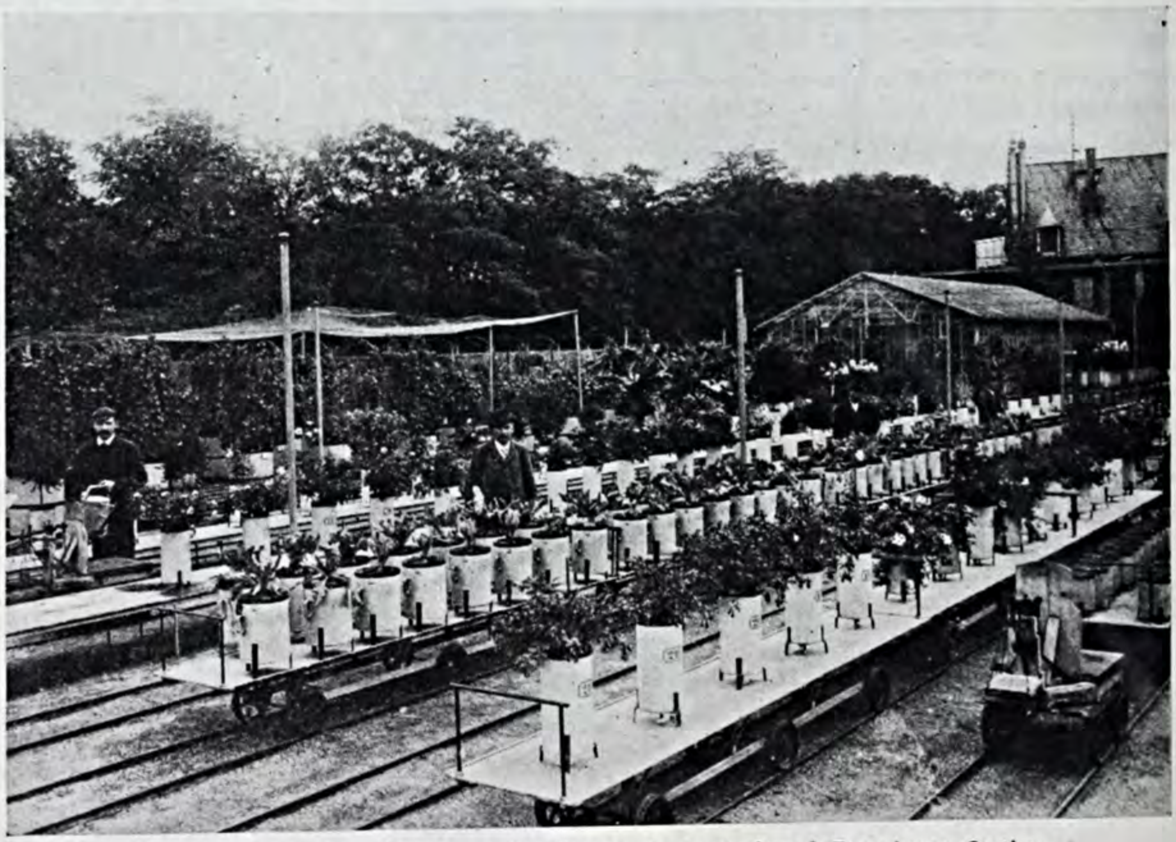
When Paul Wagner in the spring of 1923 celebrated his eightieth birthday, his activity found full estimation in all the leading agricultural publications, but the attainment of the biblical age did not mean the conclusion of the work of this untiring research scientist. It is gratifying to notice in our time of exhaustive nerves that up to his death Paul Wagner contributed to the enrichment of the agricultural literature and especially to the development of the fertilizer theory by valuable works which, after his activity as a research scientist had ended, he drew from his vast knowledge.

The fundamental works of Paul Wagner date almost half a century back, but the very fact that in his old age he still showed understanding for the spirit of the present time and helped the young research scientists as much as possible is to be very highly appreciated by everybody who knew his work and him personally.

At an address made by Paul Wagner when he was 85 years old on the occasion of the Seventh Potash Day in Berlin in which he expressed enthusiastically the program of his life, he said:

"We are living in the age of experiments. That is to be highly appreciated. I praise the spirit of our time; I would even praise it more enthusiastically, if the readiness to experiment would enhance the willingness to fight. There is a great natural law which is called fight and there is no progress without fight. This law applies to the material and to the spiritual world. To my mind it has become so calm on the battlefields of the past. What a joyful time it used to be when Freiherr von Dael-Koeth, Koenig, Hermann von Liebig, Julius Kuehn, Max Maercker, and many brave farmers and efficient representatives of the fertilizer industry were at war with Paul Wagner. That was a gay fight, a battle of progress fought with knightly weapons. Poisonous bombs were not known, and these cannot be recommended; they did not prove to be of any value! But it is so calm today, so peaceful on the places of the former tournaments. But I welcome the present willingness to work. And, of course, we have not yet 'researched away' everything; there is much left and new things are continuously arising. Nature evades our questions as much as possible, and gives a meaningless reply to unsensible questions. It answers comprehensibly to an intelligent question. Indeed, we have to drive nature into a corner by well-planned, exact, persistent questioning, by clear interrogation, by extensive, critical, devoted research. And I say again: *only the closest cooperation of scientific research work and practical experience* can help us to make progress, to gain higher aims, to increase the wealth of the country and the strength for the rebuilding of the greatness of the German people."

(*Turn to page 56*)



Pot experimental equipment at the Darmstadt Agricultural Experiment Station.

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

"Crop Yields from Illinois Experiment Fields in 1929" show the necessity of adapting the fertilizer treatment to the soil and crop system. Dr. F. C. Bauer reports this work in Illinois Agricultural Experiment Station Bulletin 347. The yields of crops in a number of rotations on many soils, variously fertilized, are given. All this work is summarized on a profit basis allowing average values of crops and cost of fertilizers and their application. These data show that limestone, manure, crop residues, phosphoric acid, and potash all cause profitable increases on most of the soils studied. While the author does not definitely bring it out, the data suggest that the influence of these treatments on legume crops in the rotation is one of the most important factors in determining their profitableness. In other words, the legume is apparently the key crop of the rotation. When a treatment favors legume growth this improvement probably exerts a beneficial effect on the following crops. To this is added the immediate benefits of the treatment of each crop in the rotation. This bulletin will be of greatest value to the farmers and county agents of Illinois, but other States in the corn belt will find pertinent material therein.

The results of several years experimental work on cotton growing on soils typical of the several regions of Arkansas have been compiled by Professor Martin Nelson in Arkansas Agricultural Experiment Station Bul. 255, "Cooperative Fertilizer Experiments with Cotton." The data are considered on a basis of actual yields and also on a profit basis showing average costs and prices. The State is divided into three regions and on the results of this work a complete fertilizer well supplied with nitrogen and potash, relatively high in phosphorus is considered desirable for the hill section. For the coastal plains soil a complete fertilizer well supplied with all three elements is recommended. On the lowlands area a complete fertilizer well supplied with phosphorus and potash with a high percentage of nitrogen is considered well adapted. The author states that no soil type, locality, or condition in the State has been found which failed to respond satisfactorily to fertilizers used with cotton. This bulletin will be read with interest by cotton growers in the Southwest.

"Potash in Relation to Cotton Wilt," Fla. Agr. Exp. Sta., Gainesville, Fla., Bul. 213, April, 1930, M. N. Walker.

"A Study of the Effect of Certain Fertilizer and Cultural Treatments Upon the Vigor of Young Stayman Apple Trees," Ark. Agr. Exp. Sta., Fayetteville, Bul. 254, June, 1930, C. B. Wiggins.

"Effects of Irrigation with Sewage Effluent on the Yields and Establishment of Napier Grass and Japanese Cane," Fla. Agr. Exp. Sta., Gainesville, Fla., Bul. 215, May, 1930, W. E. Stokes, W. A. Leukel, and R. M. Barnette.

"The Production of Artificial Farm Manures," Iowa Agr. Exp. Sta., Ames, Iowa. Bul. 126, 1930, F. B. Smith, W. H. Stevenson, and P. E. Brown.

"The Effects of Artificial Farm Manures on Soils and Crops," Iowa Agr. Exp. Sta., Ames, Iowa, Bul. 127, June, 1930, F. B. Smith and P. E. Brown.

Quarterly Bulletin, State Board of Agriculture, Dover, Del., Vol. 20, No. 2, June, 1930.

"Analysis of Fertilizers," North Carolina Department of Agriculture, Raleigh, N. C., June, 1930.

Soils

"The Principles of the Liming of Soils," U. S. D. A., Washington, D. C., Farmers' Bul. 921, Edmund C. Shorey.

"Occurrence of Nitrites in Soils," Texas Agr. Exp. Sta., College Station, Texas, Bul. 412, July, 1930, G. S. Fraps and A. J. Sterges.

"Caliche in Arizona," Univ. of Ariz., Tucson, Ariz., Bul. 131, April 15, 1930, J. F. Breazeale and H. V. Smith.

Crops

A six-page leaflet, No. 151, recently issued by the Purdue University Department of Agricultureal Extension on soybeans is one of the interesting publications on crops coming into circulation during the past month. K. E. Beeson, the author, has arranged his material compactly and for the ease of reading by busy growers. Of the plant food requirements of soybeans he says:

"Being heavy users of phosphate and potash as well as nitrogen, it is imporant that the rotation be fertilized to compensate for heavy removal of minerals. This is particularly true where soybeans are grown successively for several years on a thin field in order to build it up. They cannot exercise the maximum beneficial effect upon the succeeding crops if the soil is permitted to become depleted in mineral plant foods."

The other phases of success with this crop, which is assuming so much importance in rotations, are also included in the leaflet.

"Oats with Vetch or Austrian Peas as Grazing Crops for Fattening Hogs," Ala. Agr. Exp. Sta., Auburn, Ala., Bul. 233, July, 1930, J. C. Grimes, W. E. Sewell, and W. C. Taylor.

"Cotton Spacing," Ark. Agr. Exp. Sta., Fayetteville, Ark., Bul. 253, June, 1930, J. O. Ware.

"Color Schemes of Cacti," Ariz. Col. of Agr., Tucson, Ariz., June, 1930, John M. Breazeale.

"Monthly Bulletin of the Department of Agriculture," Sacramento, Calif., Vol. XIX, No. 7, July, 1930.

"Effects of Clover and Alfalfa in Rotation—Part II," Col. Agr. Col., Fort Collins, Colo., Bul. 362, Jan., 1930, Wm. P. Headden.

"Effects of Clover and Alfalfa in Rotation—Part IV," Col. Agr. Col., Fort Collins, Colo., Bul. 364, Jan., 1930, Wm. P. Headden.

"Agriculture and Related Subjects," Dept. of Agr., Tallahassee, Fla., Vol. 40, No. 3, Nathan Mayo.

"Agricultural Experiment Station Report for the Fiscal Year Ending June 30, 1929," Univ. of Fla., Gainesville, Fla.

"1929 Cooperative Extension Work in Agriculture and Home Economics," Univ. of Fla., Gainesville, Fla.

"Winter Legumes—Soil Improvement and Forage," Ga. State Col. of Agr., Athens, Ga., Cir. 166, July, 1930.

"Pastures for Georgia," Ga. State Col. of Agr., Athens, Ga., Bul. 389, July, 1930, Paul Tabor and E. D. Alexander.

"Blackberry and Muscadine Grape Culture at Hammond, La.," Agr. Exp. Sta., Baton Rouge, La., Bul. 213, May, 1930, B. Szymoniak.

"Results of Sweetcorn Suckering Experiments on Long Island," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 509, June, 1930, H. C. Thompson, H. S. Mills, and P. H. Wessels.

"Raspberries and Blackberries in Ohio," Ohio Agr. Exp. Sta., Wooster, O., Bul. 454, June, 1930, J. S. Shoemaker, C. W. Bennett, and J. S. Houser.

"Twenty-eight Years of Irrigation Experiments near Logan, Utah," Agr. Exp. Sta., Logan, Utah, Bul. 219, June, 1930, D. W. Pittman and George Stewart.

"Biennial Report of Utah Agricultural Experiment Station, July 1, 1928 to June 30, 1929," Agr. Exp. Sta., Logan, Utah, Bul. 220, July, 1930, P. V. Cardon.

"Department of Agriculture Immigration of Virginia," Richmond, Va., Bul. 272, Aug., 1930, and Bul. 273, Sept., 1930.

"Growing and Management of Pastures in Western Washington," State Col. of Wash., Pullman, Wash., Bul. 155, June, 1930, Leonard Hegnauer.

"Pasture Experiments," Agr. Exp. Sta., Morgantown, West Va., Bul. 235, June, 1930, T. E. Odland, C. V. Wilson, H. O. Henderson, and E. P. Deatrick.

"Thirty-ninth Annual Report of the University of Wyoming," Agr. Exp. Sta., Laramie, Wyo.

"The Conference Procedure in Teaching Vocational Agriculture," Federal Board for Vocational Education, Washington, D. C., Bul. 147, Agr. Ser., No. 38, June, 1930.

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Agricultural Developments

(From page 42)

was worth at current values—the cost per acre was \$54.62 with an acreage crop value of \$50.24. In the case of mangels, it cost \$72.45 an acre to produce the crop and the yield of 17.81 tons per acre, valued at \$1.91 a ton, was worth only \$34.02; or, mangels showed a loss per acre of \$28.43. Potatoes on the other hand proved a particularly profitable crop, showing a surplus of \$97.94 per acre over cost of production; potatoes cost \$80.99 per acre to produce and yielding 192.4 bushels, valued at 93 cents, showed an acreage value of \$178.93.

POTASH KEEPS APPLES

The amount of potash in the soil of the orchard appears to have an important bearing on the storage life of the apples produced.

Dr. Franklin Kidd and Dr. C. West, of the Low Temperature Station, Cambridge, England, have found that the storage life of apples on which they worked increases as the amount of available potash in the soil increases. Trees grown in soils deficient in available potash yield apples which are particularly susceptible to low-temperature break-down in cold storage.—*Science News Letter,* August 16, 1930.

SMALL BAGS OF SPUDS

Increased use of small packages in marketing potatoes last season is reported in a recent survey by the Bureau of Agricultural Economics. Potatoes in small packages are intended to reach the consumer in the original container without the necessity of reweighing or repackaging by the retailer. Small bags made of cotton, burlap, or other fiber, and also paper cartons are used. The bags or cartons usually contain 15 or 25 pounds.

The survey included 17 cities and compared sales last year with those of the previous year. In eight cities an increase in the use of small packages was reported. In two cities a decrease was indicated. In the other cities the quantity of potatoes marketed in small packages was very slight, or no trend was reported. Boston, Los Angeles, and New York made most use of the small packages. These cities also reported the greatest increases over sales the previous year. Chicago and Minneapolis reported fewer potatoes received in small packages than a year earlier. In most cities potatoes in small packages were only a small part of the supply. This class of receipts was mostly from Idaho and Prince Edward Island.—The Official Record, U. S. D. A., Sept. 25, 1930.

FERTILIZER CONSUMPTION

With an average of 798 pounds of fertilizer used on every acre of crop land during 1929, Florida leads the United States in the use of fertilizer, R. O. E. Davis, research chemist of the U. S. Bureau of Chemistry and Soils, told members of the American Chemical Society, at their recent meeting in Cincinnati. Next to Florida is New Jersey with 417 pounds per acre. On the whole, the States of the Atlantic Seaboard use it much more extensively than those inland, though a great increase in its use has come since 1913 in the Pacific Coast States, and there is also a tendency to increased use in the West North Central States. Cotton uses on an average 108 pounds per acre, though 31 per cent of all the fertilizer used is on this crop. On citrus the rate is 1,163 pounds. Five principal crops consume about 82 per cent of the fertilizer, though less than 25 per cent of the acreage devoted to them is fertilized.—*Science,* Sept. 26, 1930.

American Cotton Deteriorates

By E. B. Ferris
Jackson, Mississippi

THERE seems to be little doubt about the fact that the quality of American cotton is steadily deteriorating. Statistics show that 18 per cent of all cotton ginned in the United States during the 1928-29 season was untenderable, and that this had increased to 24 per cent for the 1929-30 season. Some of this difference was due to more favorable weather conditions in 1928 over 1929; still this could not have been responsible for the entire 6 per cent increase.

The Reasons

There have been a number of reasons for this deterioration: namely, the boll-weevil; the fact that short varieties are earlier in maturing as a rule than those with longer staple; the custom of country buyers of cotton paying as much for one length of staple as another; carelessness in saving planting seed; and last, but not least, the fact that we have allowed our soils to become depleted of plant food by a failure to rotate our crops, grow legumes, and at least to use as much plant food as the crop removes by annual harvest. There is no doubt about the fact that the same variety of cotton grown on rich land will have a better staple than when grown on poor land.

While the grade of American cotton has been decidedly downward in recent years, the reverse is true with that grown by our competitors in foreign countries, who have made prodigious efforts not only to increase the quantity but the quality of cotton grown, although the average of the latter was always below the standard of American cotton.

In order to maintain America's world position in the cotton market, it is most important that we improve the length and quality of our staple; first, by selecting varieties long enough to meet world demands; second, by building up our soils to where all cotton may from the beginning of its fruiting season develop this fruit as rapidly as possible; third, by the exercise of more care in the control of the weevil, even where we do not actually resort to poisoning.

There is no longer any doubt but that the direct poisoning of the weevil is economically advisable; still, there are many ways of lessening weevil damage besides actual poisoning, as the use of larger fields rather than small patches, increasing the number of plants per acre, and quick development of the crop by better fertilization.

The Outlook

The farmer who continues to grow extremely short cotton puts his labor in competition with underpaid foreign workers to a much greater extent than the one who exercises a little more care and grows as good or a better yield from varieties of superior quality. Much of the poor outlook for American cotton is no doubt due to the poor quality we have all but unconsciously come to produce in such large quantities.

Each year a considerable per cent of cotton much shorter than it should be is produced as a result of rust, wilt, and diseases due to the improper feeding of the plant, and could be prevented easily and cheaply by proper fertilization that would prevent premature ripening and opening of the bolls.

The Power Farmer Needs Good Soil

By E. T. Leavitt

Chicago, Illinois

THE advantages of a soil high in organic matter with plenty of plant food available has been particularly apparent the past year in sections affected by drouth. The need of humus to secure high crop yields, both where sold for cash or marketed in the form of milk, eggs, or other livestock products, has been properly stressed; but that it is also essential to the continued profitable operation of power farming equipment has sometimes been overlooked.

Depletion of organic matter has taken place in many sections where fields are rolling to the extent that serious damage has resulted from both sheet and gully erosion. This has not only lowered yields but has made terracing necessary in order to keep surface soils from washing away. It is extremely difficult if not impossible to operate binders or any other of the larger power tillage or harvesting tools in fields cut by gullies.

C. A. Bacon, a member of the American Society of Agricultural Engineers and an authority on soils in relation to tillage problems, has found in his investigations that costs of plowing and other operations for seedbed preparation may be substantially greater where soils are low in organic content. Where soils have sufficient humus, the power required for plowing is much less. It has also found that in soils where difficulty was experienced in getting plows to scour, the addition of organic matter to bring the content to four per cent and the correction of soil acidity eliminated the sticking condition. Neither the size of the plow nor its shape caused failure to scour in soils which contained three per cent organic matter.

In corn borer territory it was found that plowing alone was not sufficient to thoroughly cover the corn-stalks in heavy soils lacking in humus. When these soils were turned either too wet or too dry, large holes were left through which the moths easily emerged.

Passing of the tractor wheels over the soil was found not to injure crop yields in clay soils when plowed dry or even in a moist condition, where the organic content was six per cent to a depth of 11 inches and was found actually beneficial in sandy soils with 3½ per cent organic matter.

Harrowing the ground low in humus did not maintain an effective mulch, but in soil containing four per cent organic matter the capillary action was seriously restricted. Corn planted in the latter field showed slight evidence of drouth when corn in the plots containing two per cent organic matter withered.

Upstanding and early maturing crops which result from being adequately fed are also necessary for the economical use of the corn picker, the binder or the combine.

Livestock manures in the limited

A grain drill with a fertilizer attachment means greater yields with lowest cost of fertilizer application.

quantities which are usually available have not been found sufficient without the use of legumes. These are heavy feeders of calcium, phosphorus, and potash which must be supplied in adequate amounts if the plants are expected to thrive. On the 40 year-old experimental plots at the Pennsylvania Experiment Station it has been found that with a rotation of corn, oats, wheat, and hay, the organic content of the soil was maintained by the application of 100 pounds potash and 300 pounds of superphosphate applied every other year.

J. W. White, professor of soil technology, Pennsylvania State College, also points out the possibility of quickly building up the organic content of the soil with bluegrass pastures. Referring to the tests at this same station, he finds soils in permanent grass gained 20,329 pounds an acre of organic matter in eight years as compared to 9,675 pounds in the rotated plots. Each soil was treated with limestone, superphosphate, and potash.

Recent experiments which show the advantages of feeding the crop in the row as with potatoes and wheat or in the hill as with corn have brought about improvements in planters equipped with fertilizer distributer attachments so that larger applications of highly concentrated fertilizers may be more safely applied without injury to the seed. According to Professor H. H. Krusekopf, soils department, University of Missouri, the time has come in that state when a grain drill without a fertilizer attachment must be considered only 50 per cent efficient. With this attachment for his drill he believes that the farmer not only receives the greatest return from his fertilizer investment but also has the least extra expense for power and labor in its application.

Chlorate Weed Killers

By E. N. Bressman

Oregon Agricultural College

The chlorates are still considered the most effective killers of all perennial weeds. Remarkable kills have been obtained with these sprays in all parts of the United States. Even in California, where weed eradication is difficult because of favorable climatic conditions, perennial weeds have been eradicated by the use of chlorates.

Almost every experiment station in the United States has been conducting trials with the chlorates for killing perennial weeds. These trials have given additional information which is of value to chlorate users. Effective methods of application have shown that the amount of spray may be reduced. A boom nozzle attachment for a power spray outfit assures 100 per cent coverage of the spray on the weeds. One, three, or five nozzles may be placed 14 inches apart on the boom. Four feet of ¼-inch pipe covered with rubber serve as a handle for the boom. This home-made device will be widely used in the West.

The other important change in chlorate recommendations applies to the time of application. Chlorates may be applied from the blooming time of the weed to the end of the growing season. Late applications, even after severe frost, have been effective. It seems that the applications in the fall require less chlorate to get satisfactory kills. In most cases fall applications have no effect on the crop planted the next spring.

Calcium chlorate reduces the fire hazard, always present when sodium chlorate is used. In hot, dry sections, however, users of calcium chlorate should use precaution against fire.

The Unseen Half

(*From page* 26)

fall these grasses come back surprisingly well. It is a remarkable root system which allows these grasses to continue year after year under extremely adverse conditions.

Alfalfa has one of the most remarkable root systems of any of our cultivated crops. It is not uncommon for the root system of this crop to reach a depth of 40 or 50 feet, and even the first season the roots of the little plant, which is no higher than 5 or 6 inches, may reach a depth of 6 feet and will more than double the second season, producing a normal crop under ordinary conditions.

Recent work at the Nebraska station shows that this extensive root system of the alfalfa plant dries out the subsoil rather rapidly, particularly under upland conditions and that crop yields decline very abruptly after 4 or 5 years of cropping. They find that on upland soil the restoration of this moisture at depths below 5 feet is very slow and that under their conditions it would require about 225 years to replace the subsoil moisture which has been taken away by 6 years of growth of the alfalfa crop. This depletion of subsoil moisture may account for many alfalfa failures on upland soils after the crop has grown for 5 or 6 years. Of course in these cases it is best to grow crops such as the cereals which feed mainly on the first 3 or 4 feet of soil and take advantage of the rainfall which is obtained each year.

Potatoes do not have as extensive a root system as the other crops previously discussed. As a rule, the true roots of the potato plant do not grow down much more than 3 or 4 feet in depth. In the early growth of the plant when cultivation is carried on, most of the roots are in the first 8 or 10 inches. It is apparent that cultivation should not be too deep at this time, but should be designed so as to keep the upper soil layers mellow for proper development of both roots and tubers. Roots should not be injured and tubers should be kept covered so as not to be exposed to danger of frost or sun.

Renewing the Lease

(*From page* 13)

Mineral fertility alone has always given a large swell in yields during latter June and early July on account of the clovers present. With the turf built back again to production qualities, it may be predicted that nitrogen will make an outstanding showing on this pasture in the future. All indications favor that point of view this, the fourth season.

Even though the effect of nitrogen has not been to increase yields materially beyond mineral fertilization alone on this pasture, earliness of grazing is a factor to be considered. In 1929, the nitrogen fertilized plats had produced 526 pounds of dry matter an acre more than the phosphated, potashed, and limed plats up to June 1. In 1930, the difference was 429 pounds. This is enough feed for one cow for about 15 to 20 days, and it is a common observation in this section of the country that nitrogen fertilized grass can be grazed at least two weeks earlier.

Protein production in nitrogen fertilized grass is also a decided advantage favoring its use on pastures. On a second pasture under fertilization treatment, where the natural mineral fertility was at a medium level, 60 pounds of elemental nitrogen in ammonium sulfate made in two applications of 30 pounds each, the season's yield of dry matter produced 1,029 pounds of crude protein an acre. Complete mineral treatment on this same pasture yielded 696 pounds of protein during the same season, while no treatment gave 326 pounds. It would appear that nitrogen fertilization of pastures is an economical way to get protein, and that the grain ration fed to dairy cattle pasturing on such grass might readily omit the high-priced, purchased protein.

In the writer's judgment, the pasture referred to in this discussion is typical of thousands of acres that cannot be restored in the short space of one season. It takes time to build back what it has taken years to deplete, and this means consistent fertilization to compensate for what has annually been removed through grazing.

Reviews

(*From page 46*)

Economics

"Prices of Farm Products in Utah," Utah State Agr. Col., Logan, Utah, Bul. 217, June, 1930, W. Preston Thomas.

Insects

"Control the Cabbage Root Maggot," N. J. State Col. of Agr., New Brunswick, N. J., Ext. Bul. 74, April, 1930, Prof. L. G. Schermerhorn and C. H. Nissley.

Diseases

"Timber-Rot in the Pepper Tree, Schinus Molle," Ariz. Agr. Exp. Sta., Tucson, Ariz., Bul. 132, May, 1930, J. G. Brown.

"Cotton Diseases in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 214, May, 1930, M. N. Walker.

"The Sugar-beet Leaf-spot Disease and Its Control by Direct Measures," U. S. D. A., Washington, D. C., Cir. 115, April, 1930, G. H. Coons, Dewey Stewart, and F. G. Larmer.

From Peaches to Wheat

(*From page 27*)

tion at that point. Mr. Baird has a spur track on his farm and delivered the wheat to the railroad last June from his surrounding fields, obtaining approximately $1.22 per bushel f.o.b. his farm. This gave him an average return of $40.26 per acre and a very nice profit on his investment. A flour mill at Macon, Georgia, 30 miles away, contracted for his entire crop, and the price which he received was predicated on the basis of Chicago prices plus freight to Macon, Georgia.

Mr. Baird produced more than three times the average yield of wheat in Georgia by first growing a good crop of Otootan soybeans which was turned under in the fall of 1929 just before the wheat was sown. Then in the spring of 1930 he applied 200 pounds per acre of a 9-0-10 (NPK) top-dresser. Superphosphate was applied to the preceding crops. Mr. Baird attributed a large measure of his success with wheat to the cover crop of soybeans which was turned under. He stated that potash as a top-dresser gave him increased yields and wheat of better quality.

He conducted a test in 1929 using 100 pounds of muriate of potash as a top-dresser in addition to 125 pounds of sulphate of ammonia per acre and found that the extra potash increased his yield from 24.3 bushels per acre to 30.1 bushels and also increased the weight of the wheat per bushel.


The home of Mr. Baird at Edgewood Farm, Fort Valley, Georgia.

A number of farmers in central and southern Georgia have recently become interested in the production of wheat on account of boll-weevil damage to cotton. Mr. Jim Kelly of Tennile, Georgia, averaged 33 1/3 bushels of wheat per acre in 1930 and the average weight per bushel was 59½ pounds, which is considered excellent quality for that section. Mr. Kelly, like Mr. Baird, used a cover crop of soybeans before planting the wheat and then top-dressed with 200 pounds per acre of 9-0-12 (NPK).

The Inquiring Mind

(*From page* 20)

the harvester manufacturing business.

It was through the influence of F. B. Swingle, now one of the esteemed editors of the *Wisconsin Farmer and Agriculturist* at Racine, that Mr. Appleby presented his first twine knotter to the Wisconsin State Historical Library Museum at Madison.

But Appleby was not the only solver of the "knotty problem." In the museum of the agricultural engineering department of the Wisconsin College of Agriculture at Madison may be seen today two old twine knotters which were obtained by Professor E. R. Jones, chairman of the department. They were made by Joseph Barta of Bangor, Wisconsin. One of them was patented in 1866, the other in 1872.

Barta, who was a Bohemian music teacher, came to Hillsboro, Wisconsin, in the fifties, and finding few students, while he was learning the English language, worked in the harvest fields for money to pay expenses. There, the severity of the work, which lamed his back and wounded his tender fingers, led him to seek some method by which bundles might be bound by machine instead of hand. I fancy he, too, sat on an old railfence and played on his violin the tune of a jingle like that of Appleby's, while the two puzzled over the same problem quite unaware of each other's existence.

At first Barta worked with discarded sewing machines and at length devised a knotter of stitching pattern. In this he interested four partners who backed him with their money, and in 1863 all of them worked away seeking a more practical device. They succeeded, got their new contrivance to bind a bundle, and on May 15, 1866, were granted for it U. S. patent No. 54,672. Their machine automatically raked the grain from the upper platform into a binding basket, bound it with twine, and tied it with the knotter.

Professor Jones told me that the first field test of Barta's original twine binder was made in 1866 on the McCumber farm two miles east of Bangor. Its work was somewhat unsatisfactory. Sometimes it worked well and again it didn't; so the inventor kept tinkering with it until 1871.

Then he and his partners decided that a practically new design would have to be made. Money having been contributed by friends, the work continued and in 1872 a new revolving knotter was perfected in place of the original one of sliding shuttle type. When tested in the harvest field, the new machine did perfect work. The demonstrations which followed were watched by the farmers of the district and by at least one outsider who keenly followed its every motion.

During the next six months, working leisurely, a La Crosse firm produced 15 Barta knotter binders then suddenly a new knotter of Barta type, but with enough differences to make it patentable, appeared and put an end to the prospects of Barta, his partners, and financial backers just when they expected to reap a well-earned reward. It has been figured that each of the knotters patented by Barta cost some $25,000, so the loss was great.

Barta lacked the business acumen of Appleby and gained nothing from 20 years of strenuous experimental work. He died at St. Paul, Minnesota, in 1880 a tired, disillusioned, disappointed, almost penniless old man.

It was Appleby, not Barta, who was fortunate in attracting the attention and obtaining the cooperation of William Deering and through him attaining fame and a competency. He had spent much time in devising and popularizing the wire-knotting binder before he recognized the superiority of the twine binder and concentrated his efforts on that. Barta, on the contrary, and greatly to his credit, believed in the twine knotter from the first, never lost faith in it, and unlike Appleby, patented his inventions but unfortunately gained no reward for his splendid work.

Barta and Appleby both deserve credit as originators of the knotting devices now in use. It seems likely, too, that many other inventive geniuses helped in the work, but they are never mentioned today. Professor Jones once told me that probably 1,100 or more men contributed to the perfecting of the grain harvester during the fifties, sixties, and seventies.

Of the knotter makers of this noble band of inventors, Appleby seems to have been the only one given public recognition. He has passed on, but at the Houghton Farm where he worked may be seen a tablet, placed there in October, 1926, which bears this inscription:

"On this farm John F. Appleby made the first knotter in 1858."

All honor to all of the great men of the past whose eminent work and skill gave us the efficient self-binders of the present day which, as F. B. Swingle has happily said, solved the problem of *unbending backs at harvest time.*

Lawn Care

(*From page* 29)

It is far better to purchase a good lawn mixture at a reasonably high price from a reliable seed firm than to buy poor seed of unknown mixture. Study the seed label and insist on pure seed. Home-mixing can be practiced and is not much of a trick. Measure the lawn, or estimate the size, then go to a reliable seed dealer and purchase bluegrass seed at the rate of three-fourths pound and one fourth pound of red top for every 500 square feet of lawn. Mix the two thoroughly and sow one pound of the mixture per 500 square feet. The red top germinates quickly and makes a temporary turf that will later be crowded out by the bluegrass.

For shady spots add to the bluegrass-redtop mixture an equal quantity of rough stalked meadow grass, commonly called *Poa trivialis.*

The best time to sow lawn grass is in the fall. Fall seeding has the advantage over spring seeding in that weeds do not crown the grass when it is making a start. Spring seeding places the tender grass shoots in direct competition with the hardy weeds that naturally grow during the spring or early summer season.

The question is often asked, does it pay to reseed the lawn every year? If there is a stand of bluegrass, it should not be necessary to reseed. Of course if the turf is a stand of timothy, the product of cheap seed, then reseeding with good bluegrass is necessary. Once bluegrass has become established, greater returns can be looked for from money spent on fertilizer than from money invested in annual seedings. The weeds will begin to disappear as the fertilizer encourages bluegrass growth and forms a heavy weed-proof turf.

It is a mistake to expect the weeds to disappear after making an application of ammonium sulphate. It is not a herbicide, but merely a stimulant to the grass. It makes conditions unfavorable for most of the broad-leaved weeds. This new practice will do away with the back-breaking labor of digging out weeds and at the same time result in a beautiful mat of bluegrass which is so essential and pleasing to the eye. One can well be proud of a good lawn and look upon it as a masterpiece of art.

Due to Details

(*From page* 30)

previous to planting. The other half was applied in the row with the planter.

After planting the field was bushed twice just before the potato shoots showed through. The bush used was the common birch bush or brush. Such an instrument levels the soil and kills the small seeds.

As soon as the rows showed a prout hoe was used to cover the plants somewhat and particularly any weeds in between plants. In five to seven days a riding cultivator was used and in a week or ten days the prout hoe was used again. Hilling was practiced somewhat with this prout hoe. There are no weeds in the row or between the rows after this type of cultivating. There was a ridge of dirt about five to six inches high around the potato plants. The potatoes grew fast, and without weed competition came through in excellent shape.

Weekly spraying of the potatoes took place, starting when the plants were from six to seven inches high and continuing until about the middle of September. Thus eight sprayings or more were applied. A four-row sprayer, three nozzles per row, was used, and a 150-pound pressure or more at all times was carried.

The Bordeaux mixture used was home-mixed, care being exercised to keep the milk of lime and the bluestone liquid separated or diluted by pure water. Each spraying required from 75 to 100 gallons of Bordeaux per acre. As the plants increased in size, more material was used. A slight increase in the strength of the material, that is bluestone or lime, was also made.

The crop was harvested and placed in a new storehouse erected on his farm, and was sold at good prices throughout the winter. Mr. Pease says his results are entirely due to timely and thorough attention to the details of potato raising.

Paul Wagner

(*From page* 44)

It is needless to embellish the memory of Paul Wagner with any phrases of appreciation. Agriculture owes him the creation of scientific foundations of plant nutrition which have added considerably to the increase in crops. Therefore, the work of Paul Wagner gained also importance for the artificial fertilizer industry. Up to this day the scientific methods of Paul Wagner are considered to be of great value to agricultural science in field and greenhouse research.

The amiability of Wagner in which the wisdom of age was coupled with a rare youthful elasticity will live on in the memory of all those who had the benefit of knowing him.

EDITOR'S NOTE: More incidents in the remarkable life of Paul Wagner, who is so well-known among our soil scientists and whose work has had such an important bearing upon our agricultural science, are found in an article by Geh. Regierungsrat Professor Dr. Gerlach, Berlin, published in "Die Ernaehrung der Pflanze," March 15, 1923:

"In the fall of 1922 the director of the Agricultural Experiment Station of Darmstadt, Professor Dr. Wagner, was able to look back upon an activity of 50 years at that institute. In a few days he is going to celebrate his 80th birthday. Behind him is a life of work, but also of success, and his name is widely known. Petty persecutions, mostly caused by envy and jealousy, were not spared him either, but he always keeps his cheerful smile and looks at the stormy life of the present more mentally alert and physically fit than is usual in the research scientist, and is always willing to continue to take part in the solution of important problems with regard to plant nutrition.

"Paul Wagner was born on March 7, 1843, at Liebenau in the Province of Hanover. He studied chemistry and pharmacy in Erlangen. After passing the state examinations he devoted himself to agricultural chemistry following the advice of the Professors Zoeller and Gerup-Besanex of Erlangen and entered the agricultural chemical laboratory at Goettingen as an assistant where he worked five years and occupied himself particularly with work on plant nutrition. In the spring of 1869 he wrote his thesis for the doctor of philosophy on 'Nitrogen Plant Food.' In 1871 he took up his residence as lecturer at the University of Goettingen. But in the fall of the following year Wagner took over the direction of the 'Agricultural Experiment and Information Station' in Darmstadt. This institute was founded in 1871 with the help of contributions from various corporations, especially agricultural associations, the Bank of Trade and Industry, the town of Darmstadt, and the Hessian Ludwigsbahn (Railroad) amounting to 3,630 florins and the granting of a flat amount of 2,800 florins by the Duke of Hessia for its outfit. Dr. Ernst Schulz was the first director of the institute. However, in 1872 he was called to Zurich and his successor was Dr. Paul Wagner.

"As with most of the experiment stations at that time, the Darmstadt institution also was installed at first in private quarters. There were only a few laboratories and no greenhouses and experiment fields and the activities were restricted to the examination and control of fertilizers and feedstuffs and to information. Wagner occupied himself at first with the improvement and revision of analytical methods of investigation. In 1872 he published the book, 'Manual of the Manufacture of Fertilizer and Instruction for the Investigation of Commercial Fertilizer.'

"But very soon Wagner had a great desire to investigate by scientific research work the effect of the plant foods contained in the soil and in the fertilizers. After a short time he had the conviction that the field experiment carried out at that time in an exceedingly simple manner was not satisfying. It seemed to him to be difficult to carry out simultaneously and in a short time so many field experiments as were necessary to solve the respective problems. He saw the disturbing influence of the weather, unequalities of the soil, damages, and other inconvenient influences on the growth of the plant, and he learned that the results attained were so far only of local importance.

"It was necessary to find an exact research method based on a scientific foundation making the carrying out of a large number of single experiments in a small room possible and eliminating disturbing side effects, so that with the equalization of all the most important factors of growth only one of them was changed. To attain this, the pot experiment seemed to him to be the most suitable means.

"Wagner defended his new research method energetically and at the same time criticized thoroughly the field experiments carried out hitherto. At first his statements and suggestions did not find recognition by all agricultural chemists. On the contrary, they were strongly contested by some of them, and a vivid argumentation on this subject arose. In order to carry out his plans, the rooms and equipment of the agricultural experiment station were no longer regarded adequate by Wagner, but he soon succeeded in getting the Hessian Government interested in his research method and in having a new institute built in Darmstadt which had beside large, well-equipped laboratories, a large vegetation station and a garden for experiments. In the course of time this plant was considerably enlarged. At the present time the Institute of Darmstadt is still one of the best equipped agricultural experiment stations and is a model to many institutes in the inland and

A laboratory at Darmstadt. In the background (left to right) are Professors Wagner and Roessler.

abroad.

"Wagner developed a zealous and untiring activity. He had more and more success with his exact research method, but the argument whether pot or field experiment was still continuing. At the end of the eighties, Maercker, who was particularly interested in the field experiment, went to Darmstadt to see his friend. He returned to Halle full of enthusiasm and there built a greenhouse after the Darmstadt model. On the other hand, Wagner later on used the field experiment—which he never entirely rejected—to a great extent in order to enhance and to improve our knowledge with regard to the fertilizer theory. Nowadays no institute working on plant nutrition can do without these two methods of research which are of equal value and which complement each other. Therefore, they have to have the necessary equipment for both in order to work successfully.

"After Wagner had obtained the scientific basis for further investigations on the influence of fertilizers in different soils by his pot experiments, he turned again to a greater extent to the field experiment in order to study the fertilizer requirements of the Hessian soils and to gain the basis for a practical fertilizer theory. The number of these experiments is very high, and their execution lasted generally several years. The cooperation in these experiments of the Hessian agricultural field tutors (Wanderlehrer) and the support of the Deutsche Landwirtschaftliche Gesellschaft (German Agricultural Association) as well as other corporations was of great value to Wagner.

"The experiments of Wagner showed that the results of pot experiments are in close relation to those obtained by the field experiment. But they also demonstrated that the fertilizer need of the different soils varies considerably and is influenced not only by the quantity and solubility of the plant foods contained therein, but also by the weather, the rotation of crops and other factors which are eliminated by the pot experiment. The scope of this article does not permit a more detailed discussion on the field experiments by Wagner. They are carried out with the utmost perfection and are of great importance, not only for Hessia, but also for all Germany. I do not know of any research scientist who supplied such copious, valuable material on this subject.

Direct Methods

"The great success of Wagner's activity is based on the simple and clear questioning, the selection of suitable research methods, the careful execution of the experiment and their scientific exploitation, the correct interpretation of the results of the experiments, the comprehensive arrangement of the material, and the brief and clear demonstration by summarizing the most important results in a few striking figures and the addition of excellent photographs. Pictures are made in the background of which the whole arrangement of the experiments can be seen, but the results of them are pointed out distinctly and in a plastic way through their depth. Wagner's writings are widely disseminated and are even known to the circles of the small farmers.

"The exact research method worked out by Wagner is still today applied everywhere. The attempt to improve it was made. Particularly known and of importance are the intelligent investigations and mathematic foundations for further scientific work in this line by Mitscherlich. From a theoretical point of view the work of Mitscherlich is very valuable and can be developed, but so far Wagner did more for practical use. Up to this day he is working eagerly to advance agriculture and his standpoint with regard to new theories shows that he not only disposes of an excellent material, but also knows how to use it intelligently, in order to contest the viewpoints of his opponents. Honor was conferred to a great extent upon this meritorious research scientist. In 1881 he became professor and in 1897 "Geheimer Hofrat (Privy Councillor). At the beginning of this century the Technische Hochschule (Technical College) in Darmstadt bestowed the title of Dr. ing. h.c. upon him. He refused the invitation to join the Biological State Institute in Rahlem as Director, as he did not want to depart from the beautiful experiment station and his comfortable home in Darmstadt."

Selling an Idea

(*From page* 16)

Before leaving the community, however, it was learned that the Federal Land Bank had never had a foreclosure in the Angier section. A local representative of a large money lending insurance company said he had never had a foreclosure in 14 years, and the North Carolina Agricultural Credit Corporation representative said the Angier farmers were the first to pay up every year and the credit corporation had never lost a penny of its loans.

Back in Raleigh again, I talked to a banker about the fine things I had seen that day. "You are right," he said, "we loan those men thousands of dollars every year and we have never lost a cent."

It then dawned on me that in addition to tobacco, I had seen gardens by nearly every home. The farm houses and buildings were painted and well kept. There were poultry and hogs, cotton, corn, and soybeans. There was a fertile soil handled well and I thought then that these folks lived in a kingdom of plenty crowned with a golden coronet of yellow leaf. I said as much to Jackson. "Sure," he assented laconically, "they know how to fertilize."

A New Food Plant

(*From page* 17)

least one of its natural hosts can be easily transplanted and can be established in any suitable sand hill region of mild climate.

The Ammobroma seeds germinate three to five feet below the surface of the ground and grow into the roots of a small, inconspicuous desert shrub known as the Coldenia. To some extent it grows also on the desert Eriogohum. The flower stalk grows from the roots and extends to the surface where the plant forms a flower similar to a sunflower head resting on the surface of the sand. The flowers are sand colored and one must look closely to locate the plants. Once found it is easy to pull the stalks from the ground.

In addition to the roots growing into the host plant, Ammobroma has free roots capable of absorbing soil moisture and minerals discovered in it, but it has no green coloring matter and can not manufacture its own food.

Perhaps because of its independent root system and method of storage of water in its thick, fleshy stems, the Ammobroma is able to produce a large crop of palatable human food with a very small rainfall. In the spring of 1928 an enormous crop was produced in the sand hills east of the Imperial

Valley, California, with a total rainfall from October, 1927, to March, 1928, of about four inches.

What is regarded as the most interesting feature of this discovery is the possibility of making the Ammobroma more accessible to the Papagos, and many others including farmers who have dry, sandy soil with little rainfall. The shoots can be canned for market which would make a new industry.

Dr. Walter T. Swingle of the Office of Horticultural Crops and Diseases for several years has been cooperating with the Office of Indian Affairs to secure plants that would prevent famine on the Papago Indian reservation in years of drought. About 6,000 Indians live in an area where hardly 600 white men could hope to survive. Failure of the desert crops often imperils their food supply. On discovery of this natural crop the Government has taken steps to improve the growing, harvesting, drying, and canning of the Ammobroma, which in seasons of drought might enable the natives to store sufficient food to tide these Indians over seasons of want.

Better Crops in Russia

(*From page 9*)

greatly differs according to different regions. In the basic grain regions 50 per cent of the peasants are already working collectively, and in some cases 70 and 80 per cent. In the non-grain regions this per cent decreases to 20 and even to 7-8 per cent. But there is no such region all over the Union, where a considerable number of collectives has not been found this year (1930)."

No one knows whether collectivization of farms according to the Soviet plan will be finally successful, but in event of success what are the possible advantages of such a system? First, a system of land utilization can be worked out according to the best information in the hands of agronomists and economists. The several crops can be restricted to those soil types and climatic conditions for which they are best suited. For example, areas fit only for timber would be used for that crop, thus eliminating much marginal land from agricultural utilization. Conversely, land now in forest but perhaps better adapted to tilled crops would be cleared and put to better use. Likewise, areas suitable for winter wheat, maize, sugar beets, etc., would be defined and used for those crops when economic conditions warranted them. Second, since the government owns all the land and manages the collectives, it will be possible to grow the best varieties known to specialists. The best quality of seed obtainable may be used over wide areas. Further, the best known practices regarding tillage and the use of fertilizers may be applied uniformly in any given region regardless of its extent.

And all these practices may be introduced simply by orders from the proper administrative officers. It will not be necessary, according to the Soviet plan, to go through the tedious and expensive processes of education. Again quoting Volf: "Passing by a whole series of intermediate epochs the primitive economy of the peoples . . . leaps at one stroke from the primitive technics inherited from olden times to the up-to-date technics created on the basis of the latest achievements of the world's science, and simultaneously passes over from the minutest individual farming to a large scale socialistic one."

In other words, agricultural practice will be introduced and regulated by decree rather than by evolution through education, imitation, and propaganda. Agricultural science will surely have its day in Russia. All the scientist will have to do is to prove to the satisfaction of a critical administration that a certain practice is the best, and that practice will be ordered. But the scientist must be very sure of his ground, for along with his great privilege of guiding agricultural practice of large groups and immense areas goes great responsibility—*noblesse oblige.*

One may go on almost indefinitely pointing out advantages that theoretically would accrue from collectivization and state administration of farms. It makes one dizzy to contemplate them. Are they too Utopian for realization? Will they succeed in spite of many obstacles? Will Russia thus become the chief granary of the world, a great producer of cotton and manufactured cotton goods, an exporter of sugar, citrus fruits, etc.? Surely there is for the American farmer much food for thought in the Soviet agricultural plan. Its development should be followed with the keenest interest. We can hardly afford to stand by with an attitude of smug complacency and say it can't be done.

To carry out this colossal agricultural program, the Soviet government needs to build up an army of technically trained men and women. On that account the business of agricultural education is booming in Russia. The State Planning Committee assumed that 51,000 qualified specialists and 235,000 workers of average qualification would be required by 1932-33. Members of the Soil Congress visited the Timiriazev Agricultural Academy near Moscow. Before the World War this academy had 1,300 students, now has 4,000, and dormitories are being constructed to house 10,000 students. There are 30 schools of this type in Russia. In 1929, 23,000 students were admitted in the upper and middle schools and in 1932-33 it is expected that 102,000 will be admitted. Thus, the Soviet government is aiming at mass production in agricultural education as in agricultural production; the former is prerequisite to the latter.

Hardscribble Grit

(*From page* 4)

anxious brood all about the land and the neighbors, and they decided to venture on the long trip of eighty miles just as soon as Dad had filed on the government claim.

Here was a picture indeed! At a time when the brainy young men of substance and ambition were turning away with restless mien from the well-worn local paths and were complaining that there was no available land left on which to expand and found dynasties, this tired but eager fellow sat within his family circle with exuberant fancy. His joy was apparently infectious, for wife and children began to pack the few household belongings in eagerness to depart on the high road of new adventure. Even the rag dolls and the mongrel dog partook of the delight.

Now let it be fully understood that this man and his family were not morons or outcasts; that they were native stock of the same kind as ours, but with a mettle and a spirit that all the fires of failure could not crush. I am not relating to you an exodus of the Jukes, but an epic of such grit as few of the fat-landers possess.

He did not stop to cast a ballot or berate some politician who had failed to make good on farm relief promises. All he did was to lock the door of his one-time domicile, harness the nag, load up his stock of possessions, top them off with his family, and drive ahead in grim expectancy.

I do not know whether he belonged to the Farmers' Union or the Grange, the Equity, or the Farm Bureau, but I do know that he belonged to the Immortals. Forty-nine years, two hands, a lame back, and a skull full of pluck! That's what the Master Misfit took with him to the unclaimed claim located in a county with forty thousand inhabitants. If you ever hunted for a nickel on a circus lot two days after the kids had scoured over it you know what he found!

AND the climax of it all is that he *was* satisfied, his family was satisfied, and they *remain* satisfied to this very day you read it. But I must not anticipate, except to warn you that there is no failure for a man with such a brand of courage and devotion. If there ever was a chap who shames those querulous fat-landers who are always kicking about depression and farm woes, my friend is that man.

Money had to be found with which to make the hegira into the new haven. The little bluff place was offered to all comers at six hundred dollars, with no takers. The old neighbors croaked dismally of the land toward which the family had set their faces. It was either peat swamp or blow sand, they predicted. Resolutely the Head of the Family cashed in for the venture by selling his only cow for fifty dollars and borrowing another one hundred dollars from somebody willing to take the bluff farm as security.

They arrived in the vicinity of their venture and borrowed beds at the home of a hospitable neighbor for a few days. The wife was equally courageous, for she was more than fifty years old. The eldest child was fifteen and there were four more. Had they not met kindly neighbors their capital of one hundred and fifty dollars would soon have vanished.

Real neighborly feeling sprouts and thrives best under such conditions. I have observed it in a like manner as a boy living on a Dakota homestead, where it was sixty miles to a doctor and five miles to water, "up, down, or sideways."

About four miles from the claim stood an abandoned hewn log cabin, a story and a half high, which was mute evidence of somebody else's failure. Nothing daunted by portents or "signs," the homesteader bought the cabin for twenty dollars. There must have been something appealing about him, for all those hill-billy neighbors hitched their ponies to the shack and fetched it over the roads to the new site free of charge.

"I just know we are going to love our neighbors, and it won't take the reading of scriptures on Sundays to make us do it either," remarked the hero to his family the first night they snuggled into the rude shelter.

SO here they settled down, amid the blueberries, the scrub oats, and the trailing arbutus. A few acres had been cleared before they came, so they hired it plowed and harrowed, and planted corn, potatoes, and garden truck. A source of soft water was found at a depth of about fifty feet. The cabin had to be chinked. The wife improved daily, our hero noted. A small stable was built for the gray horse. Two barrels of snow apples and a coop of Leghorns were unloaded and added to the largess of the larder.

When the little tads started to school over the sandy roads that fall, the teacher asked them, "Do you belong to the old man that has moved into the brush on blueberry hill?" Even the old timers in those parts had not realized that the blueberry bluffs were government land. They knew that the government wards, the Winnebago Indians, pitched their camps there; so that was enough to put the seal of inferiority on the tract.

As protection against sudden forest fires, the family set to with a vim and hacked away the brush that choked the premises. Sound deadwood was chained into piles. Some of the trees had been blasted by old fires. A pile of marketable logs were laid up in a few weeks and from this came the first income. The logs brought about twenty dollars.

That fall Providence was with the hero, and he praised the Lord for deliverance. A dry summer was followed by fierce fires in the slashings. The onrushing flames came swooping over the blueberry ridge. The hero and a neighbor hastily plowed a couple of furrows around the little cabin home. A few minutes more and the inferno jumped upon them and destroyed the wood-pile and all the corn-shocks. Only the cabin itself, the rude hen house and the stable were left. Friends came and helped beat out the cinders. But optimism could not be downed. "All my brush has been swept away and much of my land is cleared, with plenty of ashes to be plowed down into the starving soil!" How's that for high degree confidence?

There is always a thrill in the first snowfall.

HOW easy it was now for people to visit them. No brush to scramble through, few logs to clutter the path. Plowing was easy now for the old horse and the wiry little hero. The fires were followed by untold amounts of blueberries. The following spring pickers came from afar, and the family sold nearly one hundred dollars worth of these acid soil nuggets.

"Now we can rush things a trifle," remarked the settler when he had finally sold the former farm for four hundred dollars. With this he hired more acres plowed, bought some strawberry plants, a cow and a calf, some seed corn, and a phonograph! Seemingly this man was not addicted to the fiddling habit like the stories related of the Arkansas homesteader. His music was in his soul and on records.

I regard that phonograph as symbolic of the great discussions we have been having incidental to the country life movement, the standards of living, culture in the sticks, and so forth. It was before the days of the radio, or probably that item would have been secured at all hazards.

Personally I think that phonograph helped make "Ma" better. Maybe that's why he picked blueberries a week to get it. I do not know anybody more entitled to those scratchy cylinder records than the family under discussion. I resist all criticism of them based on extravagance. Canned polkas were of greater aid on a cut-over farm than canned peas—sometimes. Isolation no longer worried them. The automobile had become a necessity in those diggings and folks flocked from near and far, passed and repassed as the roads improved. They had no car nor did they envy those who bumped along in second-hand outfits. They enjoyed the motor maze because the hero said it brought people up past his shack, and a few of them stopped to buy strawberries, eggs, or chicken meat. Absence of envy is not wholly a mark of no ambition, although you may think so. I know it is hard to swallow that idea in the midst of an American depression following roaring prosperity and installment buying.

Three years later the beneficent government land office yielded up the clear title to the land which the family had squatted upon. By this time the farm had mostly emerged from raw to revenue, with fruit, eggs, honey, and vegetables as cash crops.

TODAY the man is more than sixty years old, his wife and children are all living, and they own their own car and drive it, too. So indomitable is his spirit that he vows with a "vum" that he would take a hundred dollars cash and go out to any virgin tract in the state to win all over again. His certified potatoes on fertilized land, his hives of bees, a small orchard and everbearing strawberry plantation, his five cows and a flock of sheep—plus the phonograph *and* a radio set, could there really be more honest cause for good cheer?

I presume that he *does* add to the surplus of food when consumers are the dominating force in the market on a dull reaction. But I likewise affirm that he has added manifoldly to the surplus of optimism, an article which is never a drug on any market.

Economists of the class-room brand will violently disagree with any principle connected with taking up submarginal land, such as I have related. They will argue that there is already too much good land poorly worked and often under-capitalized, with too much working loss chalked up against agriculture as it is.

But agriculture represents two kinds—mass agriculture and individualistic agriculture. I am very much afraid that what is proven wise and good for mass agriculture never will become a guiding star for individualistic agriculture.

When men seek a home and staple food, solid comfort and family security (however humble) they are very apt to disregard entirely all the noble tenets taught in schools of economy. I am afraid that my friend, the homesteader, would not have improved upon his technic or his intentions after taking a thorough course in economics —had he faced the same bitter necessity.

I do not believe, of course, that the government should deliberately seek to inveigle such folks out onto large and visionary reclamation areas; but in this case the government actually hid away the claim which our hero found. The government cannot either be blamed or praised for any hand in his rejuvenation.

Similarly, I often wonder if the government or economists can be credited much for settling all of rich Iowa or Illinois, or any of the tract once regarded as the Great American Desert. It was individualistic agriculture, urged on by courage and need, that brought the prairies under the plow. The only difference between them and our hero was that they had better picking. He established a home, and what more can be said for most of the pioneers?

AND so this is the story of the Master Misfit who became almost a Master Farmer in his own small way. Maybe if we should scan very minutely the real difference between the successful farmer and the reverse, some consideration would be given to spiritual qualities and courage.

We are apt to count only as heritages certain attributes of shrewdness and wealth accumulation. But there *are* country fathers who have neither possessed the one nor acquired the other and whose memory is as green and tender in the hearts of their children as those who have had something tangible written in their wills.

If you disagree with me I have no animus. Perhaps a budget of letters to me on this matter would help me to jump the next hurdle on the yearly round.

PASS THE MURADS

A tabloid newspaper, offering $1.00 each for "embarrassing moment" letters received the following epistle:

"I work on an early night shift in a steel plant. I got home an hour early last night and there I found another man with my wife. I was very much embarrassed. Please send me $2.00 as my wife was also embarrassed.

The editor, so we are told, sent a check for $3.00, admitting the possibility that the stranger, too, might have been embarrassed.—*Exchange.*

Preacher—Dat's as fine a goose as I evah see, Bruddah Williams. Whar did yo' git such a fine goose?

Mose—Well now, pahson, when yo' preach a speshul sermon, I never axes yo' whar yo' got it. I hopes yo' will show me de same consideration.—*Wall Street Journal.*

Peggy—"The man I marry must be brave as a lion, but not forward; handsome as a Greek god, but not conceited; wise as Solomon, but meek as a lamb; a man who is kind to every woman, but loves only one."

Peter—"By jove! How lucky we met!"—*Tit Bits* (London).

Willie was being measured for his first made-to-order suit of clothes.

"Do you want the shoulders padded, my little man?" asked the tailor.

"Naw," said Willie significantly, "pad de pants."

SOUND BUSINESS MAN

Judge: "You can take your choice; ten dollars or ten days."

Prisoner (still in a foggy condition): "I'll take (hic) the money, your honor."—*High Tension News.*

Family Friend: "So your boy got his B.A. and M.A. before leaving college?"

His Host: "Yes, indeed, but his PA still supports him."—*The Enamelist.*

And then there is Rudy Vallee, a Yale graduate, getting his nine thousand a week for singing love songs. It just goes to show what a college education will do for a man.—*Brown Jug.*

"It was terrible," said Mrs. Murphy. "There were twenty-seven Swedes and an Irishman killed in the wreck."

"Indeed," said Mrs. Grogan, "the poor man."—*Wroe's Writings.*

A baseball game being played in Old Man Jones' pasture broke up in the seventh innning in an uproar when Joe Spivis slid into what he thought was third base.

—*Better Methods Magazine.*

Rastus (at dance): "Mirandy, is yo' program full?"

Mirandy: "Lawdy, no! It takes mo' dan two sandwiches and a cup of coffee to fill mah program."

Better Crops WITH PLANT FOOD

November 1930 | 10 Cents

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

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Agricultural and Scientific Bureau
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"Hiding out" on Thanksgiving appetites,

Better Crops with PLANT FOOD

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Thanksgiving directs Jeff's interest to—

Poultry

By Jeff McDermid

POULTRY date back into the dim archives of antiquity, although I refrain from proving my case with the hen I bought at the chain store last Saturday. That ossified bird was certainly blue-blooded enough to roost in the avian family tree, judging by its epidermis, and it must have inherited many of the attributes of *Gallus bankiva*, the jungle fowl ancestor of all our garden scratchers.

The British Museum and the cold storages of our own land are running neck and neck in presenting rare specimens of this sort, but I see by the papers that temporarily we are beaten in the prehistoric poultry line. The Londoners have two impressions in stone from the Jurassic period that show outlines of an Archaeopteryx sitting on its nest. An Archaeopteryx was a lizard-tailed bird of formidable perplexity to stone-age chefs, and its only modern counterpart is found in the four-year-old, tree-sitting Leghorn.

All the milk of human kindness,

plus spoon feeding and breast nursing, simply won't make some things digestible. As our fowls grow older they acquire more of the characteristics of the original fauna which had to live on gravel and survive by their talons.

I HAVE been elated lately. My feathered friends have elected me a poultry society director. Not being a Methodist minister, a colored deacon, or a ballet teacher, I can claim no long career as a picker of chickens. Yet I have been the first one to sit down at forty-odd Thanksgiving dinners and have lived on poultry left-overs ten days thereafter. I have arisen in my shirt-tail to shoo polecats out of hencoops, and I have successfully produced roasters and broilers on the twentieth day in one of those experimental hot blast incubators. That's what I call shortening the distance from cackle to culmination. The secret of my success in this line is patterned on the government method—restricted moisture!

But I have lived, as you might say, close to the hennery and am a sort of little brother to the brooder. It has been my pleasant duty to write poultry fiction between sandwiches of fact, and to prod many curious farmers into asking, "What ails my chickens?" I have celebrated National Egg Week without exposing myself within range on the lecture platform. And finally, I have hung around the edge of one World Poultry Congress, and I know Harry Rhode Island Lewis. Such explanatory matter is needful so the reader will consider me an authority worth following, with or without a shotgun or sodium fluoride.

FOWLS have entered into the interests of human beings almost more closely than any other animate creature. In the days of Darius Green of flying machine fame, men were content to flap their mechanical wings like unto the barnyard rooster. Today they outdo the flocks of migrating geese, whose aerial honkings in wedge-shaped formations used to set us a-tingle with the first breath of spring and the first sting of autumn.

From time immemorial man has used the sign manual of the bird as his emblem of achievement. Poets cinched their saddles on the back of a winged horse. Mercury, god of speed and progress, wore wings on his shoulder blades. Then the good Yankee fathers adopted the soaring eagle for the trademark of liberty. When they got to stamping it on the coinage, even a native of Glasgow found that money took wings and flew away.

AT the Canadian poultry congress I chatted with a devout follower of Mahomet, who spread his prayer rug with nonchalance anywhere from Prince Edward Island to Vancouver. He was wise to the lore of the cradle of poultrydom. Previous to meeting him I had imagined that quick-thinking American commerce had invented the custom hatchery, but he demonstrated an ancient oven, erected on the Sahara desert before the days of Moses, which was used as a huge hatchery; and he showed me how on camel back they collected the eggs for hatching. Perhaps they were thicker shelled eggs than we have in Minnesconsin, but he claimed the hatcheries had more leftovers than shorts just the same.

He said furthermore that the cock of old times was a family symbol of steadfast virtue. His example inculcated virtue to the heads of those numerically large families. They pointed out the gorgeous rooster, and said, "Behold the bird! Imitate him in fighting, early rising, eating with the family at all hours, and affording protection to his spouse."

Thereupon he secretly confessed to me that he had tried to follow the aforesaid injunction to the letter in all of the three first things, but that his

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An Asparagus Field Day was held on August 6 at Aiken, South Carolina—in the "heart of the iodine belt." More than 75 per cent of all the "grass" grown in South Carolina was represented by the 350 farmers present.

King of the "Grass"

By G. C. McDermid

Charleston, South Carolina

WHEN one man in a whole State can produce nearly four times as much asparagus per acre as his State averages, he rightly deserves the title of "King of the Asparagus Growers." Such is the case with Rufe Lott of Williston, South Carolina. According to the best figures we can find, South Carolina growers averaged 36 crates per acre for the past three years. Mr. Lott, on a 10-acre field, has produced more than 125 crates per acre for the same three years, and his methods of fertilization have been so different from those of the vast number of growers that they have caused most "grass" producers to sit up and take notice.

In questioning Mr. Lott as to his practices, the writer learned many valuable lessons on fertilization of this crop. About February 15, before cutting begins, Mr. Lott applies 1,800 pounds of 5-7-5 (NPK) fertilizer per acre. After the cutting season ends, generally about May 10 to 15, he uses a side-dressing of 1,000 pounds of kainit per acre.

In looking over his field, one is impressed by the unusual number of stalks per hill, the remarkable stand which Mr. Lott has, and the large top growth which especially is noticeable. A great many hills had from 20 to 40 stalks, and most of these were tremendous, thrifty, and full of "pep." He stated that he was a believer in cowpeas as a cover crop, but that he liked clean cultivation until rather late in the season, so that the "grass" could make a maximum growth during the early summer.

RECORD OF ASPARAGUS YIELDS, L. A. CAVE, BARNWELL, S. C.
(3-yr.-Grass)

Fertilizer (NPK)	Amount per A	Time of application	Yield per acre Colossal bunches	Fancy bunches	Choice bunches
Plot 1					
5–7–5	1100 lbs.	Feb. 10			
5–7–5	1000 lbs.	May 30			
12% Kainit	500 lbs.	May 30			
20% Kainit	500 lbs.	July 10	190	120	50
Plot 2					
5–7–5	1100 lbs.	Feb. 10			
5–7–5	1000 lbs.	May 30			
12% Kainit	500 lbs.	May 30	109	90	52

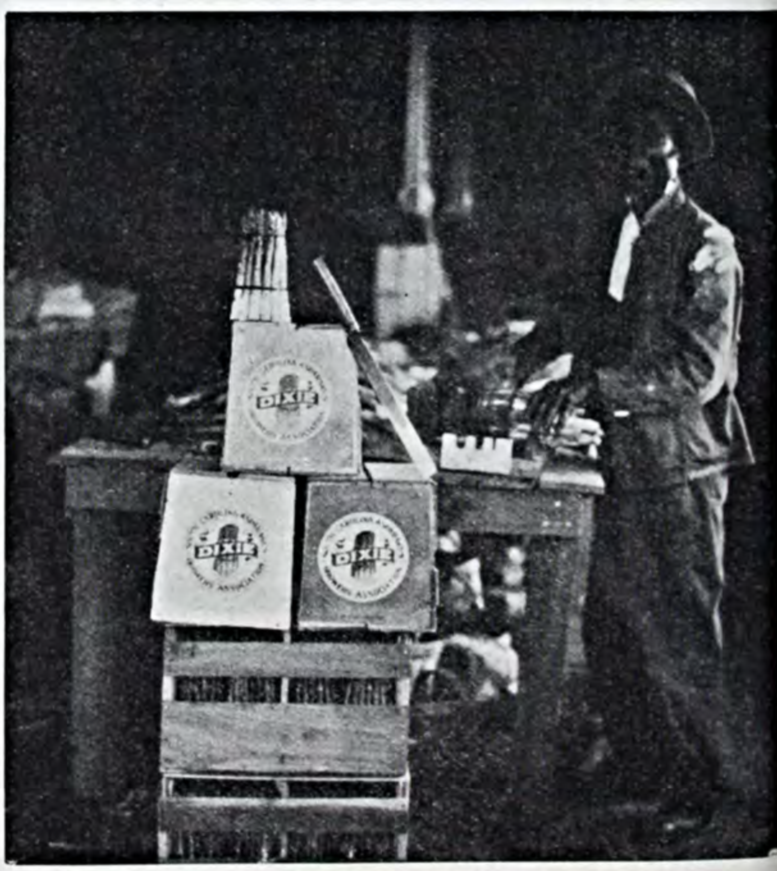
Mr. Lott made a talk at the recent Asparagus Field Day held at Aiken, and he explained his practices to the growers at that time. Lang Cave, another very successful grower, made a talk and outlined his methods of culture, fertilization, and general practice. In addition he showed the growers a very interesting chart which he had made from records kept on his fertilizer experiment with a 3-year-old crop.

Mr. Cave conducted his "test" on a two-acre basis, using two check plots. The table above shows what, when, how, and why Mr. Cave was proud.

From the above figures we see that a gain in COLOSSAL "grass" of nearly 75 per cent was made by the use of the additional 500 pounds of 20 per cent kainit, and that the gain in FANCY "stuff" was well worth while.

Mr. Cave's experiment and Mr. Lott's practice, in the use of additional potash salts on the asparagus crop during its growing season, proved conclusively to the growers at the Asparagus Field Day that while they had been using some potash, they were way under the mark when it came to the amount per acre they could use profitably. There were five other successful growers who made talks at this meeting, and each one in his turn stressed the major importance of potash for the crop.

More light on the subject of asparagus fertilization has been secured by the compilation of the answers to a questionnaire which was given to the farmers at the field day program. A summary of these answers is of inter-



Packing Dixie Brand asparagus, Pender's Crown Farm, Williston, South Carolina.

Cutting Dixie Brand "grass" on Pender's Crown Farm, Williston, South Carolina. This asparagus was fertilized with 2,000 lbs. 7-5-7, 300 lbs. of nitrate of soda, and 600 lbs. 20% potash manure salts per acre.

est, and is given below:

Clemson Agricultural College is carrying on some very interesting experiments at present on the various problems of asparagus fertilization, time of application, etc., and Dr. R. A. McGinty, State Horticulturalist, has made the recommendation of 200 pounds of nitrate of soda before cutting season begins, and a ton of 5-7-5 after cutting is over. On some soils, the light sandy type, which are so prevalent over the South Carolina asparagus area, his recommendation calls for a ton of 5-7-10 after the cutting season.

The Massachusetts Experiment Station in Extension Leaflet No. 49, recommends the use of one-half ton of 5-8-7 before cutting season begins; another half ton of 5-8-7 after the

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	Average Analysis N P K	Average yield per A
GROUP 1		
Farmers using mixed fertilizers only	4.82—7.07—4.91	41.9 crates
GROUP 2		
Farmers using mixed fertilizers plus potash salts	4.50—4.33—8.10	54.6 crates
Average cost per ton of fertilizer (Group 1)	$28.87	
Average cost per ton of fertilizer (Group 2)	$29.03	
Per acre fertilization	1,521 lbs. (Group 1)	1,935 lbs. (Group 2)
Average cost per crate	52c (Group 1)	51c (Group 2)
Average return per acre @ $2 per crate (All grades)	$83.80 (Group 1)	$109.20 (Group 2)

In addition to the fertilizer information given above, some interesting facts were uncovered as to time of fertilization and its effect upon yields per acre:—

	YIELDS
Mixed fertilizer applied, one-half before and one-half after cutting	45.0 crates
Mixed fertilizer all applied before cutting	42.3 crates
Mixed fertilizer before cutting and potash side-dressing after cutting	50.2 crates
Potash application before cutting and mixed fertilizer after cutting	60.0 crates
All fertilizer after cutting	50.0 crates

The Fertilized Pasture Diagnosed

By George B. Mortimer

Professor of Agronomy,
Wisconsin College of Agriculture

TO get more out of pastures, there must be more put into them than has commonly been the custom. For every pasture being consistently fertilized at least 10 are not. Those farmers who depend upon permanent grasslands for the season's grazing, whether wholly or in part, can well afford to consider a program of management for their pastures. This is particularly true for limited amounts of pasture on high priced land.

It may not have a like application for those having many acres of natural pasture on cheap land, but even for them it does have value in staving off the day of inferior returns and livestock ills. A little repair of any machine at the proper time usually prevents the big bills caused by neglect. I often think that plants are a lot like people. Make the conditions for work right in both physical equipment and surroundings and plants will do their best. Contrary to what one may believe, pastures are no exception to this rule.

Ten Arguments for Fertilized Pastures

Fertility attention has been given other crops for a long time. Rotations, legumes, stable manure, and lime have kept the wheels of production turning profitably. But pastures, generally speaking, seem to have escaped this or any other scheme of fertility. Bound by the faulty tradition that land in pasture is land at rest—that it cannot wear out, and because they often occupy the cheaper lands, pastures stand as a glaring example of crop neglect. But fortunately that notion is passing. Improvement of pastures through the application of scientific principles of plant and soil chemistry is directing the way out. Farmer and scientist alike are exhibiting deep interest in pasture lands today. It may be hard for some to conceive that pastures are worth fertilizing, but when once practiced and the results noted, even the most skeptical are compelled to smile at their doubts. I don't believe there is any crop that will respond better to fertility treatment than pastures that are in need of it, and let it be kept in mind, a good pasture is one of the most useful crops on the farm.

For the right sort of a fertilization program for any pasture in poor condition, there may be offered not less than 10 substantial arguments gleaned from the findings of carefully conducted experiments. Set down in school-room fashion, they might read something like this.

Fertilized pastures offer

1. More feed,
2. Feed of superior quality,

3. A better distribution of feed throughout the season,
4. Earlier grazing in the spring,
5. Later grazing in the fall,
6. More home-grown protein,
7. A much thickened turf,
8. Quicker recovery from drought,
9. Better weed control,
10. The prevention of pastures wearing out.

Fertilized Pastures Have More Feed

On this point, there is little left to the imagination. Yield increases are usually among the pronounced visible effects. Feeding a hungry plant is like feeding a hungry animal. It doesn't take long for the response to show. Investigations display varying yield increases, the range being determined by the state of soil depletion, amounts and kinds of fertilizer used, when and how frequently applied, and the type of soil. Increases are more often gradual, paralleling a building back of the turf, rather than appearing in momentary jumps. This is especially true of fertilization that omits nitrogenous manuring.

When fertilization is needed, it clears the way for an improvement in the quality of feed. The pasture becomes inhabited with superior pasture plants, redtop, Canada bluegrass, poverty grass, weeds, etc., gradually succumbing to the will of Kentucky bluegrass and white clover.

Quality is also enhanced through increased protein and mineral values of the feed. Plants growing on soils rich in mineral fertility contain higher percentages of ash in their dry matter, and nitrogen fertilized grass carries from six to eight per cent more protein than nitrogen starved grass. Then too, grass growing on rich soils produces a higher proportion of leaf to stem, with less tendency to run into stemminess and seed head early in the season. All this makes a superior feed.

Fertilization involving nitrogenous manuring offers not less than two weeks earlier grazing in the spring. Nitrogen fertilized grass seems to yield consistently 500 to 700 pounds more dry matter an acre up to the first week in June. If a second application of nitrogen is made by the middle of June,

FROM SICKNESS TO HEALTH

300 pounds of 20 per cent superphosphate, 150 pounds of potash, and 1 ton of lime per acre effected the cure.

growth is carried farther into the season, and recovery is quicker following the usual August drought. The use of nitrogenous manures on grasslands distributes the grazing more uniformly by placing a lift in growth at both ends of the season. While mineral fertilization without nitrogen swells total yields very materially, earlier grazing and uniform distribution of feed are not so characteristic of it.

Fertilized Pastures Grow More Protein

Because yields are increased and because protein per cents in the feed are raised, pasture fertilization should be doubly attractive to the dairy farmer. Fertilization stimulates protein production in at least three ways. If a pasture is mineral fertilized only, the pronounced increase in clover growing with the grass is one way that more protein will be produced, the clover itself not only being high in this compound, but the grass being benefitted by some of the nitrogen fixed by the legumes. Furthermore a soil rich in mineral fertility favors a more rapid rate of soil nitrification, and hence more nitrogen is available for grass growth.

If a pasture is nitrogen fertilized, protein per cents in dry matter are very materially lifted. In 1929 the writer computed the protein yields an acre for two pastures in different stages of mineral fertility, one being very high in lime, phosphorus, and potash, and the other low. The first yielded 1,179 pounds of crude protein an acre, and the second 419.

In another test, a pasture which had been limed, phosphated, and potashed yielded 3,472 pounds of dry matter an acre containing 749 pounds of crude protein. An untreated portion of this same pasture gave 1,472 pounds of dry matter an acre carrying but 234 pounds of protein. The average protein per cent in the feed throughout the season for the fertilized pasture was 21.57, and for the untreated, 15.89, a difference of 5.68 per cent.

On another pasture, untreated plats yielded protein at the rate of 326 pounds an acre for the 1929 season. Plats fertilized with lime, phosphorus, and potash produced 696 pounds, and when 60 pounds of nitrogen, made in two applications, were applied with the mineral treatment, 1,029 pounds of protein were the result. It would seem that increasing protein production in the pasture might be far more economical than purchasing it in the sack, everything else considered.

Fertilized Pastures Have Thicker Turfs

Thin turfs and poor pastures are almost synonymous. Poor yields of inferior quality, lots of weeds, drought affliction, and grub injury when that pest strikes, all belong to thin turfed pastures. Fertilization and controlled grazing are the important steps to take in building back a turf. In the writer's judgment, the effect of nitrogen fertilization in hastening a thickened turf is one of the big arguments for using it on poor pastures.

The thicker the turf, offering greater competition to weed encroachments, the fewer the weeds and other undesirable plants present in the pasture. The weediest pastures examined are the ones with the thinnest turfs, and I have seen some of them come to be possessed with a thick and practically weedless turf when placed under suitable fertilization treatment. It should not be thought, however, that the worst perennials can be eradicated from pastures in this way, but such weeds as ragweed, mullen, dock, and yarrow are usually eliminated by exciting a greater competition from the pasture plants. A weedy pasture is a pretty sure sign of a starving pasture.

A pasture, well managed and in good producing condition is not so easily afflicted with drought, and recovery takes place quicker when the

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USE GOOD SEED

By O. C. Lee

Extension Botanist
Purdue University

ONE of the oldest lessons in agriculture, that man cannot gather fruit from thorns, or figs from thistles, is being completely ignored by thousands of American farmers, due largely to a sudden and complete change in the seed situation to which we have not yet become adjusted. To further this evil the recent drought in the corn belt area, where clover plays an important part in the crop rotation, has brought about a scarcity of good seed.

It is a well-known fact that America does not produce sufficient clover seed for home needs. The huge deficit has long been supplied from European sources and before the war most of the imported seed was a blended product, a single shipment of which may have represented a dozen European countries scattered geographically from the Baltic to the Mediterranean. During the war all this stopped and shipments of seed direct from Italy, France, and other European countries reached our shores.

The Blame for Failures

Then began almost complete clover failures on thousands of American farms, and the trail of suspicion led to seed that originated in warm climates, principally in Italy, a country that has supplied American farmers with many millions of bushels of seed. It was definitely proved that warm climate seeds cannot stand the rigors of winter weather in parts of the American clover belt, a revolutionary discovery that led to the new federal seed staining law requiring that 10 per cent of

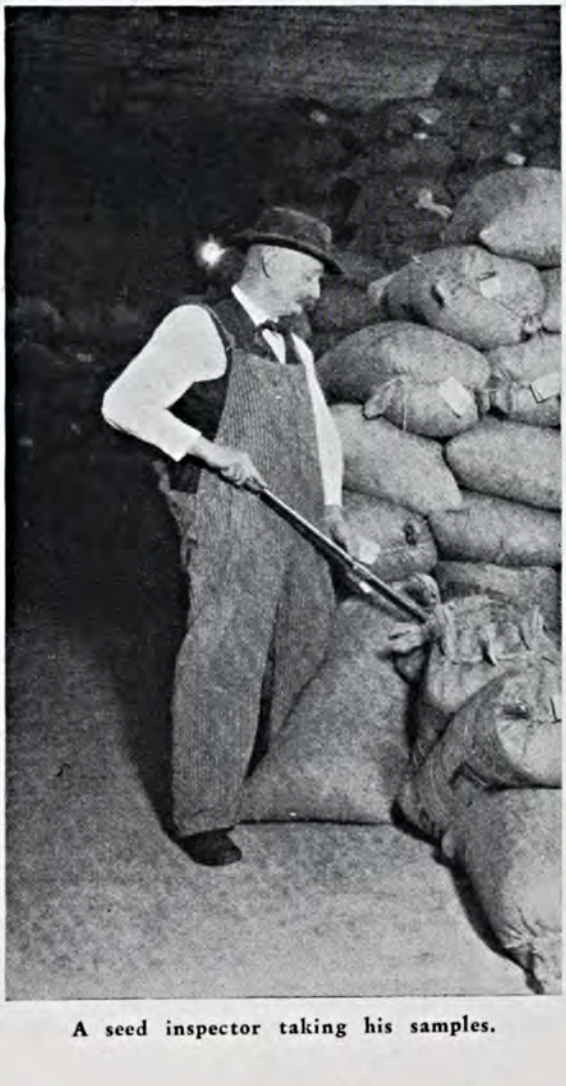
Seeds of the field bindweed commonly are found in our Western seeds.

all unadapted imported clover and alfalfa seed be stained red as a warning to American purchasers. The only exception is in the case of unadapted alfalfa seed from South America, which is stained orange.

Since the knowledge that winterkilling resulted from the use of unadapted foreign seed has become prevalent among farmers, and since we have been given the means for distinguishing the imported product, the demand for clover seed has been tremendous. With small supply and great demand, prices of seed have increased. The most unfortunate result of this situation is the fact that high prices have resulted in the dumping on the market of vast quantities of native seed so badly ridden with weed seeds, of such low germination and such poor quality generally, as to be even worse than unadapted foreign products. When a farmer uses unadapted seed, the worst that can happen is the loss of his crop through winter-killing, but when he sows seed infested with quack grass, Canada thistle, dodder, and other noxious weeds, he is piling up hard labor and heavy losses for years to come.

Dodder seed, for instance, has been found to lie in the soil for years and continue to prohibit the profitable growth of alfalfa or clover. And many thousands of farmers regret the day they brought the Canada thistle, field bindweed, and other pesky weeds to their lands via the impure seed route.

Most up-to-date farmers are pretty well convinced regarding the value of good seed, nevertheless it is safe to say that the majority of the clover and alfalfa seed used on American farms contains over 1,000 weed seeds per pound. Fifty-nine samples of alfalfa seed tested last year at the State Seed Laboratory at Purdue University, Lafayette, Indiana, averaged 7,846 weed seeds per pound, while white clover contained 40,950 weed seeds per pound. The same year mixed seeds were found to contain an average of 69,613 weed seeds per pound when calculated on a 35-sample basis. Of the sweet clover samples, 13.9 per cent contained Canada thistle seeds, while dodder was found in 12.1 per cent of the alsike clover, in 19.8 per cent of the red clover, and in 41.4 per cent of the alfalfa samples tested.



A seed inspector taking his samples.

Reliable Sources

The question then arises, how can a farmer be sure of getting good seed? To answer this question, let us first consider the sources of seeds. The average farmer has five principal sources of supply—his own land, his neighbor's, the local seed merchant, traveling agents, and the mail order seed houses.

Two of these, the mail order seed house and the traveling agent, should be regarded with extreme caution. When seed is purchased by mail from a firm located outside the border of the state, the farmer automatically loses the protection offered by the state seed law, which is argument enough for buying at home. Many mail order seed firms are not sufficiently reliable. We have seen enough of the ruinous results of purchasing so-called "bargain" mail order seed to feel it unwise for anyone to indulge in this practice unless absolutely certain of the reliability of firms offering such wares.

Speaking of the traveling agent, we can say that there are undoubtedly honest vendors of seed by this method, but the fact remains that the itinerant peddler is here today and gone tomorrow and has very little interest in the farmer aside from the profit he can make in the seed transaction. This is not true of the local merchant, who has a business establishment and a reputation to maintain, and who is interested in seeing his farm patrons prosper and eventually help his business.

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The Difference

By L. J. McDonald

Henryetta, Oklahoma

"WHAT caused the great difference, Mr. Edwards?"

The question was asked by the President of the Henryetta Rotary Club when that organization was holding a rural acquaintance meeting in the Irish-potato field of Floyd Edwards, prominent farmer living near Henryetta. The selling of the business men of the city upon the idea that it is absolutely necessary for them to talk the use of commercial fertilizers to their customers was the compelling motive back of the meeting being held.

The business men could see for themselves that fertilizers did make a big difference in the growth of the plants and when a few of the plants

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Left: W. P. Rorex, chairman of the Agricultural Committee of the Henryetta Chamber of Commerce and president of the Lion's Club, looking over the potato fertilizing demonstration conducted on the Edwards Farm.

Right: Floyd Edwards standing between the convincing part of the demonstration. The potatoes on his left represent the yield of one row of the unfertilized plot and the baskets on his right show the yield of one row of the plot receiving 600 pounds 4-8-6 per acre. Note size of potatoes on top of each crate.

The Inquiring Mind *and the* Seeing Eye

By Dr. A. S. Alexander

University of Wisconsin

IT is a pleasure and a privilege to honor Professor Charles Sumner Plumb, the eminent animal husbandman of the Ohio State Agricultural College.

That, I am sure, was the feeling of the host of co-workers and friends who placed his portrait in the picture gallery of the Hall of Fame of the Saddle and Sirloin Club at the Union Stock Yards, Chicago; for they esteem him as a man who has rendered splendid service as a teacher, research worker, judge of livestock, and writer.

From these walls his kindly, alert, intelligent countenance will, through the coming years, look down upon the rising generation of visiting animal husbandry students, successful 4-H boys and girls, teachers, and the leading breeders, feeders, exhibitors, salesmen, and utilizers of livestock. To all of these, the memory of his work and service will be an inspiration and encouragement to make the farm animals of America the finest and most profitable on earth.

Those who know Professor Plumb most intimately can say of him honestly, lovingly, and without fulsome praise, that he perfectly personifies those Christian virtues which some now consider old-fashioned, but are virtually important as a foundation for stable, lasting success in every vocation of life. They admire him also for his cheerful spirit, unselfishness, industry, enthusiasm, religious character, and neverfailing patience.

And what wonderful patience, indomitable will power, vitality, and recuperative stamina he must have had to surmount and survive the terrible accident which brought him, in 1925, to the very portals of death, broken in body, utterly helpless, and for a time clouded in memory.

Through God's great mercy his life, eventually, was spared. Today, though past the allotted Biblical age, he is out and about, efficient, intensely interested in life, and, as his intimate friend Uncle Davie Fyffe, the well-known expert manager of the Ohio Experiment College stud, herds, and flocks reported recently, "He is as clear in his mind and as ready for an argument as ever."

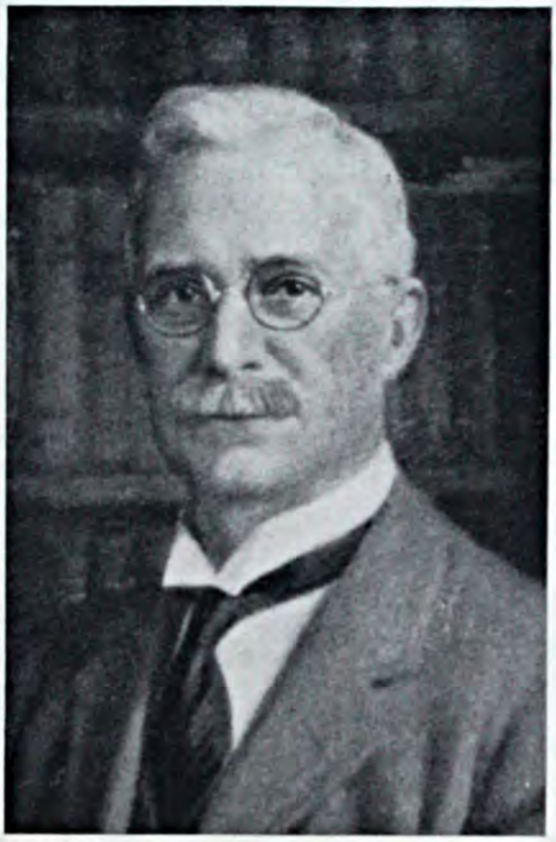
It is no wonder that Professor Plumb is esteemed and admired by all those who have benefitted by his teaching and example; for it has well been said of him that he has always held high the virtue of honesty and stressed and impressed upon the younger men who have come under his influence the fact that man has no greater asset than his integrity. The world ever is quick to appreciate one who possesses those fine attributes.

His Early Training

Professor Plumb was born at Westfield, Massachusetts, April 21, 1860. His father, David H. Plumb, who traced his ancestry back to early colonists of lower New York State, was educated as a clergyman and officiated as pastor in New Jersey, Connecticut, and Massachusetts churches. He also served during the Civil War with the Massachusetts volunteers. His mother, Helen M. Wallace, was descended from Scottish seafaring folk and imparted to her son many of those sterling qualities which were to serve him in such good stead in the years to come.

Like so many other comparatively poor boys, Charles had to peddle papers to defray expenses when he attended the grammar and high schools at Westfield. As he grew older he spent part of his time in work on the dairy farms of the district and also gained practical experience in the tobacco fields of the Connecticut valley.

When the time came for him to enter the Massachusetts Agricultural College, he again had to pay his expenses by labor. He worked on the College farm and for the horticultural department. Thus he gained a sound practical knowledge of agriculture, in addition to the theoretical course of study which he took and completed, in four years, at the age of 22. He likewise developed bodily strength and vigor which enabled him to "make" the College football team in his junior and senior years.



Professor Charles Sumner Plumb

Always, he loved to write and could express his ideas clearly and concisely. This ability gained for him his first position in life, as assistant editor of the *Rural New Yorker,* which he filled until the summer of 1884. Then he became first assistant to Dr. K. L. Sturtevant, the eminent agriculturist who was at that time director of the recently organized Agricultural Experiment Station at Geneva, New York. There, he came in touch with men who were destined to become worthily famous in agricultural history, foremost among whom were Dr. Stephen Moulton Babcock, originator of the milk butterfat test now used throughout the world, and the late Dr. Edwin Freemont Ladd, who became the distinguished president of the North Dakota College of Agriculture, and later admirably served his people as United States Senator.

After working at the Geneva New York Experiment Station from 1884 until 1887, he was professor of agriculture at the University of Tennessee and assistant director of the Experiment Station, until 1890, when he became vice-director of Purdue Indiana Agricultural Experiment Station until 1901, director 1901-1902, and also served for a time as professor of agricultural science and professor of animal husbandry and dairying.

Experience, gained at the various institutions just mentioned, fully equipped and fitted Professor Plumb for the most notable and successful work of his career, undertaken when, in 1902, he was called to Ohio University to organize an animal husbandry department. Dean Hunt was then at the head of the Agricultural College.

When Professor Plumb arrived, he found but a few grade milk cows in meager and inadequate stables. These animals were cared for by students working for the dairy department, and the milk was sold to private consumers in Columbus. The new animal husbandman at once began an active campaign to obtain purebred livestock, new horse and cattle barns, and a judging pavilion. The result of his endeavors was that the State Legislature, in the Spring of 1906, appropriated about $80,000 for the purpose and the needed buildings were erected and filled with fine livestock.

The possession of these adequate buildings and better animals stimulated increased activity in the institution. More teachers were employed and regular herdsmen took the place of the students in caring for the increasing stud, herds, and flocks. All the while, Professor Plumb labored strenuously to establish his department, and soon saw it rank high with those of other State Experiment Stations. At the same time, livestock interests of the State were given personal attention and encouragement and, incidentally, the Ohio Live Stock Breeders' Association flourished and became widely influential for the good of the industry.

Friend to Students

The students had now found in Professor Plumb a capable, painstaking, and efficient instructor and that expert rapidly gained a reputation in his line of work. While a strict disciplinarian, he also proved a true friend and wise counsellor. Today he is affectionately regarded by all who took work under him and many of them have succeeded splendidly in the fields of livestock breeding and management, farm journalism, research, and teaching. Of these men he is justly proud, and that he treasures their friendship is well indicated by the fact that every Christmas he sends "the boys" a kindly letter of greeting from which he gets a wonderful response.

It may truly be said that Professor Plumb is a fine example of the type of agricultural scientist who has done much to elevate the agricultural college to a position of equality, respect, and efficiency among the other departments of learning in the State Universities of the land. The livestock breed societies have honored him in many ways and as a competent judge he has, during the past 25 years, "picked the winners" in many a show.

As a writer on livestock subjects Professor Plumb has been indefatigable and successful. His textbooks have been adopted and used throughout America and are well known abroad. One of them was translated for use in Russian government institutions. The celebrated Authors' Club of London made him a member, and his frequent trips abroad have gained him many friends "across the water."

The textbook translated was "Types and Breeds of Farm Animals" and you will see it in the hands of practically every student of animal husbandry. That fact surely proves its merits. Its author has, indeed, been a most prolific producer of livestock literature—a rapid, concise and correct writer, whose expression is clear, exact, and appealing. Notable among his works, in addition to the leading textbook mentioned, are: Little Sketches of Famous Beef Cattle; Beginnings in Animal Husbandry; Judging Farm Animals; A Study of Farm Animals; Biographical Directory of American Agricultural Scientists; Indian Corn Culture, and a Partial Index of Animal Husbandry Literature.

In 1887-91 he also edited and published *Agricultural Science*.

Resigns to Do Research

In 1920 Professor Plumb resigned as head of the Animal Husbandry Department and devoted his time to instructional work in sheep husbandry and research. Two years ago he gave up the sheep work and now is occupied with research investigations and, at home, in writing, surrounded by one of the most complete libraries of livestock literature in the country. Among the books you will see a report on sheep conditions which he prepared for the U. S. Department of Agriculture, when in Europe, and with it there are, no doubt, many manu-

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A Remedy for
SAND DROWN

By W. H. Scherffius

Baltimore, Maryland

IT would appear that an immediate remedy for sand drown (magnesium deficiency) in tobacco has been found. During the past season Professor C. B. Williams of the North Carolina College of Agriculture conducted a number of experiments on the farm of Fred Richardson, Zebulon, North Carolina, where sand drown was rapidly developing. The purpose of these experiments was to determine if sand drown (magnesium deficiency) in tobacco could be corrected or arrested in the growing crop after it had already made its appearance. To a number of plots of tobacco, badly affected with sand drown, he applied a sidedressing of 100, 150, 200, and 250 pounds per acre of sulphate of potash-magnesia.

When the tobacco was ready to harvest, the writer, with Professor Williams and Mr. Jackson, inspected these plots. To our surprise and pleasure, we found that in every instance where the sulphate of potash-magnesia had been applied to the young plants, sand drown had been completely arrested; whereas, in portions of the fields where sulphate of potash-magnesia was not applied, sand drown had continued to spread right up to the top leaves of the plants.

A farmer in the vicinity, who noticed the beginning of sand drown on his small plants, had followed Professor Williams' lead and applied 110 pounds per acre of sulphate of potash-magnesia to his crop. As a consequence there was no sand drown showing in his crop, except the original on the small sand leaves. He had completely arrested the damage and made

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A typical case of sand drown.

Korean Lespedeza

By Ralph Kenney

Field Agent in Agronomy, Kentucky College of Agriculture

"I FIGURE the drought just cost me about $1,000 on my three little fields of Korean," said John Proctor of Franklin county, Kentucky, in early October this fall.

"How is that?" I asked.

"Well there is plenty of seed on what is there and I surely will have the ground covered like a carpet next year, but it's too short to harvest seed, now," said Proctor.

And that was true. But there was not a square foot of ground without one or more vigorous Korean plants in his entire sowing. Each plant had several hundred seeds so near maturity that a hard freeze would not damage many of them.

"Did you sow anything else with it?"

"Yes, timothy, bluegrass and red clover."

There was not a sprig of any of them to be found.

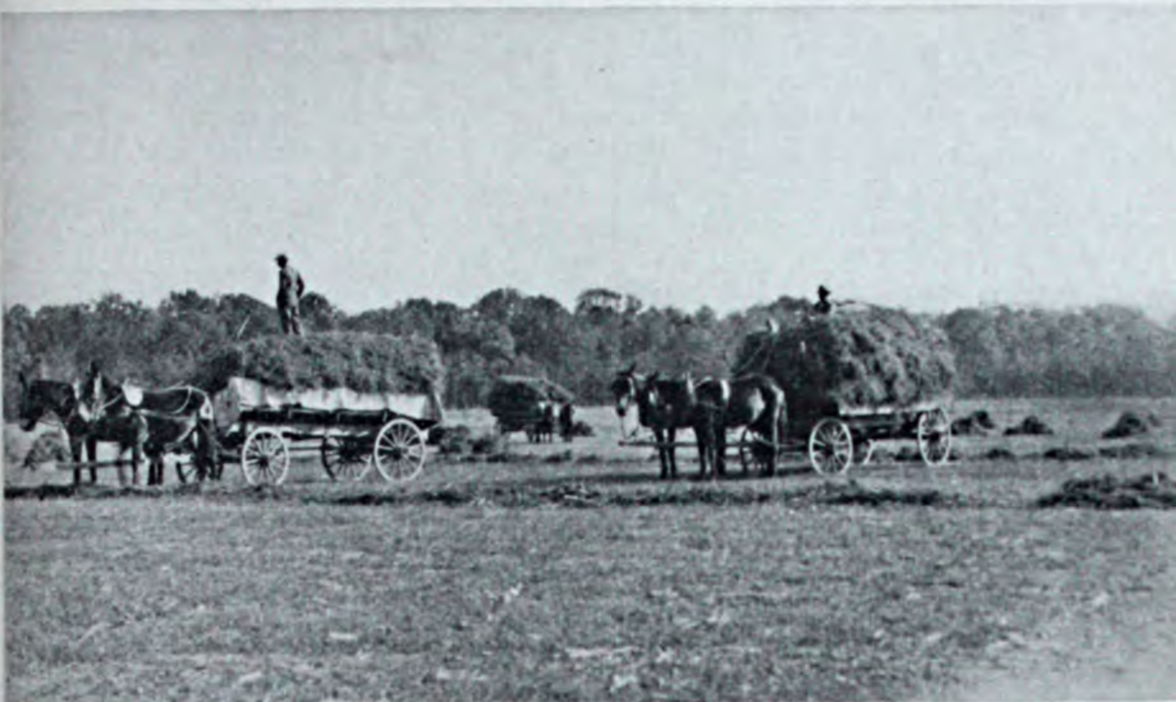
Naturally Proctor feels bad because of his failure. He has dismissed from his mind the total loss of the other seed money. But he feels mighty good over that stand of Korean lespedeza and had he not been hoping every day for rain to make it a few inches taller to harvest, he could have grazed a cow to the acre for the past 60 days.

This farm is in a territory that this year grew not more than two nubbins on each 10 stalks of corn, where all red clover failed, and half of the spring sown alfalfa and sweet clover perished in the dry weather.

The Korean performance in this situation is typical of all of Kentucky, Tennessee, Arkansas, and the drought damaged area in adjoining States. Nine out of 10 Korean fields sowed last spring made stands. True, the growth was short. But the plants lived, remained green, and furnished grazing in August when all else except sweet clover and alfalfa was brown, and will volunteer perfect stands next year.

This is the most amazing performance of any forage plant that farmers in this country have ever seen. Soybeans made some hay where Korean might not have done it, but soys would have been an abject failure for pasture where Korean made it. Sudan grass also, made some hay but was not a luxuriant plant except on well-prepared ground on favored bottom lands. Some bottoms grew two small cuttings of alfalfa hay. Some second-year sweet clover grew large and made much grazing. But of all spring-sown seeds, Korean made stands on hilltops as well as in the bottoms, on thin spots often

Harvesting Korean seed with a pan attached to the cutter bar.



Hauling Korean Lespedeza to the thresher.

better, and always as good as on the average of the field; and the fields are covered with a carpet of seed that will grow next year without additional money spent upon them.

On the other hand are the tens of thousands of spring-sown grass fields where millions of dollars worth of seed was sown, and they all require labor and as much more money next spring for—nothing better than another gamble on what the season will do to them.

In Spencer county, Kentucky, County Agent R. S. Dunn became curious about whether there was a red clover field alive in the county. He traced down 136 fields and quit. They were all failures. Nineteen men in the same county sowed Korean, and every field has a successful stand.

In Warren county, where a little more rain fell at times, 72 Korean growers with successful stands report that 47 of them sowed other fields to red clover. Only three of these red clover fields were still alive in August.

Seed Is in Demand

For six years now, since small quantities of seed were released from the Department of Agriculture at Washington, Korean lespedeza seed has been used so extensively that each sowing season has found many farmers hunting far and wide for the seed after all of the preceding years' harvested crop had been sold. The plant is an annual legume, as fine stemmed and leafy as alfalfa, capable of making profitable yields on any soil that will grow weeds of any kind, and ranking in feeding value above red clover and possibly a little under alfalfa at its best. When we realize, however, that in hay-making it holds its leaves with little shattering and is cured and hauled in 24 hours after cutting, it compares more favorably with alfalfa and sweet clover, which so often are rain-soaked and weather-damaged before finally being saved.

Korean, like other lespedezas, does well on poor, sour, wet land, frequently doing its best where even grasses are the poorest. However, it responds to lime and fertilizer, and, when treated to good land, yields as well or better than any other forage crop of its class. Five years' experience indicates that yields from a full stand will rarely fall under two tons per acre and frequently may be four or even five tons per acre on land capable of growing from 30 to 50 bushels of corn. Fifty-four hundred pounds of Korean hay per acre were secured at the Mayfield, Kentucky, Experiment Field, compared with 4,000 pounds of common lespedeza.

Korean sprouts early in the spring at temperatures too low for other lespedezas and clovers. In fact, last winter on old fields in Kentucky and Tennessee, it was found making a start in December and again in February. Of course, much of this early growth is frozen, but plenty of seed is always on hand in old fields to make a dozen new stands if need be. At any rate, with the warmest February on record for 40 years, and an unseasonably cold March, and with April temperatures down to 19 degrees Fahrenheit, not a single old field in Kentucky has been reported ruined by spring freezing. Spring seedings were damaged, but few if any were ruined.

A Hardy Plant

As pasture plants, the annual lespedezas as a rule require a grass sown with them to provide early spring forage. Korean no doubt will be most extensively used in mixtures, but it is large enough to graze fully three weeks ahead of common Jap and from one to three weeks ahead of Kobe, the other giant lespedeza that was introduced with Korean. Kobe failed to make stands in the drought and 75 per cent of common Jap perished from dry weather in Kentucky this year.

The past spring was a most disastrous time for spring-sown grasses and clovers of all kinds in Kentucky and adjoining territory. During May and June, more than 100 Korean fields were visited, ranging from 40 miles north of Cincinnati, Ohio, to the Tennessee line and from the Big Sandy on the east of Kentucky to the Mississippi river on the west. Every field had a stand capable of at least reseeding for a full volunteer stand next year, and most made 60 days grazing or a fair crop of seed or hay where they were not grazed. On the other hand, 9 out of 10 fields in the same region sowed this spring to grasses and red clover, alsike, or sapling clover are practical failures. In one June day's check up in Montgomery county, Kentucky, 18 fields were inspected. Six of these were Korean, one volunteer stand from last year and the others spring-sown. All Korean fields but one were good stands, and the poor one will reseed for a perfect stand next year.

Of the eight sowed to red clover with various grasses mixed, only one had a fair stand of clover, which looks as though it would die this summer. The grasses were all failures or very poor stands where spring-sown. The fall-sown timothy was generally good.

Few growers as yet recognize the peculiar value of lespedeza in its annual habit of growth. Winter does not damage it, and the next year's growth is always better. Other pasture and hay plants are damaged by winter, and the following year's yields are always less.

These Korean fields were sowed under all conditions of seed-bed preparation, with nurse crops and without, and no conclusion can be drawn as to which is best. There were good and poor stands and growth, no matter how handled. Likewise, on the date of sowing, no conclusion can be drawn. Good stands and growth were as frequently found from one date of seeding as another.

Widely Adaptable

Last fall (1929) Korean fields averaging more than two feet in height were common throughout Kentucky and Tennessee. Some large fields averaged 36 inches in height, although frequently in such growth the crop lodges.

Success has been had with seedings in nearly every State in the United States. One seed association shipped to all but eight States last spring, and one individual grower has equalled this record for the past three years. Growers in widely scattered localities increased their acreages rapidly once they saw what the plant would do for them.

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Of all the soil improvement practices adopted by farmers, 10.9 per cent are due to general meetings.

Effective Extension

By Rensselaer Sill

Ohio State University

JUDGING by a recent interview with M. C. Wilson, director of extension studies of the office of co-operative extension work in the United States Department of Agriculture, it looks as though guesses and hunches will be as old-fashioned and out-of-date in promoting the adoption of efficient soil practices as planting by the moon is as a means of increasing the yields of certain crops.

Indeed, research is invading the extension field as never before, media are analyzed, projects placed under the microscope, and surveys conducted on a nation-wide basis, in hopes of discovering just which are the best methods to use in obtaining the largest returns per dollar invested in the extension budget.

"Already," Mr. Wilson told me, "we have uncovered data pointing to an even more effective use of time and labor on the part of extension workers engaged in soil improvement projects of one kind or another."

"What," I asked, "are the most effective extension media for use in soil projects? What's the best way to improve them? What about their future? What combinations of media produce the desired results most efficiently?"

"Just a minute," he replied, "you've given me quite an order. First of all we'll talk about the first question, what are the most effective media to use in soil improvement projects? Well," and he turned to his chart index, "we have made a survey, as you know, of that problem. It was included in a study made by the U. S. D. A. in cooperation with the extension services of 13 States, which unearthed basic information relating to the effectiveness of extension work in influencing farm and home practices on 9,287 farms in 27 counties.

"Now this chart answers your question. It is based on 1,244 soil practices and 2,103 dairy practices, and shows just which media we found to be most effective in soil improvement work.

"For example, the soils chart indicates that 16.6 per cent of soil improvement practices adopted by farmers are due to farm and home visits from their county agent. Office calls are next with 13.8 per cent; news stories rank next in effectiveness with 11.6 per cent to their credit; general meetings next with 10.9 per cent; method demonstrations, 8.8 per cent; and adult result demonstrations, 7.9 per cent.

M. C. Wilson, in Charge of Extension Studies, Office of Cooperative Extension, United States Department of Agriculture.

"The percentage of improved practices adopted because of what we call indirect spread is unusually high in the case of soils. It is responsible for the adoption of 22.1 per cent of the soil practices adopted and is the result of one neighbor passing information on soil practices to another neighbor. That the indirect spread of improved practices plays such a large part in extension is perfectly natural. The statement of a neighbor of good standing in the community, the results obtained with different kinds of fertilizer, the reported yield of a new variety of cotton or wheat, the size of a neighbor's milk check, success in canning vegetables, or a convenient kitchen, all are powerful forces set in motion by extension teaching."

"What do you think about the advantages and disadvantages of the media which have proved most effective in soil extension work?" I asked. "How can they be improved?"

"We have," he replied, "no research data on that for any particular kind of project, such as soils. But here is what we know about the various media independent of the kind of subject matter they may be used for.

Relative Advantages

"The chart showed that farm and home visits are responsible for the adoption of 16 practices out of every 100 soil improvement practices. Now the obvious disadvantages of farm and home visit as a means of bringing about the adoption of desired practices are: it is expensive, takes a lot of time, makes it impossible to reach more than a few people, and results in a tendency to visit only the farmers living on good roads. However, this extension media has several advantages, such as, it familiarizes the worker with home conditions, builds a basis for local organization, develops good will, and what is of considerable importance in soils work, it makes possible the gathering of first hand information on actual improvements.

"I feel," Mr. Wilson said, "that this means of promoting the adoption of various agricultural practices can be improved if the extension worker plans his trip beforehand so as to visit a large number of farmers with the greatest saving of time and expense. It is a good idea to have definite purpose for each trip and to let the owner know of the visit sometime in advance.

"News stories, you'll remember,

were responsible for the adoption of 11.6 per cent of the soil improvement practices. In addition to their direct influence, they are probably of considerable help in increasing the effectiveness of indirect spread. Their total influence is high, they can be readily adopted to all kinds of subject matter, are economical, have a high number of takes in proportion to exposures, and attract attention to other extension means and agencies.

"What would be some good ways to increase the effectiveness of the news story? Well, I think much can be accomplished by using only timely news, by fitting the stories to the needs of the paper's circulation, by keeping the audience we desire to reach in mind, and by following as much as possible the journalistic style, which places the most important facts of the story in the first paragraph and which is concise, lively, and interesting.

"As to general meetings, which were responsible for the adoption of almost 11 out of every 100 soil practices, they have certain advantages over other media in that they reach a large number of people, make possible a relatively low cost per practice adopted, have a high ratio of takes to exposures, and furnish an opportunity to see and hear.

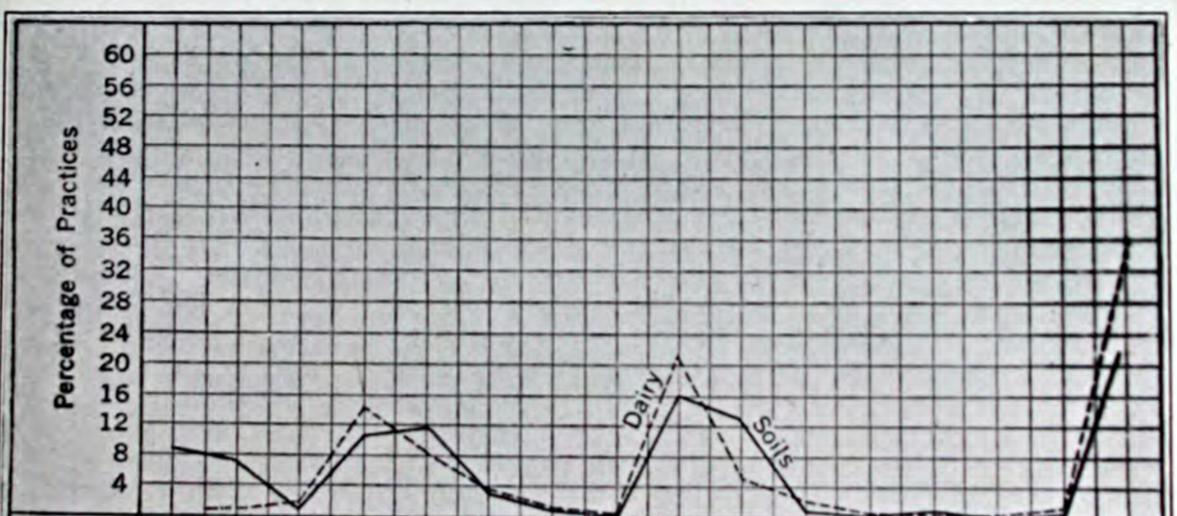
"I believe," he told me, "that they can be greatly improved through more effective advertising, through the focusing of attention on important things, the use of illustrative and graphic material, the careful planning and organizing of the programs, and the liberal use of local talent."

"Have any surveys been made on the proper combinations of media to use in various kinds of extension work?" I asked.

"No, but we are attacking that problem now and hope to have some data on it in the future. Right at present we are attempting to analyze the different kinds of projects in order

(*Turn to page* 50)

FARM AND HOME VISITS ARE SECOND ONLY TO INDIRECT METHODS



Method	M. Dem.	Ad. Res. Dem.	Jr. Res. Dem.	General Mtgs	News Stories	Bulletins	Circular Letters	Exhibits	F. or H. Visits	Office Calls	Correspondence	Telephone Calls	Ext. Schools	Ldr. Tr. Mtgs.	Radio	**Indirect**
	Percentage of Practices															
Soils	8.8	7.9	1.1	10.9	11.6	3.3	1.0	—	16.6	13.8	.8	.5	.8	—	.3	**22.1**
Dairy	.9	.8	1.5	15.1	9.4	3.5	1.1	.2	21.8	5.9	2.0	.1	.6	.1	.2	**36.7**

This graph shows the relative value of different extension methods in connection with 2,103 dairy practices and 1,244 soil practices. (Courtesy of C. B. Smith and M. C. Wilson, The Agricultural Extension System of the United States.)

HI-BRED CORN

By E. N. Bressman

Associate Professor of Farm Crops, Oregon Agricultural College

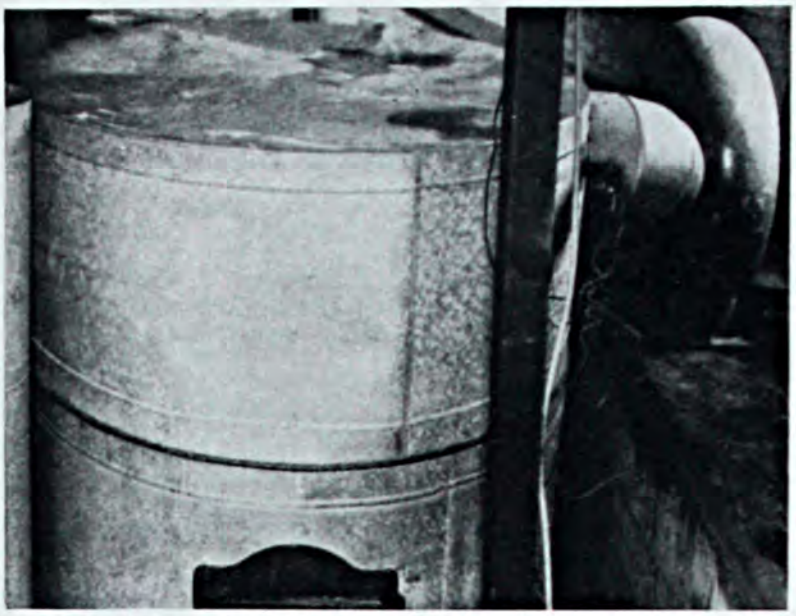
THE practical application of the most important improvement in the corn crop in more than a score of years is being carried out on the farm of J. J. Newlin at Grimes, Iowa. This farm, which is located less than 10 miles from Des Moines, is worth the visit of any corn grower in the corn belt. I spent a profitable day with Mr. Newlin seeing not only his method of developing the highest yielding variety of corn in Iowa, but also his method of handling the seed. This new variety, which he calls Hi-Bred is really a high grade product from beginning to end.

Mr. Newlin's contribution to corn improvement is two-fold; first, he is producing seed of crossed inbred corn on a commercial scale for the first time. This crossed inbred corn won highest honors in the Iowa corn yield contest last year. In fact, Mr. Newlin won 10 of the possible 12 blue ribbons in this yield contest. Let it be known that the winning of blue ribbons in a yield contest is far more important than winning blue ribbons at a corn show or a State Fair, because winnings at a yield contest are based on performance, not on beauty or someone's guess. Mr. Newlin's blue ribbons are the result of the wonderful performance of his new corn in an actual comparison with many of the best varieties of the corn belt grown under similar conditions.

Professor Bressman pointing to one of his favorite inbreds.

The second contribution of Mr. Newlin is his rapid drying method which reduces the diseases of corn greatly. The combination of a high powered, high yielding strain of corn plus disease-free seed makes for the first time a real improvement in the corn crop.

In 1905 two scientists, East and Shull, working independently, began to inbreed corn. This is the only scientific method of corn improvement that has been developed. In this method, the plant is inbred four to six generations by placing the pollen on the silk of the same plant.



A furnace with blower attachment for drying corn. (Note thermostat)

Inbreeding is the quickest and surest way of purifying corn. It does quickly what the corn grower was trying to do by selection, but it produces the same results that one gets in selecting too closely. That is, the inbred strain reduces greatly in vigor and yields only about half as much as the unselected parent. These inbred strains are of no value, as they are, but when two unrelated inbreds are crossed, they produce seed that will give astonishing results. This hybrid seed grows a plant that restores all of the original vigor and yield of the seed and also goes much further because, in most every case, the hybrid seed outyields the original varieties. An important thing to remember is that this hybrid seed will give good results for only one season. The corn grower must resort to hybrid seed each year, to get high yielding seed.

Work Is Practical

The first impression is that all of this work is very technical and not very practical. However, it is not difficult to keep the inbred strains pure and develop hybrid seed. However, it is the special work of the seedsman or seed grower. He can furnish the corn grower hybrid seed each year at a rate reasonable enough to give the grower a profit over ordinary seed. Mr. Newlin has devised a planter that plants corn through the bean attachment as well as the regular planter box.

The most important fundamental fact about this entire method, is that, when a grower is producing an inbred strain, he eliminates many strains that carried bad weaknesses of corn. Many of the strains are self-eliminating, that is, they are sterile, producing albino or white seedlings, and many other freaks of the corn field. Any strain that is vigorous enough to withstand inbreeding for from four to six generations, has pretty good hereditary characters and makes a good basis for a new variety.

The possibilities of this method are unlimited, and only the surface has been scratched. It is interesting to note that this inbreeding method is being applied to other cross pollinated crops such as red clover, sun-flowers, timothy, alfalfa, and potatoes.

The new variety of corn, Hi-Bred, was produced by crossing four unrelated inbred strains of corn. Hi-Bred shows all of the vigor and increased yield that experiment station workers have been getting with crossed inbred strains of corn. This past season Mr. Newlin sold nearly 600 bushels of seed at a high but a justified price. There has been a great interest in his new variety and it will be given a fair trial in many sections of the country, as Mr. Newlin has shipped seed corn to all sections of the United States.

Mr. Newlin says, "I give Professor H. D. Hughes, head of the Farm Crops Department of Iowa State College, a large share of the credit for the development of Hi-Bred, as Professor Hughes has given encouragement in the work and has helped with many ideas and suggestions. The combination of the four inbreds that make up the Hi-Bred variety is the result of many trials and the growing of many hundred inbred strains. Most of the combinations of inbreds give good results, but the combination that goes into Hi-Bred is the best one from the standpoint of increased yield, disease resistance, and ease of husking. Also, this new variety carries at least one ear to every stalk and a great many of the stalks have two ears."

Mr. Newlin does not claim that Hi-Bred will be the best variety for all sections of the United States, but the Iowa corn yield contest indicates that Hi-Bred is the best variety for Iowa conditions and without a doubt similar conditions will show good results with this new variety.

The Rapid-Drying Method

This progressive Iowa farmer is of the opinion that what is known as the "Newlin Method of Handling Seed Corn" is his greatest contribution. The method is what Mr. Newlin calls "The Rapid Drying with Forced Ventilation and Control of Uniform Temperature Plus Visible Method of Sorting Each Shelled Ear."

He says, "This method is the result of two years' work and study; also an investigation of the best drying methods that I have been able to find. I give a large share of the credit to Dr. W. L. Burlison, and Mr. Kelleher of the Experiment Station of the University of Illinois. This method of picking and drying seed corn is based on results of the Iowa Experiment Station at Ames carried on by Dr. Melhus and also on my own results which definitely show that early picking plus drying reduce the amount of disease in corn. I pick my seed as early as possible and reduce the moisture quickly and effectively by artificial heat.

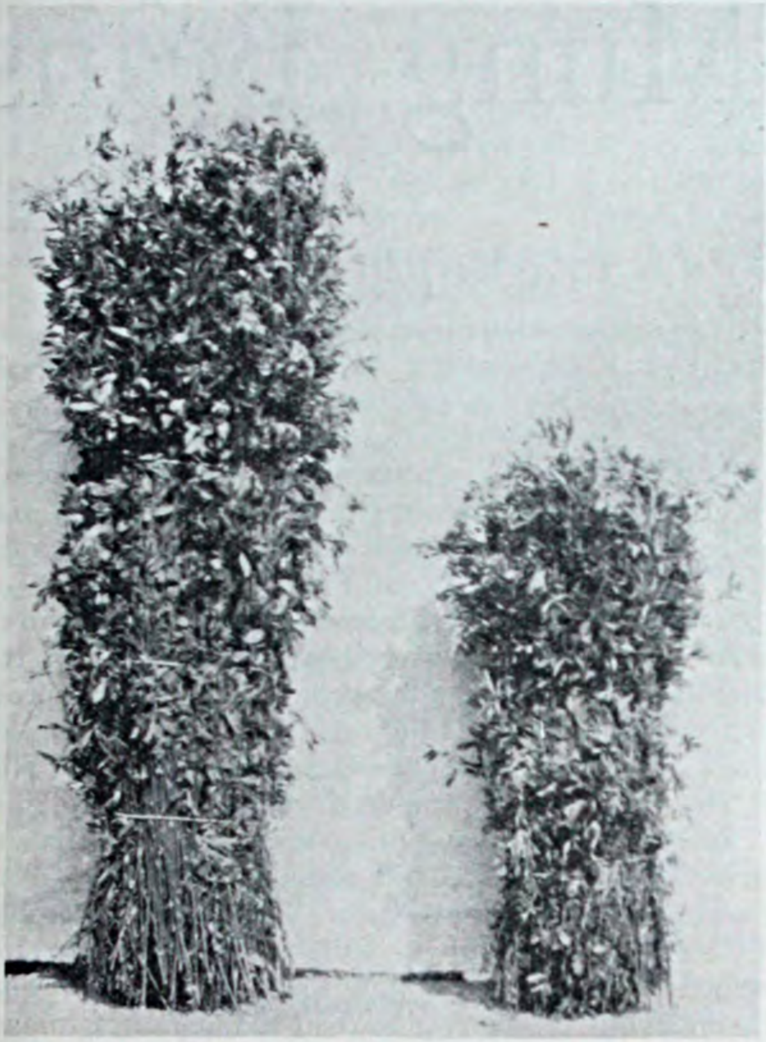
"My seed corn is picked from the standing stalks as early as possible in September before any chilling frosts have occurred. The corn at this time carries from 30 to 35 per cent moisture and so it must be dried out quickly and carefully. The husked ears are carried directly to steel granary cribs. These 500-bushel cribs cost about $75 each. I use four of them in my equipment.

"The corn is placed on the floor in a pile about three feet high, and then a false floor made of 1 x 3's, one inch apart, is placed to hold the second three feet of corn. No more corn is put in the crib so that the heat travels through only six feet of corn which is separated by a false floor. This corn is dried out in four days and the moisture is reduced from 35 per cent to 12 per cent by artificial forced heat."

Each of the cribs holds from 75 to 90 bushels of corn. Mr. Newlin claims that a smaller amount of corn will not hold the heat effectively and a larger amount of corn will put too much moisture in the air and proper drying will not be obtained. He is quite emphatic in stating that the amount of corn in a crib of this size should be from 75 to 90 bushels and it should be in a pile no higher or not much less than 6 feet.

The heat is obtained through a galvanized iron pipe from a hot air furnace of 7,500 cubic feet per minute capacity. Mr. Newlin uses oil as a fuel, and the temperature, which runs from 109° to 114° Fahrenheit, averages about 110° and is controlled by a thermostat. Mr. Newlin gets 24 hours service per day from an oil furnace and his corn is drying while he is sleeping. He finds that it requires 2/3 of a gallon of distillate to dry out one bushel of corn. He burns about 25 gallons of distillate a day and it costs

(*Turn to page 52*)



These second-crop cuttings of alfalfa were made on the farm of Walter Foster, Wapping, Connecticut. The cutting at the left is from a field which, when seeded in 1926, received 200 pounds of muriate of potash per acre in addition to superphosphate. The cutting at the right is from a field which in 1926 received only superphosphate. The 200 pounds of potash applied in 1926 made a difference in yield four years later of 5,445 pounds (green weight) per acre.

By

T. H. Blow

Springfield, Massachusetts

Residual Potash

AN application of potash applied to alfalfa in 1926 continues to pay good dividends to Walter Foster of Wapping, Connecticut, four years later.

Mr. Foster, a well-known dairy farmer in Connecticut, grows 25 acres of alfalfa and finds it a profit-maker when well cared for. When seeding down new stands, 200 pounds muriate of potash per acre is added to his fertilizer application, which is usually superphosphate. The value of the potash has been demonstrated to him by the fact that a small area of one field was untreated in the 1926 seeding.

Since that time this part of the field has continued to get thin, unproductive, and badly affected with potash starvation, as is shown by the sample leaves in an accompanying photograph. An examination of these affected leaves shows a regular, whitish spotting working from the outer edge inward. The midrib of the leaves, however, remains green until the very advanced stages. If the trouble is not corrected, the entire leaf area becomes involved and finally dries up. The result is a decided decrease in tonnage as well as a poorer quality of roughage.

In order to see what the effect was on the yield, weights were made on the second crop in 1930. Representative areas in two sections of each of the treated and untreated plots were

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More Mung Beans

By H. F. Murphy

Associate Professor in Soils, Oklahoma Agricultural Experiment Station

RECENT observations indicate that the mung bean may find a place as a green manure crop in the Southwest.

The mung bean is probably a native of India but its growth is now common in southern Asia and also in other tropical sections. The nutritive value of this crop is recognized in the Chinese dish of chop suey. Dr. V. G. Teller of the Oklahoma Experiment Station published data relative to the nutritive properties of the mung bean in the Journal of Biological Chemistry, Volume 75:435-442 in which were stated some very important points concerning the growth and use of this crop. One very important fact stated by Dr. Heller and observed by the writer is that the mung bean makes a very quick development under favorable growing conditions and is capable of withstanding rather severe drought conditions and still make a considerable growth.

Previous to 1928 it was the custom on the Station Farm at Stillwater to plant cowpeas on land after the small grain varieties were harvested, if moisture conditions were at all favorable. The variety planted usually was Early Buff. This variety is very early and when planted either early in the spring, i.e. normal spring planting time, or after the small grain, doesn't make a great deal of vegetative growth, but is a profuse producer of seed.

Previous to 1927 we had been growing two types of mung beans on the farm. One of these was the low, prostrate running type very similar to ordinary cowpeas in this respect. This type produced considerable seed, but the yield of forage was so low that its use was not considered as being superior to cowpeas. The other type grown was of an upright nature being similar to soybeans in this respect. This type produced an abundance of forage, much more than any of the other varieties or types of annual legumes then growing on the farm, but it was so late that no seed was produced.

The Upright Type

About this time the writer was in-

Mung beans growing on an eroded soil—September, 1929.

formed that there was a variety of mung beans growing in southwest Missouri of the upright type that was producing seed and also an abundance of foliage. Acting on this advice, a small sample of the beans was secured from Mr. Paugh, a farmer in southwest Missouri. These proved to be very excellent producers of both seed and forage the first year. These beans were planted at the ordinary planting time of cowpeas, but they proved so good that since then they have been planted after the small grain varieties on the farm as a cover crop, later to be plowed under to increase the organic matter content of the soil.

During the year 1928 no exact record was made of the yield of forage or seed, but after harvesting the seed it was found that the seed could have been sold for more than the value of the wheat that had grown previous to planting the beans. The forage yield was good, being a little better perhaps than in 1929 for which data are presented.

Improvised Harvester

The beans were harvested after frost using the improvised sweet clover seed harvester made from an old binder. In the wheat section the seed could be harvested with a combine. This harvester leaves the leaves and stalks on the land to be turned under; thus for the year 1928 considerable organic matter was plowed under and the seed, though used for experimental purposes, could have been used as a source of cash income.

On July 9, 1929, mung beans were planted on double-disked barley, oat, and wheat stubble land, using kafir plates. The beans were double rowed making the rows 21 inches apart. Planted this way it takes 5 to 10 pounds of seed per acre. The yields of forage were taken on September 27 at which time the first pods were turning brown and indications were that the vegetative growth of the plants was complete. The yields per acre were as follows:

Treatment	Green wt. of tops lbs.	Green wt. of roots lbs.	Total Green wt. lbs.	Oven dry wt. of whole plant lbs.
After Barley	6234	770	7004	2132
After Wheat	5686	544	6230	1889
After Oats	4324	272	4596	1400

The ratio of stems to leaves (over dry) was 1:1.5 approximately.

If the beans had been plowed under at that time, the amount of green manure would have been from 2¼ to 3½ tons per acre, or in terms of dry matter from about three-fourths ton to a little more than one ton. The beans could have been used for pasture purposes and in this case would have furnished considerable high-grade feed with the manure left on the land.

On November 1, 1929, seed yield data were collected. The yield of seed averaged 252 pounds per acre. After harvesting the seed the frost killed plants were turned under. The seed contained 28 per cent protein. The amount of nitrogen in the roots was 0.75 per cent; in the leaves 1.81 per cent, and in the stems 1.48 per cent.

(*Turn to page 52*)

This mung bean seed harvester was made from an old binder.

Lack Of Potash Is Responsible For Poor Farm Yields

Success Predicted For Potash Use As Crop Needs Are Seen

THAT we have barely started in the use of potash fertilizer is the opinion recently expressed by C. J. Chapman of the extension staff of the Wisconsin College of Agriculture. From extended observation Chapman has come to the conclusion that lack of potash on many farms is just as much responsible for poor yields as is the lack of lime or phosphate.

In a recent broadcast from WHA this extension worker cautioned Wisconsin farmers that while theoretically there is enough potash in our soils to meet the requirements of most crops for at least 200 years, yet this element is not becoming available fast enough in many soils to satisfy the needs of our growing crops.

"In other words, our potash supply is a frozen asset and yields only a small interest on the total supply," declared Chapman. "If we could be sure of one-half of one per cent a year it would come close to meeting the requirements of our crops, but unfortunately we don't even get that much out of many of the soils of this state. Some authorities put it one-fourth of one per cent."

Gives Three Conditions

There are three conditions under which Chapman would use potash fertilizers— first, on soils naturally very deficient in the element; second, where the supply of manure is limited or on fields that never receive any stable manure; and third, for crops which make heavy demands on the potash supply of the soil.

He pointed out that all of the peat and muck soils of Wisconsin are very low in their reserves of available potash; in fact, most of the black bottom soils need fertilizers high in potash. In his opinion, the sands come next and soils workers are finding that practically all of these sandy soils of the state are low in their reserves of both total and available potash; the black fine sands and sandy loams are especially so.

"There are certain fields on some farms which have not seen a forkful of manure in forty years," reports Chapman. Back forties, isolated tracts a long way from the buildings, ridge fields and plateau fields where it has been nearly impossible to haul manure, and here on these heavier soils potash is needed; and most certainly when we get a combination of no manure and soils which are naturally low in potash, we should use commercial fertilizers high in their content of this element.

Potash Feeds Vegetables

"Most all truck crops are heavy feeders on the element potassium. Potatoes, cabbage, sugar beets, tobacco, peas, in fact all legumes are rank feed-

(*Turn to page* 54)

"All Quiet on the Western Front."

PICTORIAL

"We weren't ready," will be no excuse here.

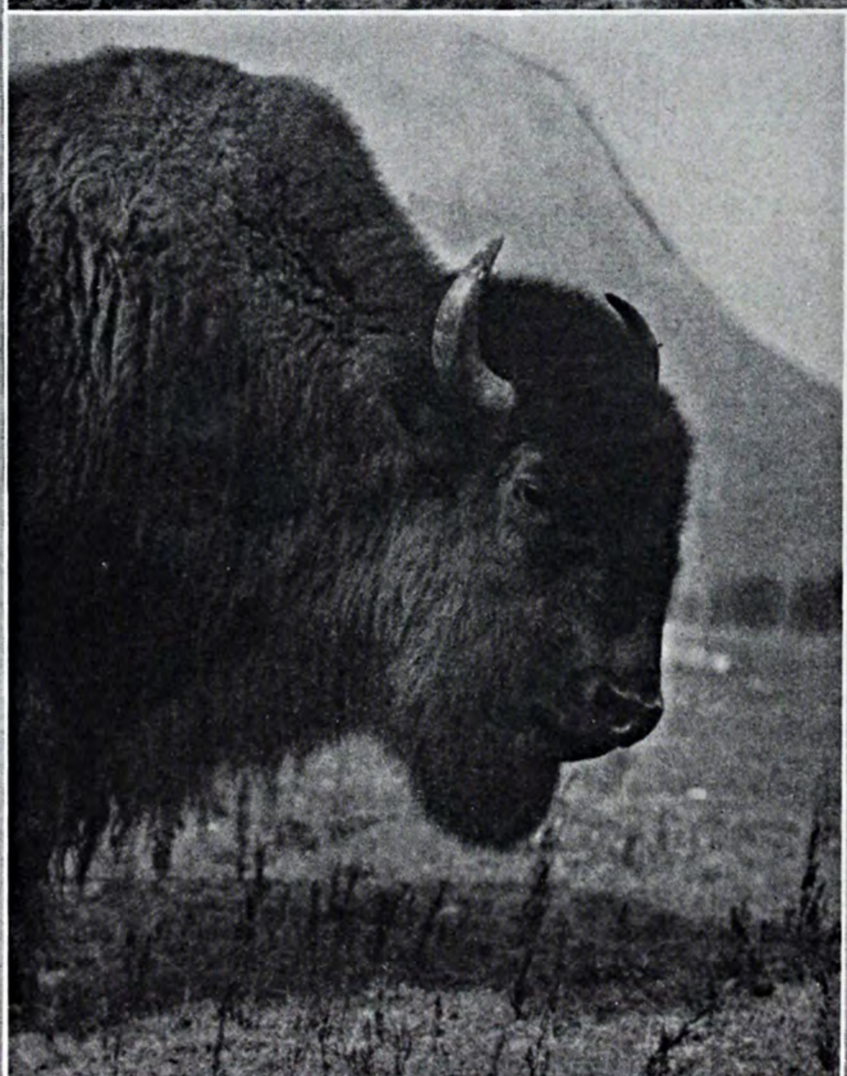
Expectancy fulfilled!

Undisputed possession!

Wanted—A Cave for two.

(By Ewing Galloway, N. Y.)

Out where deuces are wild.



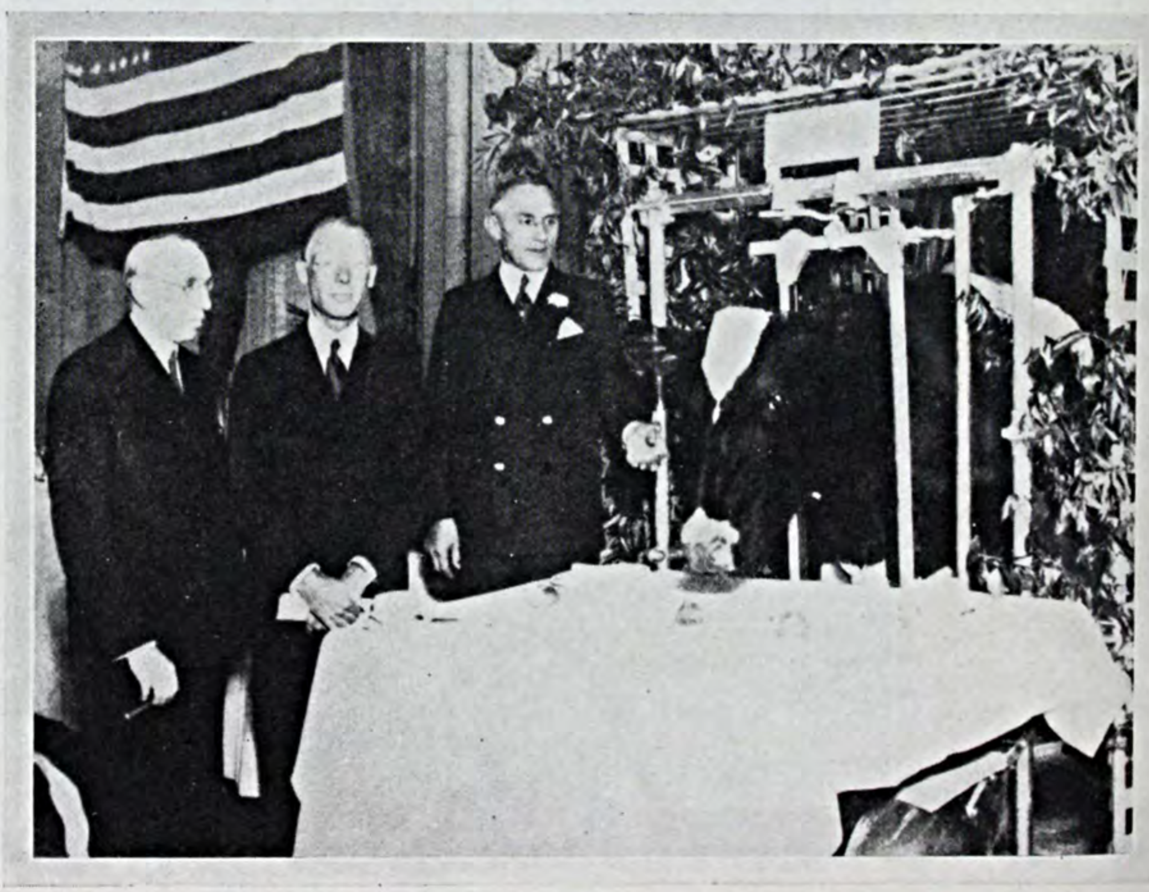
The original American.

Did they smile when they piled?

A well-known imposter.

Above: These boys, students of vocational agriculture at Arendtsville, Pennsylvania, enjoyed a trip of 7,100 miles over the United States and Canada this last summer. The trip was financed by the earnings of their Future Farmers Cooperative Project from three acres of land.

Below: Left to right: Wm. R. Dawes of Chicago; Walter J. Kohler, Governor of Wisconsin; and Col. Fred Pabst of Milwaukee, at a banquet in a Chicago loop hotel given by the Chicago Association of Commerce in recognition of the increasing importance of dairying in the five central states. The guest of honor was Korndyke Heather, a Holstein cow which has produced more than 25,000 quarts of milk annually.



The Editors Talk

Thanksgiving

Again we have come to the month in which a day is set aside for a national Thanksgiving. Undoubtedly, this year there are going to be a great many people who will wonder why they should give thanks. We have had a drought, a business depression; many individual cases of sickness and catastrophe. It is in times such as these that we more than ever need a day set aside for reflection on what we actually have to be thankful for. If the day is observed in true spirit, it cannot help but prove to be a day of encouragement and inspiration.

Mob-Mindedness

The President of the University of Wisconsin, Dr. Glenn Frank, recently pointed out the dangers of the mob-mind to the average modern American. He suggested three serious temptations for the individual in this complex life of ours. He showed how easy it was for us to become one of the following:

1. A sleek conformist
2. A cynical slacker
3. A sullen revolutionist.

You can easily apply Dr. Frank's remarks, apropos the mob-mind, to those interested in the fertilization of farm crops, both from the scientific and production standpoint. Are we satisfied with present fertilizer practices; are we sure that the farmer doesn't want to know which fertilizer is best; or do we feel that everything is wrong and always will be wrong? These are the natural reactions of the mob-mind to fertilizer problems.

Surely there are many among us—minds of science and minds of industry—who, working hand in hand, will help to solve our most pressing fertilizer problems. To the fertilizer scientist they may suggest radical changes in plot technique and to the man of industry the manufacture of fertilizer mixtures with new plant food ratios.

Hand in Hand

If one word were to describe the spirit of two days of conferences on pasture fertilization held in New York City recently by extension workers, representatives of the fertilizer industry, editors of the farm press, and farmers, that word would be COOPERATION. The four groups met to review the results of this year's work on pasture fertilization in the Northeast and the meetings were marked with a note of sympathy for and desire to support the growing interest in a profitable improvement of our great pasture crop.

It was a splendid token to the spirit of cooperation to find these four groups meeting on common ground. While each group naturally had its own interest in mind, these interests dovetailed so closely that in the cooperation of all, each could see his own interest advanced.

The fertilizer industry sees in a more extensive fertilization of pastures a new outlet for its product. The farm press and the agricultural extension workers see in getting behind the work a new way profitably to serve their farm constituency. The farmers look toward improvement of their pasture as a means of cutting production costs to an appreciable extent.

The conference is but another indication of the spirit of working hand in hand so rapidly developing among allied interests. Where years ago we used to have cases of misunderstanding, we now find such statements as appeared in a recent editorial in "New Jersey Agriculture" published monthly at Rutgers University as follows:

> "Now it happens that the experiment stations and the federal department of agriculture by no means claim credit for all farm progress. They recognize the important parts taken by makers of machinery, fertilizers, and spray materials. In fact, they are quite ready to admit that these private agencies have been important aids in enabling a dwindling farm population to feed amply a rapidly growing urban population."

Where we used to have some antagonism on the part of farmers toward the agricultural colleges and the "power of the press," we now find a more sympathetic understanding.

All of this—essentially service to American agriculture—is a good omen and warrants enthusiastic encouragement.

Years of Service

In the Fiftieth Anniversary of the founding of the New Jersey State Agricultural Experiment Station held October 8 and 9 at New Brunswick, American agriculture had the opportunity to review some of the important influences which scientific research has had in its development. The celebration, which justly has received much press comment and which called together many notables in the agricultural world, among them Sir John Russell, Director of the Rothamsted Experimental Station, Harpenden, England, who gave the key address, deserves the interest of everyone interested in agricultural science.

A very attractive booklet "Fifty Years of Service to Agriculture" issued by the Station at the time of the celebration, briefly tells of the work of this station, not only to advance the prosperity of its own commonwealth, but to be of service to the nation's basic industry. As Dr. A. F. Woods, Director of Scientific Work in the U. S. Department of Agriculture, said in his address at the celebration: "It is a mistake to say that the work done by the Department of Agriculture and the experiment stations is for the benefit only of a class or in the interest of pigs and corn. It is of direct service to every man, woman, and child in America and I think I may safely say, in the world, as scientific discovery knows no bounds—it belongs to all the world."

In the same light, it therefore behooves our citizenship to pay grateful homage to a scientific institution celebrating its milestones of progress. Just how important this progress is to our civilization is indicated in a statement made by Sir John Russell to the effect that "we would now be on the verge of a world famine were it not for the intensive application of science to problems of food production since 1898. At present it is impossible to foresee a time when the human population will lack adequate food supplies."

That the importance of soil fertility has been accorded a prominent place in the attention of the New Jersey Agricultural Experiment Station is outlined in a review of the work under the three directors, Dr. George H. Cook, 1880-1889; Dr. Edwin B. Voorhees, 1893-1911, and Dr. Jacob G. Lipman, 1911- , published in the celebration booklet. The New Jersey Experiment Station has been outstanding in its research work in this field and many of our present practices in maintaining the fertility of American soils can be ascribed to the interests of these three men.

How Do We Learn?

It is one thing to know a better way, but it is quite another thing to persuade the countryside to adopt the better way.

Therefore, the method of persuading people to adopt the better method is just as important as the method itself. For this reason, the United States Department of Agriculture maintains a Director of Extension Studies in the Office of Cooperative Extension Work. His job is much more important than it might appear on first thought, for better and cheaper methods of agricultural production are only of the greatest value if put into effect.

There are all sorts of methods of persuading us to change our practices. Which is the most successful? On another page of this issue will be found the result of a recent interview with M. C. Wilson, Director of these Extension Studies. As the writer points out, research is invading the extension field as never before. Media are analyzed and projects are being placed under the microscope. The results of this analysis of methods are given in this interview.

It is interesting to observe that while direct methods of extension work are responsible for a distinct percentage of the changes caused, the indirect spread of such information is also very effective and unusually high in the case of projects relating to soils. It is the result of one neighbor passing information on soil practices along to another neighbor. It is something like the ripple on the pond when a stone is thrown into the water. The good work started by sound methods with a single farmer or small group of farmers will continue to spread as time goes on. This is perhaps the most encouraging fact about doing good extension work.

Living Up to Recommendations

It is apparent that American farmers are not utilizing the recommendations of our state experiment stations as fully as they profitably could. Mr. W. F. Pate of the National Fertilizer Association in his yearly report brings this out most pointedly, when he compares the amounts of fertilizer actually used in several states to the amounts that would be used if farmers applied the fertilizer recommended by the state experiment stations.

The discrepancy between these amounts is remarkable, amounting to one hundred per cent in some cases. As remarked by Mr. Pate, the recommendations are based on many years of careful work by competent investigators and given the further acid test of actual practice.

We have every reason to believe that farmers obtain this information owing to the many and varied means of dispersion used. However, on the average, they do not follow the recommendations. Undoubtedly with a problem of surplus common to the production of almost all of our major crops, a large number of farmers feel that expenditures for enough fertilizer to satisfy recommendations are not justified. However, aren't these farmers losing sight of the fact that lowering costs of production is one of the safest ways out of the situation?

We quote herewith no less an observer of the national picture than Secretary of Agriculture, Arthur M. Hyde, who in a recent statement on reducing production costs says:

> "To spend less money is not necessarily the best way to reduce costs. When prices are unfavorable, however, the usual thing is for the livestock man to stop buying purebred sires, or for the dairyman to cut down on the purchase of protein feeds, or for the cotton grower to restrict his use of commercial fertilizers. Measures like these may reduce expenditures, but they do so at the cost of quality and yield per unit of land or animal."

We wonder if all this talk of depression is justified in line with the above? Are the farmers doing all they can to help themselves? The national and state investigational and extension agencies coordinated and organized under the United States Department of Agriculture constitute the greatest agricultural organization the world has ever known. If a farmer will not use it, how can he expect sympathy when he does not progress and get ahead?

We urge upon all farmers, therefore, to utilize the agencies placed at their disposal. The information that can be furnished to them is certainly an unsurpassable form of farm relief. Moreover, the farmer helps pay for these organizations. They have information worth many times to him what it costs him. Is the farmer getting his money's worth out of what he invested in this work? It is a pretty sure bet it is his own fault if he is not.

Photo As You Go

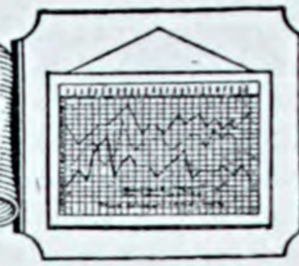
"Seeing is believing" is an old adage. "Illustration is one of the best means of telling a story" is a more modern statement of the same idea. Undoubtedly there is a far greater use for illustration in agricultural extension work than is now being employed.

The Office of Cooperative Extension Work of the United States Department of Agriculture is doing much toward furthering the use of the photograph among extension workers. Recognizing that the story-telling photograph is one of the most direct routes to the farmer's understanding, cooperative plans are arranged with state organizations to obtain photographs of local extension activities. Besides being highly useful in demonstrating improvement of farm practices, photographs are of value to extension workers in illustrating instructional articles in the farm press for exhibits, posters, and other publicity channels.

Too often the full value of a good crop demonstration is lost because a good picture is not made of it. The number of people who can visit any demonstration is naturally limited by time and distance. A photograph carries beyond these limitations and forms a permanent visual record.

The importance given to this phase of extension work is well deserved and should be carefully considered.

AGRICULTURAL DEVELOPMENTS



FERTILIZED TREES STAND DROUGHT

The experimental apple orchard at the Pennsylvania State College shows that trees which have been properly fertilized and the soil managed so as to maintain a liberal supply of organic matter will stand severe and protracted drought. For two successive seasons of unusual drought, splendid crops have been harvested.—*Market Growers Journal,* Oct. 1, 1930.

ALABAMA ADOPTS FARM PROGRAM FOR STATE

Fewer acres in cotton, improvement in the quality of cotton grown, and increased production of dairy products, poultry, and hogs, are the fundamentals in a State-wide farm program adopted at a recent meeting of Alabama leaders in agriculture, finance, and business, called by Governor Graves to consider the present farm situation in Alabama. Emphasis is also to be placed on low cost of production, the cooperative marketing of cotton and other products, and cooperative buying of fertilizer and other production products.—*U. S. D. A. Marketing Activities,* Oct. 15, 1930.

MY LADY NICOTINE

Though tobacco has been grown in Canada for hundreds of years, production on a commercial scale dates from only a few years before the opening of the present century. In 1900 there were 11,906 acres of tobacco under cultivation which yielded 11,267,000 pounds. The preliminary estimate for 1930 indicates an area of over 40,000 acres and a production of about 35,000,000 pounds. The greatest increase in the past 30 years has taken place in Ontario, which grew 30 per cent of the crop in 1900 and 75 per cent in 1930. Except for a small experimental area in British Columbia, the remainder of the commercial tobacco is grown in the Province of Quebec.

Most of the Canadian grown tobacco is of excellent quality. This is indicated by the fact that over twenty-five million pounds are used in the manufacture of cigars, cigarettes, and pipe mixtures, representing nearly 60 per cent of the leaf utilized by Canadian manufacturers. Exports of Canadian grown leaf to the British Isles have averaged over five million pounds annually for several years. Smaller quantities are exported to Belgium, Germany, Netherlands, Denmark, Switzerland, Spain, Malta, and China.

AERIAL SOIL SURVEY FINISHED BY PURDUE

The first county soil survey ever made by aid of a complete set of aerial photographs has just been completed in Jennings county, Indiana, by D. R. Kunkel of the Purdue University Agricultural Experiment Station and assistants from Purdue and the United States Department of Agriculture, Bureau of Chemistry and Soils. Announcement to this effect has been made by Director J. H. Skinner of the Experiment Station.

The photographs were used in constructing a map and locating on it the various soil types found in the county. Several months' work were required to map the county and make the innumerable soil tests.

Final inspection of field work will

be made by T. M. Bushnell, in charge of soil survey in Indiana and Mark Baldwin, inspector for the United States Department of Agriculture. The field sketches will be compiled into a finished map and a large number of soil samples will be analyzed in the chemical laboratory at the Purdue Experiment Station. Results of field and laboratory studies will be published in a report describing soil and agricultural conditions in the county and recommending the best methods of handling each type of soil, the crops to grow, the fertilizers to use, etc.

TURKEY WEIGHTS

The larger the turkey the smaller the loss when killed and plucked for market, the United States Department of Agriculture observes. Gobblers averaging 13.6 pounds lost about 10 per cent; those averaging 17.7 pounds lost 9.9 per cent; those averaging 20.99 pounds lost 8.8 per cent; and those averaging 28.9 lost 7.5 per cent. Turkey hens averaging 7.6 pounds before killing lost 10.8 per cent; those averaging 9.6 pounds lost 9.8 per cent; those averaging 12 pounds lost 8.2 per cent; and those averaging 15.4 pounds lost 7 per cent.

GIVE POTATOES FOR CHRISTMAS

Small packages of fine potatoes for Christmas gifts is an excellent idea according to E. P. Sandsten, state horticulturist at the Colorado Agricultural College. In fact, ten-pound Christmas gift packages of choice baking potatoes are being made up by the San Luis Valley, Colorado, growers for sale to businessmen and others and as a feature of the Sixth Annual San Luis Valley Pure Seed Show held at Alamosa, Colorado, November 12-14.

At the Show, special prizes will be awarded to the farmers who prepare the most attractive packages of potatoes for mailing as Christmas gifts. The potatoes are being packed in light crates 10 inches square and 4 inches deep which contain from 9 to 12 potatoes. These crates are to be wrapped in fancy Christmas paper. Possibly tissue paper, tinfoil, or some similar wrapping will be employed to add to the attractiveness and holiday effect of the packages.

ILLINOIS FARMERS INCREASE PRODUCTION EFFICIENCY

Illinois farmers, within fifteen years, have speeded up their efficiency so that today they are producing larger yields of corn, oats, and wheat with fully 35 per cent less man labor and 50 per cent less use of horses than in the year 1915, the Farm Management Department of the Illinois College of Agriculture has announced.

Whereas in 1913, 1914, and 1915, it cost Illinois farmers 18 hours of man labor and 42 hours of horse labor to grow an acre of corn, they now use only 11 man hours and 26 horse hours. An acre of oats that took 10 man hours and 18 horse hours fifteen years ago is now being grown with 6 man hours and 10 horse hours. Man labor in wheat growing has been cut from 16½ hours an acre before the war to 10 hours now, while horse labor has been reduced from 33 hours before the war to 18 hours during recent years.—*U. S. D. A. Marketing Activities*, Oct. 29, 1930.

CANADIAN FARM INVESTMENTS

What amount of capital investment in land, buildings, equipment and livestock does it take to earn one dollar on a farm in Canada? The answer is given by the Canadian Government Bureau of Statistics in an estimate for each of the nine provinces as follows: Prince Edward Island, \$3.88; Nova Scotia, \$3.87; New Brunswick, \$4.50; Quebec, \$4.55; Ontario, \$4.47; Manitoba, \$5.24; Saskatchewan, \$5.56; Alberta, \$4.80; British Columbia, \$4.54; Dominion Average, \$4.78.

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Foreign and International Agriculture

Vegetable Research in England

By A. E. Wilkinson

Vegetable Specialist, Connecticut Agricultural College

IN the United States I do not know of a vegetable research station as well equipped to investigate greenhouse vegetable problems as that of the Experimental and Research Station located at Turners' Hill, Chestnut, England. This is in the Lea valley, noted because of its very intensive vegetable forcing industry. There are about 1,400 acres of glass in this section, mainly in Hertfordshire county, but extending out into both Middlesex and Essex counties.

The cropping of greenhouses varies greatly in these counties. In Hertfordshire and Essex about 60 per cent of the total output is in the form of tomatoes, 15 per cent in the form of cucumbers, 15 per cent in the form of flowers, mainly roses, and about 10 per cent in other miscellaneous crops. In Middlesex the output is 40 per cent in the form of tomatoes, about 15 per cent in cucumbers, 5 per cent in grapes, 5 per cent in miscellaneous crops such as mint, etc., and 35 per cent in flowers and plants. The average value of crops per acre in these counties is rather high,—in Hertfordshire and Essex about 1,890 English pounds, equal to about $9,200; in Middlesex county the average returns were lower amounting to approximately 1,590 English pounds or $7,740.

With this high value and the many problems that are sure to arise, the value of scientific research was bound to be apparent. The Experimental and Research Station therefore was inaugurated in 1914 under the auspices of the Nursery and Market Industries Development Society, Ltd. The Lea Valley and District Nurserymen and Growers Association formed this society. The membership in the station is open to "all growers and interested persons, and subscriptions are payable at the rate of two guineas ($10.15) per annum for each acre of glass cultivated."

Built on Cooperation

The world war held up the building of the station until 1921. In 1925 there was an enlargement of the original by the addition of more glass houses and extended laboratories, at a total cost of 4,800 pounds, about $25,000. Part of this was paid by the Ministry of Agriculture, 2,800 pounds, about $14,000. The remaining sum has been subscribed to by growers and other interested parties. The situation of this station is in the heart of the Lea Valley Greenhouse district and is admirably suited for the study of the neighboring growers' problems. Close cooperation exists between the station staff and leading growers.

The laboratory building is of two stories, built of brick, and is well equipped. It includes offices and complete laboratories for mycological, entomological, chemical, and physiological investigations. The building is on the main street of the town. In the rear of the laboratory are found 16 greenhouses of good size. Nine of these were being used for tomato experiments when visited by the writer. Five were used for cucumber investigations, one was used as an isolation house and one as special chamber experimental houses. In every way are the conditions comparable to those found in the neighboring commercial greenhouses. In fact, the station greenhouses are duplicates of those used on commercial farms, in size, shape, etc. The experiments are conducted under similar conditions to those employed by the growers, the men actually doing the work are experienced men obtained from commercial establishments.

Wide Range of Problems

The station is under the direction of Dr. W. F. Bewley, a plant pathologist of considerable note. He has 9 or 10 prominent British investigators associated with him and in charge of their various special lines of work. There is a greenhouse working staff of 9 or 10 practical growers. The station investigates a wide range of problems. Just a few of the more important are:

Manurial and crop management trials with tomatoes. This includes modification of the amount of stable manure used; the use of potash fertilizer, side-dressings of nitrogenous fertilizer, watering experiments, and variety trials.

Cucumber experiments — especially in soils, fertilizer, manure, and sterilizing with steam.

Red spider investigations, particularly trapping with paper or straw, and fumigation trials with a wide variety of materials.

White fly parasite cultivation and distribution, the real control measure for this destructive pest. Other insect pests being studied include the vine tortrix on the grape, pests of young cucumber plants, the greenhouse leafhopper, and the chrysanthemum midge.

Among the plant diseases studied are wilt of the carnation and a bacterial disease of the chrysanthemum, tomato mildew with the influence of temperature and humidity on this latter trouble, Botrytis stem rot of the rose, a disease of strawberry plants, and mosaic disease of tomatoes.

Investigations upon the maturation period, or number of days between the opening of the flower and picking of the tomato fruit, as a guide to the general well-being of the plant have been continued.

Experiments on the fertilizing effect of carbon dioxide on greenhouse plants have shown a 15 to 25 per cent increase in many plants.

Analyses have been made of the foliage of tomato plants in soils receiving nitrogen, potash, and phosphates. From the five-year data obtained, it is clear that the effect of omitting one nutrient is not confined to the concentration of that nutrient in the foliage. There is an interdependence between the phosphates added to the soil and the potash found in the foliage and also between the potash added to the soil and the phosphoric acid in the foliage. Where phosphates are omitted from the fertilizing practices the concentration of potash in the foliage is reduced. The potash in the foliage increases with the addition of phosphate to the soil. In a similar manner the foliage of plants growing in soil to which no potash is added shows a high phosphoric acid content. When potash is added to the soil the phosphoric acid concentration in the foliage is reduced.

Other fertilizer experiments include the determination of the amount of nitrogen in some of the experimental plots. In all of the plots examined there was an accumulation of nitrates during the following (not cropped)

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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 lawn and garden are probably the most neglected parts of most farms. More and more is it being realized that this neglect is not justified, as both have a direct and indirect "dollars and cents" value. A good lawn and garden usually indicate a good farmer, and a good farmer can get credit when others are having their mortgages foreclosed. The value of the garden in feeding the family is easily seen and can be surprisingly large.

"What Fertilizers for Lawns and Gardens?" by C. J. Chapman (Wisconsin Agricultural Extension Service, Special Bulletin 92) gives excellent and useful information on their proper location, soil, handling, fertilizing, and care. It is pointed out that lime is usually not beneficial on lawns and some garden crops as watermelons, blackberries, and raspberries, but necessary on many other garden crops when the soil is acid. For new lawns 6-12-9, 5-8-7, 4-8-6, and 15-30-15 fertilizers at the rate of 3 pounds per 100 square feet are recommended. For established lawns, the same analyses at 1 to 2 pounds per 100 square feet are supplemented with top-dressings about once a month with ammonium sulphate at one-half pound per 100 square feet. For gardens, the same fertilizers at 3 to 5 pounds per 100 square feet are recommended.

"Field Experiments with Fertilizers on Some Iowa Soils," (Iowa Agricultural Experiment Station, Bulletin 269 by W. H. Stevenson, P. E. Brown, and assistants) show that most of the soils studied in this State need fertilizer in order to produce the most profitable yields. The actual fertilizers to use vary with soil and crop conditions. The authors evidently intend this bulletin as a guide in helping farmers to determine what fertilizers to try. The bulletin recommends that a farmer should use several fertilizers in order to see which is the best for his own particular condition. Maps showing the general locations of the soils studied, together with the results of the fertilizers obtained on them, make this an excellent guide in helping farmers get started on the right path in the use of fertilizers in this State.

"Fertilizer Analyses and Registrations," Department of Agriculture, St. Paul, Minn., 1930, N. J. Holmberg.

"Cabbage Fertilizer Experiments," Agr. Exp. Sta., State College, N. M., Bul. 180, Jan., 1930, A. B. Fite.

"Experiments in the Use of Fertilizers in Growing Forest Planting Material at the Savenac Nursery," U. S. Department of Agriculture, Washington, D. C., Cir. 125, Sep., 1930, W. G. Wahlenburg.

Soils

"Edwards County Soils," Agr. Exp. Sta., Urbana, Ill., Soil Report No. 46, July, 1930, E. A. Norton, R. S. Smith, E. E. DeTurk, F. C. Bauer, and L. H. Smith.

"Soil Survey of Wayne County, Indiana," Part 1, "The Management of Wayne County Soils," Part 2, U. S. Department of Agriculture, Washington, D. C., No. 21, Series, 1925, T. M. Bushnell, F. E. Barnes, Earl D. Fowler, James Thorp, A. T. Wiancko, and S. D. Conner.

"The Use of Peat in the Greenhouse," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 194, Jan., 1930, Alex Laurie.

"Soils of Blaine County," Agr. Exp. Sta.,

Bozeman, Mont., Bul. 228, *Mar.,* 1930, *L. F. Gieseker.*

"*Soil Survey of Brown County, South Dakota,*" *U. S. Department of Agriculture, Washington, D. C., No.* 22, *Series* 1925, *W. I. Watkins and G. A. Larson.*

"*Soil Survey of Nacogdoches County, Texas,*" *U. S. Department of Agriculture, Washington, D. C., No.* 24, *Series* 1925, *B. H. Hendrickson, R. E. Devereux, and E. H. Templin.*

"*Possibilities of Sulphur as a Soil Amendment,*" *Agr. Exp. Sta., College Station, Texas, Bul.* 414, *Aug.,* 1930, *G. S. Fraps.*

"*Irrigation Practices in Growing Alfalfa,*" *U. S. Department of Agriculture, Washington, D. C., Farmers' Bul.* 1630, *June,* 1930, *Samuel Fortier.*

"*Irrigation Requirements of the Arid and Semiarid Lands of the Southwest,*" *U. S. Department of Agriculture, Washington, D. C., Tech. Bul.* 185, *June,* 1930, *Samuel Fortier and Arthur A. Young.*

"*Effect of Calcium and Phosphorus Content of Various Soil Series in Western Washington Upon the Calcium and Phosphorus Composition of Oats, Red Clover, and White Clover,*" *Agr. Exp. Sta., Pullman, Wash., Bul.* 243, *June,* 1930, *Henry F. Holtz.*

Crops

Several annual reports in which valuable information on crop improvement work, as well as the other phases of investigation ordinarily done by agricultural experiment stations, have been received this month. In line with the role of plant food in crop improvement, an interesting piece of work is found in the Forty-second Annual Report of the Director of the Purdue Agricultural Experiment Station in the results of analytical work on potash in relation to growth and development of plants. The analytical determinations of soluble carbohydrates and dry weight of corn plants grown in sand cultures with three levels of potash supply show that the sugar content is correlated with the amount of potassium supplied. The high amount of potassium produced plants of high sugar content. In analyses of corn grown at Rensselaer, Indiana, under three conditions in respect to potash fertilization (0, 36, and 126 pounds K_2O per acre) the plants grown on plots that were treated with 126 pounds of potash per acre had a much higher sugar content than those from the other plots, the increase in some cases amounting to 1,000 per cent.

Another interesting item on potash is found in the Forty-second Annual Report of the Director of the Rhode Island Agricultural Experiment Station to the effect that when a low potash fertilizer was used on potatoes the yield was 204 bushels and with a high potash, 336 bushels per acre. On the low potash plots, 1,500 pounds of a 4-9-5 fertilizer were used and on the high potash, a like amount of 4-9-10. This same report states that "the results of withholding potash on red raspberries are even more apparent than in the previous season, the plat with potash showing a striking reduction in growth."

"*A Study of the Shipment of Fresh Fruits and Vegetables to the Far East,*" *Calif. Agr. Exp. Sta., Berkeley, Calif., Bul.* 497, *July,* 1930, *E. L. Overholser.*

"*Planning Educational Exhibits,*" *Ga. State Col. of Agr., Athens, Ga., Bul.* 392, *Aug.,* 1930, *M. W. Lowry.*

"*Work and Progress of the Agricultural Experiment Station for the Year Ending December* 31, 1929," *Univ. of Idaho, Moscow, Idaho, Bul.* 170, *Apr.,* 1930.

"*A Year's Progress in Solving Farm Problems of Illinois,* 1929-30," *Agr. Exp. Sta., Urbana, Ill.,* 43*rd An. Rept.,* 1930.

"*Growing Alfalfa in Illinois,*" *Agr. Exp. Sta., Urbana, Ill., Bul.* 349, *June,* 1930, *W. L. Burlison, O. H. Sears, and J. C. Hackleman.*

"*Some Factors Influencing the Keeping Quality of Fruit in Transit,*" *Agr. Exp. Sta., Urbana, Ill., Bul.* 350, *June,* 1930, *J. W. Lloyd and H. M. Newell.*

"*Effect of Certain Hydrocarbon Oils on the Transpiration Rate of Some Deciduous Tree Fruits,*" *Agr. Exp. Sta., Urbana, Ill., Bul.* 353, *Aug.,* 1930, *Victor W. Kelley.*

"*Report of Moses Fell Annex Farm, Bedford, Ind., Agr. Exp. Sta., Lafayette, Ind., Cir.* 172, *June,* 1930, *H. J. Reed and Hobart G. Hall.*

"*More Potatoes Per Acre,*" *Iowa State Col. of Agr., Ames, Iowa, Ext. Service Bul.* 128 *(Rev.), Apr.,* 1930, *C. L. Fitch.*

"*The Hopkinsville Experiment Field,*" *Agr. Exp. Sta., Lexington, Ky., Bul.* 299, *Mar.,* 1930, *Geo. Roberts, J. F. Freeman, and E. J. Kinney.*

"*Tobacco Project Junior 4-H Clubs,*" *Col. of Agr., Lexington, Ky., Cir.* 86 *(Rev.), Mar.,* 1930, *E. J. Kinney.*

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Agricultural Developments

(From page 42)

NEW JERSEY REPORTS APPLE PRODUCTION COSTS

Costs of producing apples on 25 farms in Monmouth county, New Jersey, in 1929, are reported by the New Jersey Extension Service in its September "Economic Review of New Jersey Agriculture." The net cost of producing and harvesting market apples is reported at $170.34 per acre on the average, or .78 per bushel. Net receipts averaged $356.65 per acre or $1.63 per bushel.—*U. S. D. A. Marketing Activities*, Oct. 1, 1930.

A MILLION A DAY

According to a recent check, in the consumption of 1,000,000 oranges a day, Philadelphia established a new orange eating and drinking record in 1929. In the survey it was shown that the consumption last year was nearly 2,000 carloads greater than in 1928, and that the greatest number of cars unloaded in the Philadelphia markets in any previous year was 4,317 in 1924.

U. S. SCIENTISTS BREED SUPERIOR NEW SUGARCANE

Federal scientists are enthusiastic over the breeding and development of a new variety of sugarcane which bids fair to further increase yields of sugar, already greatly augmented by the adoption in Louisiana of varieties imported and distributed by the United States Department of Agriculture several years ago. The first release of the new variety, which is now known as C. P. 807, was in the 1930 season, but the sugar experts have watched experimental plantings for several years, and base their expectations on results of these tests, in which C. P. 807 outyielded the best of the competing varieties by nearly a ton of sugar per acre, or by more than 35 per cent.

The initials "C. P." in the name of the new variety are derived from Canal Point, in Florida, where the new variety was bred at the United States Department of Agriculture's field station. This station was established by the Bureau of Plant Industry in 1920, and this is the first improved sugarcane variety produced there, which the sugar specialists have recommended to the planters. At the station the breeding program has had two objectives, production of a sugarcane that would yield a large quantity of sugar, and which at the same time would be highly resistant to the diseases that nearly wiped out the sugar industry in Louisiana prior to 1926, when it was rejuvenated by the department's introduction from Java of the disease-tolerant P. O. J. varieties.

Compared with the best of the Java canes, P. O. J. 213, which yielded 4,865 pounds of sugar per acre in four test plantings last year, the new variety in adjoining plots yielded 6,725 pounds.

FARM WAGES SHOW MARKED DECLINE

Farm wages on October 1 were at the lowest level since January, 1923, because of poor crop prospects, farm products price declines, and the fact that the supply of farm hands is more than 40 per cent in excess of the demand, according to the Bureau of Agricultural Economics.

The bureau says that the excessive supply of farm hands "is a reflection of the continuance of the present extensive business depression which has scattered unemployed industrial workers throughout agricultural sections in search of a livelihood. The supply is in excess of the demand in all geographical sections, ranging from an excess of 24 per cent in the North Atlantic States to 49 per cent in the South Central States."—*U. S. D. A. Marketing Activities*, Oct. 15, 1930.

Canadians Fertilize Alfalfa for Profit

(EDITOR'S NOTE: *The following is quoted directly from News Bulletin No. 57 of the Ontario Agricultural College, Guelph, Ontario, August 15, 1930.*)

DURING the past summer some interesting tests have been conducted regarding fertilization of alfalfa meadows. Early spring prospects seemed to indicate a considerable amount of winter-killing, but abundant rains and good growing weather overcame much of the apparent injury, so that alfalfa made a strong comeback.

In the tests conducted, two types of fertilizer were used, the first supplying complete plant food (nitrogen, phosphoric acid, and potash) and the second supplying only phosphoric acid and potash. In this latter test the percentage of potash was increased materially. In one set of tests a fertilizer analyzing 2-12-6 was used, while 0-12-15 was used for the second. Eleven tests gave an average gain of 4,852 lbs. green alfalfa per acre. Four tests of 2-12-6 made a gain of 1,891 lbs. per acre. This would indicate that while the alfalfa plant gathers nitrogen from the air and enriches the soil with same, still it benefits at times from the addition of a small amount of nitrogen to invigorate early growth.

Draws Heavily on Potash

Alfalfa is known to draw heavily upon the potash of the soil. Statistics show that a five-ton crop will take out of the soil as much as 223 lbs. of potash per acre. Where the 0-12-15 fertilizer was used there was a gain of 5,653 lbs. green alfalfa per acre. These results include two second cuttings which show an average gain for all fertilizers of 2,400 lbs. per acre; for high potash fertilizers the second crop gain was 2,880 lbs. per acre; while for 2-12-6 fertilizer it was 1,920 lbs. per acre.

The results from the tests reported, which include careful weighings from alfalfa fields in Lanark, Grey, Perth, York, and Wellington counties, indicate that a high potash, medium high phosphoric acid fertilizer will pay best on this valuable crop. The average gain for the nine tests is 45 per cent.

In these tests it was observed that where the application was made in the spring with the drill, allowing the disks to drag over the alfalfa sod, better results were obtained than where the same fertilizer was applied broadcast by hand.

The above results will be of considerable interest to dairymen and other livestock producers. The manure which is returned from the farm is relatively rich in nitrogen and organic matter. It contains on the average about 10 to 15 lbs. of nitrogen to the ton, 5 to 9 of phosphoric acid, and about 10 to 12 of potash. Growing alfalfa does not add to the potash or phosphoric acid of the soil, hence with rotation of crops and the addition of manure, it is necessary to add potash and phosphoric acid if better returns are to be looked for. The tests will be observed for residual effect and the results will be carefully noted.

"After all, what difference does it make whether a farmer increases his net profit by getting a higher price for the things he sells or by lowering his production costs? It is much more difficult for a farmer to get higher prices than it is to cut down his costs of production."—William F. Schilling, Federal Farm Board member.

A Farm Woodlot Deserves Good Care

MANY a woodlot that would otherwise be a valuable asset to the farm is nearly ruined by the careless practice of cutting valuable timber trees for firewood rather than utilizing trees suited only to this use.

This practice of cutting good timber trees for firewood is about as sensible as pulling out all of the growing vegetables in the farm garden and letting only the weeds grow.

In almost any farm woodlot there are many trees of little or no timber value that should be removed and that can readily be turned into economic use as firewood. Many of these are trees that interfere with the growth of good timber trees. Cut them out. Cull the woodlot of cull trees just as you would the poultry flock of culls.

Good woodlot management means a farm woods fully stocked with sound, well-shaped trees of valuable and useful species. It demands the removal of many undesirable kinds of trees that are too often allowed to remain. Fortunately, these trees will burn quite as well as the more valuable ones and are those that should be removed for firewood.

The list of cull trees that should be removed is quite a long one. Dead trees, both standing and down, and those that are dying should first of all come out. Diseased trees, or those that have been seriously injured by disease or insect attacks, have no place in a well-managed woodlot. Those that have been badly scarred by fire and those that have had their growth badly stunted by being overtopped by other trees add little or nothing to the value of the woodlot.

The choice of sound trees that should be allowed to remain in the woodlot depends a great deal on the comparative value of the species. Such trees as beech, birch, aspen, ironwood, black oak, black jack oak, or black gum should always be sacrificed to the welfare and better growth of such ones as sugar maple, white and shortleaf pines, yellow poplar, or white oak.

Crooked or deformed trees should be cut out as they are needed for firewood. Slow growing trees that are badly crowding faster growing ones of equal value should be removed. Trees so shaped as not to make good lumber, such as large crowned, shortboled ones with large spreading limbs, and that are crowding or overtopping more perfect timber trees should by all means come out. There are enough of these cull trees in any woodlot to make it unnecessary to cut perfect timber trees for firewood.—T. H. Bartilson, Washington, D. C.

Vegetable Research in England

(*From page* 44)

winter months; the concentration was not affected by planting. The leaching which follows the first watering caused a decided decrease in the nitrate content of all the plots. The omission of either phosphates or potash did not appear to have any effect on the nitrate concentration.

The dissemination of this valuable information is not as wide-spread nor as easily spread as in America. In England educational institutions such as agricultural extension workers and farm bureaus are unknown. The spread of the investigational results is, therefore, very slow. Nine or ten evening lectures during the winter were given at the experiment station. These meetings were attended by the leading greenhouse growers, but did not represent more than 10 to 12 per cent of all the growers. It is these leaders who must first practice, then the rank and file follow after several years.

In addition to the station lectures and discussions, members of the staff have been invited to address organized bodies of nurserymen (growers) in various parts of England. Exhibits have been sent to the Royal Horticultural Society's spring show at Chelsea. American growers in touch with these valuable investigations can prove their application as soon as the leading growers in England.

Effective Extension

(*From page* 23)

to unearth information which will prove helpful in increasing their effectiveness.

"The future? It is always dangerous to assume the role of a prophet, but it certainly looks as though with the collection of more and more scientific data on the various extension media, we will come to depend more upon carefully collected information for increasing the effectiveness of our work. In the future we will undoubtedly use the findings of research in helping us to put across programs just as we are at present using the results of the agricultural experiment stations in selecting which practices need to be adopted and which should be discarded."

Korean Lespedeza

(*From page* 20)

On the other hand, many seedings have been made in territory where the bacteria from inoculation were not in the soil. Frequently, in such locations, the plants grow poorly, as other legumes do without inoculation, and many such trial seedings are plowed up the next year and called failures.

The failure is on the part of the farmer who does not know about inoculation. One seeding of this sort was made in Montgomery county, Ohio, in 1928. Soil from the original Korean field was sent on request to inoculate the seed. The inoculation failed, but last year good inoculation on this farm resulted from sowing seed inoculated with both cowpea culture and Korean soil. In this field the crop was green until late October, but matured seed in abundance. Wherever cowpeas, peanuts, or other lespedeza have been grown, Korean does well; otherwise the bacteria must be placed on the seed before sowing. Most Kentucky growers are using cowpea cultures.

Perhaps the center of greatest interest in this crop is now in Kentucky. It is reported that more than 10,000 farmers sowed Korean seed last spring. Christian and Todd counties each sowed more than 100,000 pounds of seed. Several other counties in the State used from 30,000 to 50,000 pounds each, and there is probably not a county in the State without some plantings. The northern border of Tennessee, centering about Montgomery county, has grown it extensively for the past three years. Here, however, the interest seems to have been located in a few individuals growing it for seed purposes, whereas the majority of Kentucky farmers are sowing it for pasture and hay. A few localities in Arkansas, North Carolina, West Virginia, and southern Illinois also have taken up seed production.

The first seed issued from the Department of Agriculture was free from dodder, but unfortunately was sown on fields containing this noxious weed. The result has been very discouraging in some instances where the entire fields were ruined for seed or hay purposes. Dodder-infested fields can be used for pasture, but the weed is a serious pest in many Korean, Kobe, and Tennessee 76 lespedeza fields today. The past three seasons have favored dodder growth in other clovers, and dodder-infested seed is not peculiar to lespedeza, but red clover as well.

Kentucky farmers are getting around this situation by organization of a seed improvement association. Growers who have their seed certified through this organization will have to produce seed entirely free from dodder or, if there is a little in the crop, it must be cleaned until it meets the most stringent seed laws of any State in the trade territory. These men do not appreciate the dodder that came from other States in the beginning; neither do they intend to pass it on to others. Several fields intended for seed last year were grazed and plowed under, and more are being handled that way this season. Quite a large acreage was sown last spring with dodder-free seed, and this added to old fields that are clean will give a reasonable amount of seed to be used within the State in 1931.

In each of the past four seasons the sowing has been approximately 10 times that of the preceding year, with no seed available at the end. So great is the need for pastures and hay fields in this area now that prospects are for a sowing 10 times as great in 1931. Nearly all red clover fields were failures for hay this season. New seedings are much more than 50 per cent failures, with much of the old alfalfa so damaged that large acreages will be plowed up in the spring of 1931. The extreme pasture shortage caused all young sweet clover to be grazed to earth this fall.

The only plant that will relieve the situation for pasture on an extensive scale is lespedeza, which will be capable of doing great good to men who need pasture and hay next year on thousands of fields that they had not intended to cultivate and would not have time to tend in other crops.

A Remedy for Sand Drown

(*From page* 17)

a healthy crop of tobacco.

During 1929, Mr. Ed Rhodes, Kinston, North Carolina, saw sand drown appearing in a six-acre field of his tobacco. He immediately side-dressed the field of tobacco with 200 pounds per acre of sulphate of potash-magnesia, leaving six rows without side-dressing, for comparison. The spread of sand drown was completely arrested on the tobacco, with the exception of the six rows left for comparison. On these rows the sand drown continued to spread till the crop was harvested.

These experiments clearly indicate that sand drown can not be cleared out of the leaves in which it has already developed, but that the spread can be completely checked, by the application of from 100 to 250 pounds per acre of sulphate of potash-magnesia. Incidentally, the potash in the compound is a very important element in the production of good quality tobacco. Where sulphate of potash-magnesia is used in the manufacture of complete fertilizers, there should never be any trouble with sand drown.

The magnesia in crushed dolomitic limestone, although slower to act, if applied to the land before the tobacco is set will also correct this sand drown trouble. However, if too much dolomitic limestone is applied to tobacco lands, there is danger of developing an even more serious trouble—black root-rot. The black root-rot organism develops and thrives in a soil having or approaching an alkaline reaction. The best results with tobacco may be expected on fairly acid soils—showing about 4.6 pH to 5.6 pH; a 7.0 pH is regarded as neutral, and risky.

More Mung Beans

(*From page 29*)

The analyses of the roots, stems, and leaves are on an oven-dry basis.

On July 15, 1929, at Carrier, Oklahoma, which is in the wheat belt of the State, mung beans were planted with a lister planter on one-way disked barley stubble and on disked wheat land. A 16-hole, edge-grain corn plate with a slow sprocket was used in the planting. The rows were 3½ feet apart, and no cultivation was given the beans after planting. The yields on October 7 were as follows:

Treatment	Green wt. of forage per A. lbs.
After Barley	9048
After Wheat	6126

At this time there were a considerable number of green pods and some pods were turning brown indicating ripening. No further data were secured, but the results indicate that a good yield of green manure was obtained.

On a piece of badly eroded soil on the Station Farm mung beans were planted on June 20, 1929, in rows 3½ feet apart and cultivated twice during the season. The yield of green forage was 3,930 pounds after the seed was harvested. This was equivalent to 1,170 pounds of dry matter. The seed yield was 235 pounds per acre.

These observations and data along with the results secured by some farmers and others indicate that the mung bean undoubtedly will find a place as a green manure crop in this State.

Hi-bred Corn

(*From page 26*)

him 9½c per gallon.

The air is forced from the furnace to the granaries by means of a forge blower. This blower has a capacity of 2,500 cu. ft. per minute and will be enlarged when Mr. Newlin expands his business.

After the corn is thoroughly dried, it is shoveled to the grading room where the tip kernels are removed. The ears are fed one at a time to an elevator with slots properly spaced to handle one ear of corn at a time. The ears enter a one-hole sheller and each ear is shelled separately so that if it is a diseased or inferior ear it may be removed before it goes into the corn grader.

Mr. Newlin states that the only way to tell if an ear is diseased is to see the shelled corn. The writer agrees with him thoroughly after watching several ears go through his machine. It is very easy to pick out the diseased, dead looking ears by seeing the shelled corn, and this contribution of Mr. Newlin's is a very important one.

After the corn is shelled in the one-hole sheller, it drops on a large moving canvas, one ear at a time. There Mr. Newlin looks over the shelled seed and removes ears that do not come up to his standard of freedom from mold, brightness, etc. In last year's corn crop he removed nearly four ears out of every five, reducing 2,900 bushels of seed to about 600 bushels. In that way he raised the standard of his seed greatly. The shelled ears that get by Mr. Newlin's watchful eye are passed into a Hero Corn Grader where the seed is graded into different sizes and is ready for the planter.

The seed is packed in new sacks with the name and trade-mark of the variety. The sack is tied with a patented sealer and the product goes out in a well put up package.

It has taken more than 20 years to put the production of crossed inbred corn on a commercial scale. To Mr. Newlin goes the credit of making practical use of the work. Also, he is making use of other scientific investigations and is giving corn growers a high yielding, disease-free seed corn. The names East, Shull, and Newlin will go down in history as real improvers of the corn crop.

Residual Potash

(*From page 27*)

selected and cuttings made a day or so before the crop was cut. Green weights showed the area having the potash to be yielding 9,378 pounds while the area having only the superphosphate yielded 3,933 pounds green hay per acre.

On the dry hay tonnage basis this is a difference of practically one ton of cured hay per acre in favor of the potash application. And the potash had already fed four years' growth. Mr. Foster reported that there was even a greater difference between the plots at the time of the first cutting. The dry season affected the second crop somewhat. Since the time of seeding, the same difference has been noted each year, but has continued to get more pronounced.

Alfalfa leaves showing potash starvation. These leaves are typical of the entire area not treated with potash on the farm of Walter Foster at Wapping, Connecticut.

Potash starvation should not be mistaken for lack of lime or for leafhopper injury. It can be easily discerned by its regular leaf-circling, spotting effect, always working from the edge inwards. Leafhopper injury results in a very irregular leaf spot, while lack of lime tends to cause a more solid discoloring of the leaf.

An annual and even a semi-annual top-dressing with a fertilizer high in potash continues to become more popular with the dairy farmer wishing to grow better alfalfa and to get longer lived stands. The Connecticut Agricultural Experiment Station results* also show satisfactory returns from an application of two hundred pounds of muriate of potash per acre.

* Effect of Fertilizers on Maintaining Alfalfa Stands." By B. A. Brown, the Journal of the American Society of Agronomy. Vol. 20, No. 2, Feb., 1928.

Lack of Potash

(*From page* 30)

ers on potash. Lack of this element is responsible for many failures with alfalfa and clover.

"The fact, too, that we have been using commercial fertilizers relatively high in phosphate; in fact, in many cases using the straight phosphate fertilizers; has resulted in accentuating this lack of potash, for we have been pulling heavily on the reserves of potash all the time, due to the stimulation in growth where the phosphate has been used. The lodging of our grain, the weak spindly growth of corn and other crops, the white speckling or fringing of alfalfa leaves, the bronzing of sugar beet leaves, in fact, root rot and other diseases, may be, and frequently are, the result of the potash deficiencies of our soils."

The Inquiring Mind

(*From page* 16)

scripts which have not yet been printed.

In 1929 his *alma mater*, the Massachusetts Agricultural College, at Amherst, conferred a doctor's degree upon him, and many other institutions have delighted to do him honor. We rejoice that the life of this truly great and useful servant of the people was spared, and hope that he may enjoy good health and happiness in his declining years, surrounded by the many friends who have enjoyed his acquaintance and profited by his practical and scientific instructions.

The terrible accident to which we have already alluded befell Professor Plumb on the night of December 18, 1925. With Mrs. Plumb he was waiting for a street car when a "hit-and-run" auto, driven by an intoxicated man, who was violating the traffic law, struck him, missed his wife by inches, and severely injured two other ladies. Professor Plumb was thrown upon the radiator of the car and thence to the pavement, which he struck with fearful force. Two Ohio State students, who happened to be there at the time, rushed him in their car to Grant Hospital, and there it was found that both legs and one arm were broken, in addition to other injuries.

The Difference

(*From page* 13)

were dug and comparisons made it was easily seen that the yield was increased several hundred per cent by using greater amounts of fertilizer. Just as the proof of the pudding is in the eating, so is the convincing part of a fertilizer demonstration in the actual yields secured.

The demonstration as carried on by Mr. Edwards consisted of using varying amounts of 4-8-6 fertilizer under certified triumph seed.

Plot	Amount of Fertilizer	Yield field run potatoes
1	none	61 bushels
2	200 lbs.	109
3	300 lbs.	147
4	400 lbs.	194
5	500 lbs.	243
6	600 lbs.	277

There was not only a great increase in yield, but a vast difference in size and quality of potatoes. The unfertilized plot required 261 potatoes to fill a bushel basket, whereas only 171 potatoes from the plot receiving 600 pounds of fertilizer were required to fill a basket. The fertilized potatoes were smoother, firmer, and of superior quality throughout.

Use Good Seed

(*From page* 12)

Home-grown seed, either from your own or a neighbor's farm, is usually satisfactory. It has the advantage of being adapted to local conditions, resulting in less winter-killing in the field. It should by all means be carefully cleaned. The farm fanning mill, when run at the right speed and equipped with the correct combination of sieves and screens, will do a very nearly perfect job of cleaning seed. The minimum requirement for all seed used on farms is that it should at least have passed through a good fanning mill, which always means bigger crops and profits with less labor. Many a blustery winter day can be made profitable by cleaning seed. The screenings can be used to fatten the poultry instead of infesting the farm.

If you are among the millions of farmers who purchase seed from the local merchant you have protection from the seed law. The most important thing is to carefully examine the seed law tag now required in most states. Make certain that the purity is high, that such super-noxious weeds as Canada thistle, quack grass, and dodder are entirely absent, and that the germination is good. In case of clover and alfalfa, note the source of the seed and at the same time examine the seed for the appearance of green or red stains, evidence of foreign origin. The green stained seed is not as undesirable as the red, but is not equal to native seed. Be sure it has been recleaned and is of good quality.

It is a mistake to have blind faith in the seed law tag. It does not indicate perfect seed, but merely carries the information regarding the seed you are buying. For example, Indiana has a good seed law and what is conceded to be one of the best and most active systems of enforcement. Nevertheless, last year samples of seed for sale on the open market in the Hoosier state were found to contain as high as 69,613 weed seeds per pound. The most skilled farmer on the richest land could hardly hope for profitable crops built on so poor a foundation.

Even studying the seed law tag is not sufficient, as often times seeds are misbranded. It is a good practice to carefully examine the seed with the naked eye or with a hand lens before purchasing. If in doubt, a sample can be sent to the state seed laboratory for analysis and a recheck made.

When dealers notice that their cus-

The seeds of the buckhorn plantain are shaped like a canoe and have a waxy, brown seed coat.

tomers are careful about the kind of seed purchased, better seed will come as a matter of course. Again let me say, never demand cheap or bargain seed. The best is not too good. If every seed buyer refused to buy poor seed, the dealers handling such wares would soon be forced to close their doors, leaving only the up-to-date, reliable firms in business. Good seed is one of the foundations of successful farming.

Reviews

(*From page* 46)

"Potato Project Junior 4-H Clubs," Col. of Agr., Lexington, Ky., Cir. 100 *(Rev.), Mar.,* 1930, *John S. Gardner.*

"Tomato Project Junior 4-H Clubs," Col. of Agr., Lexington, Ky., Cir. 126 *(Rev.), Mar.,* 1930, *A. J. Olney.*

"Soybeans and Cowpeas for Hay," Col. of Agr., Lexington, Ky., Cir. 232, *May,* 1930, *E. J. Kinney.*

"Sugarcane Variety Work at the Test Fields," Agr. Exp. Sta., Baton Rouge, La., Bul. 211, *May,* 1930, *C. B. Gouaux.*

"The Forty-second Annual Report of the University of Maryland, 1928-1929*," Agr. Exp. Sta., College Park, Md.*

"Spinach for Canning," Agr. Exp. Sta., College Park, Md., Bul. 320, *Mar.,* 1930, *Fred W. Geise.*

"The Quarterly Bulletin," Agr. Exp. Sta., East Lansing, Mich., Vol XIII, No. 1, *Aug.,* 1930.

"The Results of a Five-year Mineral Feeding Investigation with Dairy Cattle," Agr. Exp. Sta., East Lansing, Mich., Tech. Bul. 105, *Feb.,* 1930, *O. E. Reed and C. F. Huffman.*

"The Fruiting Habits and Pruning of the Campbell Early Grape," Agr. Exp. Sta., East Lansing, Mich., Tech. Bul. 106, *June,* 1930, *N. L. Partridge.*

"Cantaloupe Production in Michigan," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 193, *June,* 1930, *J. B. Edmond, A. B. Strand, and F. J. McNall.*

"Maintaining the Productivity of Cherry Trees," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 195, *Mar.,* 1930, *V. R. Gardner.*

"The Farm Woodlot in Michigan," Agr. Exp. Sta., East Lansing, Mich., Spec. Bul. 196, *Apr.,* 1930, *A. K. Chittenden and P. W. Robbins.*

"Cultural Methods in the Bearing Vineyard," Agr. Exp. Sta., East Lansing, Mich., Cir. Bul. 130, *Mar.,* 1930, *N. L. Partridge.*

"Experiment Station Research," Agr. Exp. Sta., Columbia, Mo., Bul. 285, *Apr.,* 1930, *F. B. Mumford and S. B. Shirky.*

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"Clover in the Subirrigated Meadows of the Sand Hills," Agr. Exp. Sta., Lincoln, Neb., Bul. 241, *Apr.,* 1930, *E. M. Brouse.*

"Pulp Wood as a Cash Crop," N. C. State Col. of Agr. and Eng., Raleigh, N. C., Ext. Cir. 180, *Aug.,* 1930, *R. W. Graeber.*

"Extension Work, 1929*," Univ. of N. H. Ext. Ser., Durham, N. H., Ext. Bul.* 36, *Feb.,* 1930, *J. C. Kendall.*

"Composition and Fruit Bud Formation in Non-bearing Spurs of the Baldwin Apple," Agr. Exp. Sta., Durham, N. H., Tech. Bul. 42, *June,* 1930, *G. F. Potter and T. G. Phillips.*

"Exp. Sta. Progress," Agr. Exp. Sta., Fargo, N. Dak., Bul. 233, *Mar.,* 1930, *P. F. Trowbridge.*

"Hettinger Substation Report for 1929*," Agr. Exp. Sta., Fargo, N. Dak., Bul.* 234, *May,* 1930, *C. H. Plath.*

"Williston Substation Report, Apr. 1, 1929 *to Mar.* 31, 1930*," Agr. Exp. Sta., Fargo, N. Dak., Bul.* 235, *May,* 1930, *E. G. Schollander.*

"The Chemical Composition of Some North Dakota Pasture and Hay Grasses," Agr. Exp. Sta., Fargo, N. Dak., Bul. 236, *June,* 1930, *T. H. Hopper and L. L. Nesbitt.*

"Feeding Low Grade Wheat to Cattle and Sheep," Agr. Exp. Sta., Fargo, N. Dak., Cir. 44, *Aug.,* 1930, *J. H. Shepperd and F. W. Christensen.*

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"Field Work, Ohio Agr. Exp. Sta.," Agr. Exp. Sta., Wooster, Ohio, Spec. Cir. 27, *June,* 1930.

"Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, No. 146, *Sept.-Oct.,* 1930.

"Slash Pine for Reforestation in the Coastal Plain," Agr. Exp. Sta., Clemson Col., S. C., Cir. 41, *Aug.,* 1930, *Wilbur R. Mattoon.*

"Winter Cover Crop Experiments at the Pee Dee Experiment Station," Agr. Exp. Sta., Clemson Col., S. C., Cir. 42, *Oct.,* 1930, *E. E. Hall, W. B. Albert, and S. J. Watson, Jr.*

"The United States Department of Agriculture—Its Growth, Structure and Functions," U. S. D. A., Washington, D. C., Misc. Publ.

88, Sept. 1, 1930, M. S. Eisenhower and A. P. Chew.

"The Home Production of Onion Seed and Sets," U. S. D. A., Washington, D. C., Farmers' Bul. 434 (Rev.), May, 1930, W. R. Beattie.

"The City Home Garden," U. S. D. A., Washington, D. C., Farmers' Bul. 1044 (Rev.), June, 1930, W. R. Beattie.

"Lettuce Growing," U. S. D. A., Washington, D. C., Farmers' Bul. 1609 (Rev.), May, 1930, W. R. Beattie.

"Agricultural Evening Schools," Federal Board for Vocational Education, Washington, D. C., Bul. 89, Agr. Ser. No. 17, Rev., 1930.

"Department of Agriculture Immigration of Virginia," Richmond, Va., Bul. 274, Oct., 1930.

"Alfalfa and Sweet Clover on Irrigated Land," State Col. of Wash., Pullman, Wash., Ext. Bul. 158, June, 1930, R. P. Bean.

"Reforestation by Private Enterprise," Col. of Agr., Madison, Wis., Cir. 239, May, 1930, F. G. Wilson.

Economics

Trends and fluctuations in the prices received by farmers for their products are described in Illinois Experiment Station Bulletin 351, which is entitled "Prices of Illinois Farm Products from 1866 to 1929."

Prices received by Illinois farmers for their products declined from 1866 to 1897; then rose rapidly until 1910, after which there were only small changes until the rapid rise during the World War. The rapid decline in prices during 1920 and 1921 has been followed by a more or less general recovery. These long-time price movements were typical of practically all important farm products, and were largely the result of changes in monetary conditions. However, wide differences are shown in the magnitude of the changes for different products. The authors, L. J. Norton and B. B. Wilson, attribute these differences to such factors as the weather and changes in production and marketing costs, on the supply side, and to changes in the number of consuming units and in consumption habits, on the demand side.

"Business Procedure in Shipping Grain Direct from Producing to Consuming Sections," Agr. Exp. Sta., Urbana, Ill., Cir. 359, July, 1930, Lacey F. Rickey.

"Cropping Systems in Iowa Past and Present," Iowa State Col. of Agr., Ames, Iowa, Bul. 268, Apr., 1930, Edgar B. Hurd.

"Ranch Organization and Management in Western North Dakota," Agr. Exp. Sta., Fargo, N. Dak., Bul. 237, June, 1930, M. B. Johnson.

"Economic Adjustments on Farms in Southeastern South Dakota," Agr. Exp. Sta., Brookings, S. Dak., Bul. 249, Mar., 1930, R. H. Rogers.

"Origin and Distribution of the Commercial Strawberry Crop," U. S. D. A., Washington, D. C., Tech. Bul. 180, May, 1930, J. W. Strowbridge.

"Car-lot Shipments and Unloads of Important Fruits and Vegetables," U. S. D. A., Washington, D. C., Statistical Bul. 30, May, 1930.

"Cooperative Marketing and Purchasing, 1920-1930," U. S. D. A., Washington, D. C., Cir. 121, Aug., 1930, R. H. Elsworth.

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Diseases

"Factors Influencing the Severity of the Root Rot Troubles of Sugar Cane," Agr. Exp. Sta., Baton Rouge, La., Bul. 212, May, 1930, H. H. Flor.

"Potato Diseases in Oregon and Their Control," Agr. Exp. Sta., Corvallis, Ore., Sta. Cir. 96, Feb., 1930, M. B. McKay and T. P. Dykstra.

"Ginseng Diseases and Their Control," U. S. D. A., Washington, D. C., Farmers' Bul. 736 (Rev.), June, 1930, H. H. Whetzel, J. Rosenbaum, J. W. Brann, and J. A. McClintock.

"Diseases and Insects of Garden Vegetables," U. S. D. A., Washington, D. C., Farmers' Bul. 1371 (Rev.), May, 1930, W. W. Gilbert and C. H. Popenoe.

"The Control of Bunt or Stinking Smut of Wheat," Agr. Exp. Sta., Pullman, Wash., Bul. 241, July, 1930, F. D. Heald and E. F. Gaines.

Insects

"The Hessian Fly and How Losses from it Can be Avoided," U. S. D. A., Washington, D. C., Farmers' Bul. 1627, May, 1930, W. R. Walton and C. M. Packard.

"Life History of the Oriental Peach Moth at Riverton, N. J., in Relation to Temperature," U. S. D. A., Washington, D. C., Tech. Bul. 183, June, 1930, Alvah Peterson and G. J. Haeussler.

King of the "Grass"

(*From page 7*)

cutting season is over; and 300 pounds of nitrate of soda, and 200 pounds of muriate of potash in the rather late summer.

Other experiment stations concur in these recommendations, and it seems that what with good farmers using it, experiment stations recommending it, and other good farmers "perking up their ears" about it, a high grade fertilizer with plenty of potash and nitrogen is going to be much more widely and profitably used.

Mr. L. A. Cave, Barnwell, South Carolina, in his field of young asparagus which was fertilized with 500 lbs. of 12% kainit and 500 lbs. of 20% kainit per acre in addition to his regular fertilizer.

The Fertilized Pasture Diagnosed

(*From page 10*)

first rains set in. A good turf does not permit as much surface evaporation as a poor turf. And if there is plenty available nitrogen on hand for growth and repair, pastures suffer less from injuries of all kinds, recovery always being quickest when there is lots of nitrogen and minerals accessible for the plants.

Fertilizing pastures is the one and only means of compensating the grazing away of soil fertility. The inevitable result of continuous grazing is a depleted soil. The process is so slow that it comes as silently as day steals into night. Any pasture no matter how good it is in the present should receive some fertilization from time to time to compensate for the removals made through grazing, consequently keeping it forever good. It should be remembered that the heavy yielding pasture has its fertility grazed away more rapidly, and the time is bound to come when it will begin to return less and less. It follows, therefore, that for even the best pastures in the present, the day of inferior returns should be set aside by pursuing a consistent program of fertilization and other management practices essential to maintenance.

It is an accepted truth that the best natural pastures are found on soils rich in the mineral elements. Yields and soil tests verify that observation. No one acquainted with experimental results doubts the worth of phosphates, potash, and lime for pastures any more than they do for tillable crops. Potash, once thought to be easily accessible, at least in most of the heavier soils, has found its place in the fertilization of these old pastures, with the discovery that better results are had from the lime and phosphate program when potash is used with them. Experimental results with the fertilization of these age-old pastures is continually pointing in that direction.

All pastures do not need liming, but many do. It is imperative wherever needed. Finely ground limestone may be just as good for the pasture as for the alfalfa field. Liming if needed, should be regarded as the first step, while phosphating and potashing are usually considered the nucleus about which the fertilization program is built. In Europe, phosphating, potashing and liming pastures have come to be recognized as standard practices, and today the same movement is rapidly developing in America.

Judged by its effects, it might generally appear that the vegetation covering these old, permanent grasslands is starving for nitrogen. Large increases in yield when applied with mineral fertilization, higher protein values in the feed, and quicker recovery from grazing and drought injury attest to this observation. Nitrogen with mineral fertilization is winning its way for these time-worn pastures. Nitrogenous manuring is making its beginnings on those pastures whose mineral fertility has been raised to meet the demands of better production. It is not economical to use it alone when mineral fertility is known to be low. Phosphates, potash, and lime are basic, but they cannot substitute for nitrogen limitations.

In many of the early experiments with nitrogen in this country, it was used in amounts too small to make an appreciable showing. One hundred pounds an acre of sodium nitrate or ammonium sulfate were often recommended. Experience shows that it takes upward to 200 to 350 pounds an acre for one application. In other words from 40 to 50 pounds of elemental nitrogen are about what the early spring application should be. I believe an application of such amounts can easily be paid for through extra grazing days, and for the protein produced, and still a profit may be had. And even a second application later in the season may very well be considered for extending the grazing period later in the fall, and for hastening recovery from drought and other injury. Nitrogen fertilization has usually been looked upon as something too expensive for grass, but if properly practiced and the results carefully analyzed, it appears that much of the early prejudice is not justified.

A pasture may be limed at most any time, but because of convenience in applying, and because of firmness of the soil then, the fall season is a good time. Either ground limestone or any other form of agricultural lime will do. If the soil is very sour, liming should precede the application of phosphate. This is recognized as the best practice, because the presence of lime in the soil prevents less soluble phosphates from forming with the reversion of superphosphate.

Because it has taken a long time to deplete the fertility of pastures, it is a mistake to assume that either a single application of fertilizer or small amounts infrequently applied will suffice to return them to good grazing lands. Amounts large enough to produce an effect from the beginning and consistently repeated with the course of time should be the rule. To continue to supply what has been taken away in the past, and to keep pace with its constant removal through grazing, a consistent program of fertilization should be undertaken, and practiced to the point where the pasture is again brought up to good levels of fertility.

What to Apply

For supplying phosphorus and potash, mixed products, such as an 0-20-20; 0-16-8; 0-21-9, etc., are excellent. From 300 pounds to 500 pounds of these make a reasonable, initial application. Where both superphosphate and potash are low, an 0-20-20 is an excellent mix to use. In my judgment it is a mistake to use complete mixes low in nitrogen such as 4-16-4 for pasture fertilization, because they are too limited in nitrogen to furnish it in sufficient amounts to get results. It would be much better to use a suitable mix of phosphates and potash, and then supply the nitrogen separately for the early spring application. If a second application of nitrogen is made later in the season, and before the mineral fertility has been sufficiently built back, a mix like a 12-16-12 might very well be considered. Speaking for a wide range of cases, I think it is safe to say this would be sound practice.

The best time to treat pastures with phosphates and potash is either in early spring or in the fall, the latter probably being the more convenient time. Spring applications should be made before grass starts growth, to give them time to move downward into the root zone. Both have been practiced, and it seems there is little to choose between.

While nitrogenous manures show some carry-over from season to season, the best time to apply them is in spring just at the time grass is showing signs of coming out of dormancy. Ordinarily this will not be before the middle of April in northern sections and it may extend up to the first of May. If a second nitrogen application is made the same season, it should be done not later than the last of June in order to be caught by June rains so that it will carry the pasture farther into the droughty period of summer.

There are thousands of acres of natural pasture lands for which no fertilizer program should be recommended because satisfactory returns would not be had for one reason or another. Steep, thin soiled hillsides where drought hits a maximum; low, wet areas whose greatest need is drainage; and wooded pastures where shading limits the growth of pasture plants, do not warrant it. Their natural setting for grass production is entirely too inadequate.

Fertilization should start with the best pastures, those equipped with deep soils and good surface topography. It is on these pastures that best results will be attained with suitable fertilization. The combination of a natural setting for grass growth and induced fertility can make many of these pastures from two to three times as good as they are. There are immense areas of such grazing lands, and they should occupy our attention first.

Poultry

(*From page* 4)

spouse required no protection as she was able, by the goodness of Allah, to shift for herself.

Poultry are indeed a wide field of study, and men are not content with the breadth of the horizons provided by creation, but they must forever be scheming out new and startling breeds. Glance at the difference between the awkward and behemoth proportions of the ostrich and the dainty flitting form of the humming-bird. I have stood off fifty yards and observed an ostrich kick forward and split a two-by-four in one fell stroke, and I have tried to find a humming-bird that was quiet and sociable.

Speaking of ostriches, our college professor in poultry had a carload of ostrich eggs wished on his experimental sanctum one spring. He hatched out a few, but abandoned the idea because no suitable arrangements or storage space could be found on the campus for a cast-iron junk pile for their scratch and mash. But you can't charge him with being an extremist, for he never tried humming-birds.

Science has done much for poultry and poultry have done several good turns for science. Much experimental work has been accomplished with the Mendelian laws on fowls to prove sex-linked inheritance and other genetic gymnastics. I shall not try to improve upon former presentations of those facts. The county agent will tell you all about it if you drop into his office some day.

The blood test is getting as popular with chicken fanciers as it is with cows and veterinarians. Vitamins are useful also in the scratch and mash, and chickens have lately been discovered tasting things and smacking their bills like epicures. Of these sundry items of crow cultivation I need not bore you.

American poultry history easily divides itself into three distinct eras. They are the limb-roost era, the dung-hill era, and the straw-loft era. No doubt today we have evidence of all three eras within any ordinary State, just as the geologist finds strata of rock remnants of any and all ages.

We hear there were plenty of turkeys, Dorkings, Dominiques, and game birds back in the times when the conestoga wagon trains trailed their weary way from east to west. Our pioneering fathers insisted upon ham and eggs for breakfast and desired to sleep in billowy featherbeds. The wild turkey and the pigeon were such common neighbors that the provident settler placed little dependence upon his domestic fowls. If a rude cabin was good enough for a son of New England, then the handy pine tree was ample shelter for the chickens.

No farm fortunes were laid by the doughty flocks of free lancers in those formative days. It is without question, nevertheless, that many a muscular harvest hand owed some portion of his sustenance to the lowly hen, and she played a distinct but obscure part in the destiny of our empire.

Next came the importers and breeders of fancy livestock, met for a time with reserve or outright skepticism by the western farmers. Gradually the hobby became a habit. Grading upward began, and the better sire campaigns swung along into step with the agricultural revolution. In this period the hen entered her dunghill era, and she remained there for awhile unsung, except for her own domestic voice. In this period of her career she was the concern of housewives and ignored by the menfolks.

About the time that the local butcher shop and abattoir vanished from our ken and we kids got no more free bologna or pig bladders, the poultry business began to pick up something besides worms and kitchen scraps. City consumers got to living in apartments, took less exercise, and cut down on the red meat and pork gravy. Packers branched out and took the old hen under their wings, along with other things efficiently acquired.

Suddenly the jokesmiths began to find less point to the gag about addled eggs for breakfast, and the spotlight of quality production shed its beams on the poultry yard. The dunghill nondescripts began to shuffle off the scene, and the first standard-bred specimens found their way farmward. Then the humble hen and the hard-worked Missus entered a promising partnership, in which the Mister and the Boys took more than passing interest. When eggs for hatching cost a little more than crate run prices and when trios for foundation stock became almost as enticing as Shorthorn pedigrees, the renaissance had arrived.

Hence the hen had wedged herself into the picture of bucolic progress, and men began to help their frauen build special houses in which to keep the cacklers, whereas the windy limb or an empty barrel was good enough before.

FURTHERMORE, agricultural experiment stations quit expending all efforts on quadrupeds of quality and began to think in terms of avian advancement. They split up into divers departments about this time also, and finally they found somebody on the staff willing to take care of the chickens and be called a poultry professor. For a few introductory years the poultry professors had to associate with sewing circles and ladies' aid societies in order to prove that there was profit in the egg as well as in the golden fleece and the succulent sirloin. They found the going pretty slow at times, even with the better halves of the families rooting for them. Their hardest job was to keep women from coddling pop-eyed peepers with the rickets and using Father's moustache cup for a water fountain.

Probably the first outstanding climax of this pioneer professorship was in getting the menfolks to clean and fumigate the chicken coops. Without fear of contradiction I declare that the gradual eradication of *Dermanyssus gallinae* and *Lipeurus variabilis* may be traced to the determined drive of womenfolks and the obedience of their men. Sanitation goes forward apace if the ladies have a cash balance sheet to prove that cleanliness is even more than holiness. And as environment means as much in any scheme of life as ancestry, we can trace the rise of successful poultry culture to the same feminine touch that has done so much for kitchens and homes.

Culling stands next in importance, no doubt. Here, too, the trace of feminine stamina is found. Feathered flocks have been culled more closely than bovines, and maybe it's because the women are more willing to face the facts and swat the "boarders." Mark well, the menfolks raising poultry have been strong enough for ancestry and lineage when once converted, but it's the women who have proved that environment decides the result.

So poultry culture has arrived at a complex popular dominance period. It has attracted the best efforts of the scientist and the student on the one hand, and invited the attention of the racketeer and the roost robber on the other. In between these opposing forces stands the expectant farmer, hoping that what has already happened to the poor old cow is not going to sidetrack the hen.

THE farmer is often puzzled to know whether the most harm comes from his poultry-booming friends or his chicken-swiping enemies. The answer lies within his own balanced control. Let him watch out and base his actions so as to avoid pitfalls that have tripped up many a livestock career.

Men have worshipped the golden calf and paraded the pedigree paper in their excess of zeal for purebred livestock. Poultry keepers may have gone to certain extremes, but they have never sat down to eat a banquet with a *live* rooster at their sides. Many a dazzling Belshazzar's feast in our bovine bailiwick has been honored by the presence of some great bull of Bashan or a cud-chewing female of the species—accompanied by a convenient waiter armed with a scoop shovel.

Besides, the cattle associations have learned that herd tests and herd performance pay better than individual and exceptional records, and the swine boys are scaling up points now in terms of pork per sow rather than somebody's opinion at a show. Poultry have advanced to a point where they take rank with livestock, and it is up to their sponsors to shy away from the extremes into which quadrupeds have been led by promoters.

Hatcherymen are crowding the livestock breeders out of the advertising columns. Country feed stores and cream shipping stations are turning into mammoth incubator warehouses. The spring air is full of fluff and down in every village. Brood coops and hoppers outsell stanchions. Rival commercial salesmen scratch for the feed trade and mash their competitors. The fox and the rooster, the squab and the skunk are unusual co-workers in this age of fur and feathers. The Missus who urged her unwilling spouse to buy a sitting of standard-bred eggs in 1916 has a hard time keeping him from plunging wholesale into the shell game. Verily, the stone that was rejected by the builders has become the cornerstone of the temple. Just look who laid it!

AS we are aware, the periodic urge from the factory towns to the countryside has set in once more; and the hopes of many a back-to-the-lander are pinned on the poultry game. It is easy to see why they pick on poultry every time for their ventures and visions. Poultry are small in size, *supposed* to be small in feed capacity, develop quickly in $$$ signs, and require no silos, leading staffs, or consignment sales. Conveniently inclined real estate boosters tickle the imagination of the disgruntled civics, and the incubators get red hot with a rushing trade. All the schemers in the territory are laying for the prospects, even though the hens won't.

Our advice to all such is to do their poultry gambling at a holiday keno raffle. It is more sociable and far safer.

In his hints toward the making of a "perfect poultryman," an old-time writer says some unique things. He thinks that the perfect poultry raiser should combine the stubbornness of the bachelor, the fussiness of the maiden lady, the gentleness of the mother, and the common sense of the essay writer.

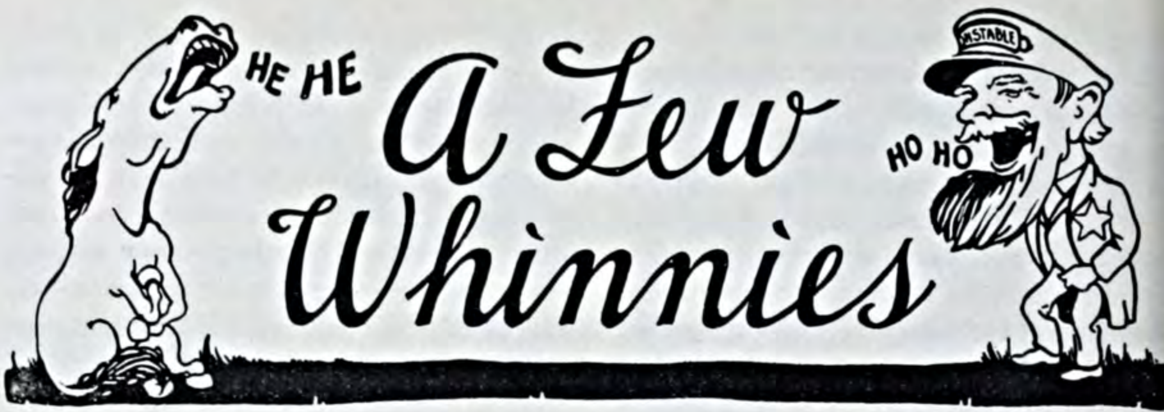
He desires that the prospect should study chemistry, biology, physics, principles of breeding, factors in feeding and nutrition, as well as a course in mechanics. If that writer were alive today he might well add a system of instruction in chain store advertising methods, veterinary medicine, and a course in life insurance selling. I am rather sorry that the advice of our old New England mentor did not take root in his day and age. The surplus might not bother us so much if it had.

There's one more item about poultry culture that seems pleasing to me in theory. The fellow possessed of plenty of grit and courage and a sandy farm has a better chance than the man on the low and fertile black bottoms. This kind of evens things up a little in the old agricultural world. Light, shifting sand farms have been the prison of so many hopes and the bar to so much achievement that it really helps a heap to know that the factors of good drainage and warmth on those types of soil supply a good foundation for poultry profits. And the folks on those lands will know enough to regard the *location* of the plant as one thing and the upbuilding of the adjacent crop acres as another. Here's to milk-fed fowls on sand-bed farms!

AS I wind up the story it appears that no mention has been made of commission firms, cooperative marketing, or the return of the turkey from oblivion and black leg. But something must be saved for another chapter.

Neither have I any preference nor prejudice for the various breeds with which to entertain or embitter you. But my youngest daughter has. She thinks that some conjurer in genetics should invent a chicken with more than two drum sticks and one wishbone.

Tombstones are cold and cheerless. Yet they always have a good word for everyone under them.



THIS WASN'T BRIDGE

"Deacon White," asked Parson Jackson softly, "will you lead us in prayer?" There was no answer.

"Deacon White," (this time a little louder), "will you lead?"

Still no response. Evidently the deacon was slumbering. Parson Jackson made a third appeal and raised his voice to a high pitch that succeeded in rousing the drowsy man. "Deacon White, will you lead?"

The deacon in bewilderment rubbed his heavy eyes and announced: "Lead yourself—I just dealt."

A woman went into a chemist's shop and said: "Have you any Life Buoy?"

The assistant, a young American, replied: "Set the pace, lady."

—*Tit-Bits* (*London*).

A university student received a question during an examination that he did not know how to answer. He wrote the question on his paper and gave this reply:

"God knows; I don't. Merry Christmas."

The day after New Year's he received back his paper, with this notation:

"God gets a hundred; you get zero. Happy New Year."

ONE THING SURE

"I'm afraid you can't waltz very well, Ed?"

"No darling, but I surely can intermission."

THE FIVE AGES OF MAN

"Daddy, I know how to do everything," said the little boy of five.

"What I don't know isn't worth knowing," said the young man of twenty.

"Well, anyway, I do know my own trade from A to Z," said the man of thirty-five.

"There are very few matters, I am sorry to say, that I am really quite sure about," said the man of fifty.

"I have learned a bit, but not much, since I was born; but knowledge is so vast that one cannot become wise in a short lifetime," said the man of sixty-five. —*Courier.*

"Could you tell me, plizz, Mister, where is the rest room?"

"Escalator, Madam."

"Esk you later? I gotta go now!"

—*Fusion Facts.*

"When did the robbery occur?" the cross-examining lawyer asked the witness.

"I think—" he began.

"We don't care what you think; we want to know what you know," remarked the lawyer.

"Well, I may as well get off the stand, then," said the witness. "I can't talk without thinking. I'm no lawyer."—*Fyr-Fyter News.*

IMPOSSIBLE

Teacher (to boy who is misbehaving): "James, sit down in front."

James: "I can't. I'm not made that way."

NEARLY

Half a Billion Dollars

(including renewals)

Have Been Loaned by
The Federal Intermediate Credit Banks

SINCE 1923 TO

85 Farmers' Co-operative Marketing Associations with a membership of more than 1,250,000 individuals

THESE loans have been made upon warehouse receipts covering the following commodities to enable co-operatives to carry out their orderly marketing programs:

Wheat, barley, rye, flax, cotton, tobacco, wool, rice, broomcorn, red top and alfalfa seeds, evaporated milk, beans, cheese, olives and olive oil, canned and dried fruits, cold pack fruits, canned vegetables, hay, peanuts and other nuts, and honey.

The interest rate on these loans has averaged approximately 5%.

In addition these banks have discounted agricultural paper (farmers' notes) for agricultural credit corporations, for banks —both state and national—for livestock loan companies and other financial institutions amounting to more than $400,000,000 including renewals. The Intermediate Credit Banks do not make loans directly to individuals.

The 12 Federal Intermediate Credit Banks located at

Springfield, Mass.	New Orleans, La.	Wichita, Kan.
Baltimore, Md.	St. Louis, Mo.	Houston, Tex.
Columbia, S. C.	St. Paul, Minn.	Berkeley, Calif.
Louisville, Ky.	Omaha, Nebr.	Spokane, Wash.

500,000 Farmers

Have Borrowed from the 12 Mutual Federal Land Banks a Billion and a Half Dollars at an average interest rate of

5.4%

THIS $1,500,000,000 in long-term loans secured by first mortgages on their farms provided much needed capital during a period when funds were scarce and the average farm income low. All but a small percentage of these farmers have met their obligations. The 12 Banks have total capital, legal and other reserves and undivided profits aggregating more than $84,000,000. Their total assets exceed $1,300,000,000. The net carrying value of the real estate, sheriffs' certificates and similar items owned by the 12 banks on November 30, 1929, was only 1.1% of their assets.

The services of the 12 Banks and the National Farm Loan Associations through which the loans are made have been of inestimable benefit and they will increase in the future.

The 12 Federal Land Banks are located at

Springfield, Mass.	New Orleans, La.	Wichita, Kan.
Baltimore, Md.	St. Louis, Mo.	Houston, Tex.
Columbia, S. C.	St. Paul, Minn.	Berkeley, Calif.
Louisville, Ky.	Omaha, Nebr.	Spokane, Wash.

Printed in U. S. A.

Better Crops WITH PLANT FOOD

December 1930 10 Cents

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

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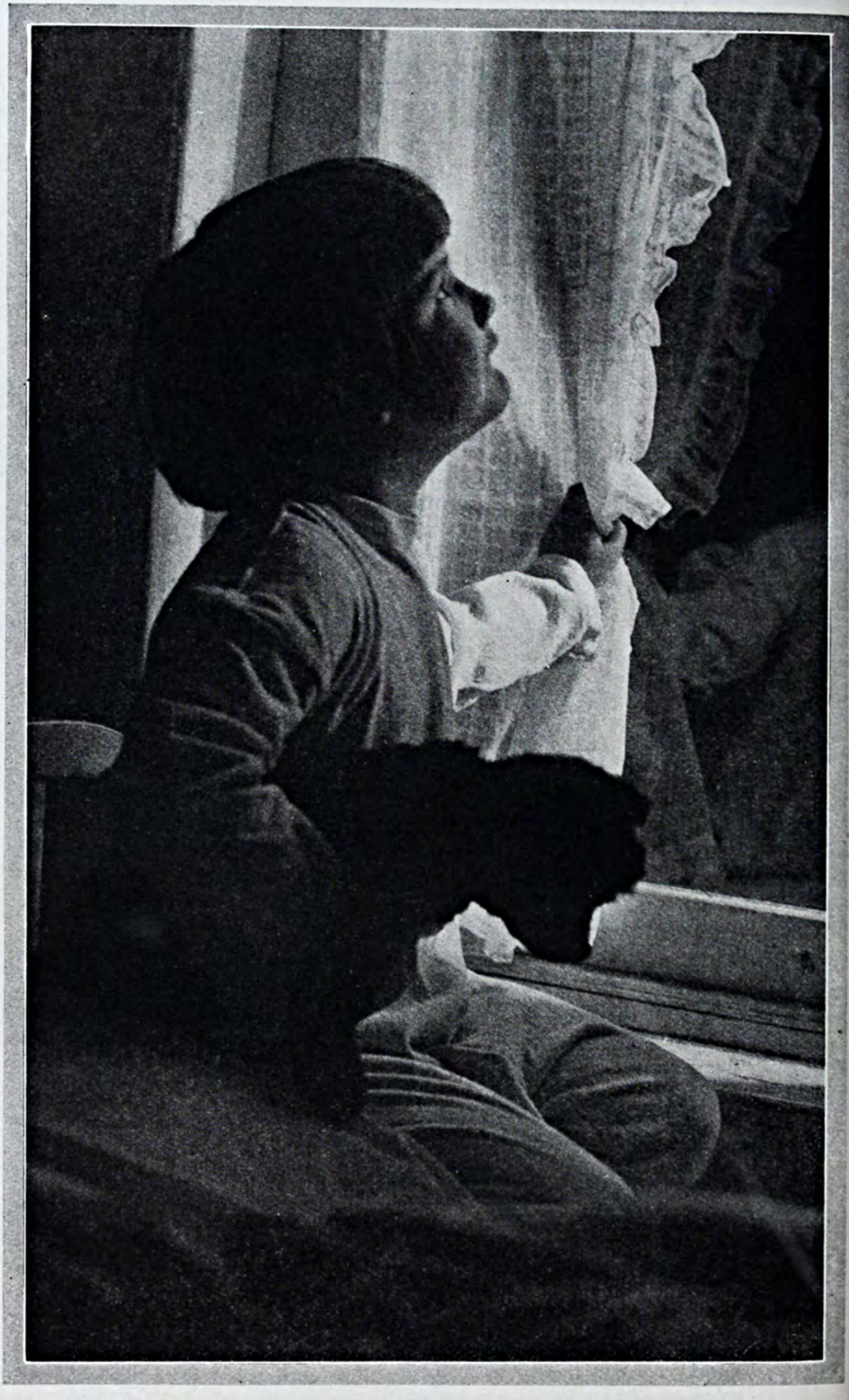


Awaiting the Reward for Good Behavior

Better Crops with PLANT FOOD

PUBLISHED MONTHLY BY THE BETTER CROPS PUBLISHING CORPORATION, INCORPORATED UNDER THE LAWS OF THE STATE OF NEW YORK, WITH OFFICES AT 19 WEST 44TH STREET, NEW YORK CITY. SUBSCRIPTION, $1.00 PER YEAR; 10c PER COPY.

VOL. XV NEW YORK, DECEMBER, 1930 No. 6

Jeff takes us back to the Yuletides of our childhood—

Chimes *and* Tinsel

By Jeff McDermid

SANTA CLAUS has joined the Salvation Army this winter, and Columbia has become a spiritual medium—trying to make the "ghost walk." Our philanthropy and our patriotism have at last joined forces.

Uncomfortable "economic readjustments" have certain compensations at this season. Those with jobs and those without them must get down to fundamentals again in their thinking and living. To be thankful in November or to be merry in December appears more vital to those who have cause for thanks or happiness, and more singularly precious to those who temporarily lack it.

Peaks and hollows in the index line of prosperity form a kind of pictorial saw blade with which we cut through the cambium layers of life and get right down to the heart-wood and the sap of sense.

The elemental things of life lived in a simple way stand out starkly against a modern haze of recently acquired habits and desires. Right here among the dazzle and the speed of the world's most sophisticated civilization we return to many of the absorbing realities, both material and spiritual.

That loaf of well-earned bread, that shovelful of coal on established credit, the exhilaration of snow cleaning on your own doorstep, that glow of health and that enthusiasm for work to be done before sundown—all take on a crisper, heartier, and more potent power. We are content to be John Jones with a Job. It's very tough on ambition and competition, but an excellent purgative!

And along with the sense of those primary necessities and privileges still vouchsafed to some of us, I am sure that we have a trifle more of the honest spirit of human sympathy which prompts us to have some real Christman virtues in our stock of brotherly barter instead of crowding them all into the show windows. Those are stocks that we do not need to mark down or discount in order to make them current assets.

AFTER all, many of us have passed through the same trying experience as the country merchants. We have had to rearrange our goods on nifty lines; we have been forced to paint our store-fronts and put in costly plate glass windows—just to hold the trade in soap chips, prunes, and floor mops that some high pressure Pete has forced us to protect with pride. We have dealt in the same old commodities in the main, but we have leaned toward speed and service, letting them supply most of our sentiment from Hollywood or Greenwich village, fully assembled and screen grid. Some of us have been so busy ringing up change that we failed to hear the chimes.

And there's a lesson for me in Christmas candles, too. Over at our house we light candles only at Christmas or during summer electric storms. In other words, when there is either perfect peace or holy terror we reach for the old beacons of simplicity. The rest of the time we punch the button and cuss the utility dynamics. Of course, nobody wants to return to tallow dips and candle-light, but regarding them as symbols of simplicity, we still find use for them in one extreme or the other.

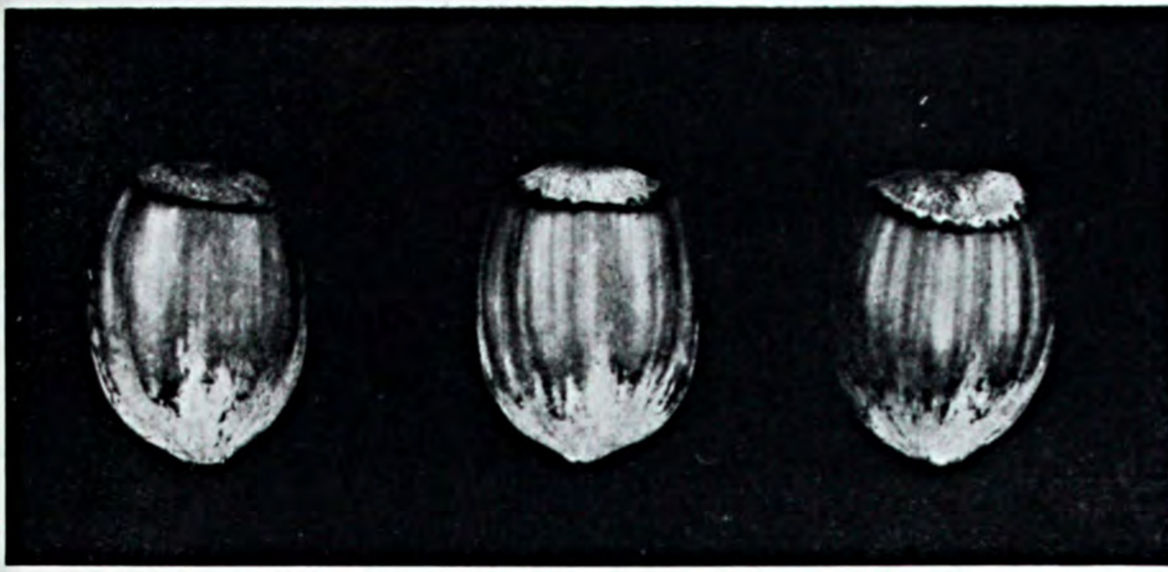
You may cite taxes or tariffs or anything you please as the phantom at the feast, but as for me, I regard the high cost of complexity as the thing that is worrying some of us. But Christmas is no time to argue with economists or to reopen any old threadbare thing except the purse. So on we go to the subject in hand.

THERE is no such thing as Christmas spirit in any true state of nature. You have heard the old classroom wheeze in physics about there being no audible sound in the wilderness when a tree falls. It is that to which I refer in saying that there is no true Christmas spirit in a void of plant life minus any human hopes and desires. Yes, and I expect that even after Adam and Eve started housekeeping there was no Christmas spirit that amounted to much, just as there is none in darkest Africa. It takes a divine spark to set it afire and a human torch-bearer to carry it onward.

And another thing, too! When civilization and hard work join hands and begin to dominate the situation anywhere, folks sometimes wish to "unlax" and forget about sweat and imagine that the world is really a place to live in. But if they ever think for a moment that Christmas doesn't come without working in advance to meet its obligations, then they simply don't have any plum pudding.

How long in anticipation do our women-folks sight ahead to plan for the merry Christmas time! How many visits to the dime store do they make, how many recipes do they practice upon us, and how many long hours do they spend bent over some

(*Turn to page 61*)



The meat of the Du Chilly filbert (pictured above in actual size) is a real mouthful.

Meaty Nuts

By M. E. McCollam

Puyallup, Washington

FILBERTS (not hazelnuts) and walnuts are adding more each season to the diversified agricultural income of the Pacific Northwest farmers. The acreage of filberts is increasing steadily under the stimulus of a good market. Fine quality, a nut growers association, and a protective tariff have all contributed to the success of this crop.

A visit to some of the filbert groves during the October harvest season soon convinces one of the surprising size and quality of the filberts now being grown. Two varieties, the Barcelona and the Du Chilly are most popular. They are amazingly fine products, a real mouthful com-

A view of Walnut Hill Farm, owned by A. W. Ward at Battleground, Washington.

pared with the old hazlenut. That wise but greedy robber, the blue-jay, hesitates not a moment in evincing his preference for the filbert, much to the annoyance of the growers.

While it may seem strange to bring the walnut from under the California sun to the North Pacific States, it still remains a fact that for a number of years a very fine grade of walnut has been produced. With careful marketing, the crop has given satisfactory returns to most growers.

Interest in fertilizer applications is quite apparent among the nut growers here, and fertilizer demonstrations are under way on two filbert groves, to the writer's knowledge. One of these is being conducted by County Agent Inskeep in the vicinity of Oregon City, Ore. Another demonstration has been located on the R. W. Grant grove near Vancouver, Wash. As time goes on these plots will yield valuable information on the place of fertilizer in nut culture.

A. W. Ward, who operates Walnut Hill Farm at Battleground, Wash., exemplifies the interest being shown in the fertilizer question. He has 18 acres of walnut trees, some being 25-year-old trees. He also has a filbert grove, fruit trees, grapes, and a carefully selected nursery stock of young filbert trees.

Mr. Ward formerly had a great deal of trouble with blighted walnuts. In 1927, out of an estimated crop of six tons of walnuts approximately five tons were blighted. He started in on a fertilizer program in the fall of 1927, using a complete fertilizer of 3-10-10 analysis. Each tree received one pound of fertilizer for each year of age of the tree, that is, a 10-year-old tree received 10 pounds of fertilizer. This fertilizer was plowed under.

In 1928 a crop of 4½ tons of good nuts was harvested from these same trees, and in 1929 the crop was 5 tons of good nuts. Since the fertilizer has been used, the reduction in walnut blight has been exceedingly gratifying to Mr. Ward, and he believes staunchly in the value of a complete fertilizer program.

Another very conclusive result has been the improvement in the flavor of the walnuts. Mr. Ward has many customers for his walnuts, and all of them remarked on this improved flavor, without knowledge that a fer-

(*Turn to page* 42)

The Franqette Walnut (actual size) has proved profitable in the Northwest.

Agronomists Meet

A Report of the Annual Meeting of the American Society of Agronomy

By G. J. Callister

New York, N. Y.

THE 23rd annual meeting of the American Society of Agronomy was held in Washington, D. C., at the Hotel Raleigh on November 20 and 21. Approximately 300 members representing practically all fields of work in agronomy and all the states were registered. The attendance set a new record for the eastern meetings of the Society, according to statements of officers, and provided striking evidence of an increasing interest in the work of the Society.

In a general session on the 20th, very interesting reports of the International Soil Science Congress held last summer in Russia were given by members of the Society who attended the Congress. The introductory remarks to the session were made by Dr. W. P. Kelley, University of California, President of the Society of Agronomy. The members who then reported were: S. A. Waksman of the New Jersey Agricultural Experiment Station, G. W. Conrey of the Ohio Agricultural Experiment Station, Richard Bradfield of the Ohio State University, A. B. Beaumont of the Massachusetts Agricultural College, and R. S. Smith of the University of Illinois.

Other important fields of work were covered in the two days by sectional programs on crops, soils, fertilizers, extension work, and a symposium on the production of quality tobacco.

Of increasing importance in agriculture are quick methods of finding out what fertilizers the soil and crop need. This important subject occupied one section of the fertilizer section program under the symposium title "Diagnosing Soil Deficiencies and Crop Needs."

The Value of Shorter Methods

Chemical methods for determining soil deficiencies are coming to the front again. Dr. G. S. Fraps of the Texas Agricultural Experiment Station discussed existing chemical methods from the point of view of their reliability in determining soil deficiencies in relation to the plant food removed by plants growing in pot experiments. Dr. Fraps concluded his remarks by pointing out that chemical analysis properly used offers a valuable method for determining soil deficiencies and that much further work on chemical analysis in connection with field experiments in the United States is needed in order to set up standards of interpretation applicable to different soils, crops, and climatic conditions in different parts of the country.

The Mitscherlich method for determining soil deficiencies and crop needs and also the Neubauer method used for the same purpose were ably discussed by M. F. Morgan of the Connecticut Agricultural Experiment Station and S. F. Thornton of the Indiana Agricultural Experiment Station, respectively. S. F. Thornton has done excellent work on correlating the Neubauer method with known crop records due to fertilizers. The contributions of field experiments and their places in an agronomy program were discussed by H. J. Harper of the Oklahoma Agricultural Experiment Station, and the value of plant symptoms in determining nutrient deficiencies of soils was presented by J. P. Jones of the Massachusetts Agricultural Experiment Station. Excellent points were brought out in each paper.

It is very significant and encouraging that scientific thought is being given to the shorter methods of diagnosing soil deficiencies and crop needs. It was emphasized that under certain conditions, field plot experiments will always be of value, but that other methods also have a place in our agricultural program.

Other Important Discussions

The new fertilizers, mono- and diammonium phosphates, which are increasing in use were ably discussed by R. M. Salter of the Ohio Agricultural Experiment Station. He has brought this subject up—not to date, but today. Ammonium sulfates, chlorides, and nitrates were well presented by J. W. White of the Pennsylvania Agricultural Experiment Station; sodium and calcium nitrates by A. W. Blair of the New Jersey Agricultural Experiment Station; and cyanamid and urea by M. C. Sewell of the Kansas Agricultural Experiment Station. With new fertilizer materials appearing on the market, these papers become of increasing importance.

A whole section was devoted to the control of soil erosion. H. H. Bennett of the Bureau of Chemistry and Soils brought out very clearly that soil erosion annually is costing agriculture in the neighborhood of $200,000,000 in soil fertility. Methods of control were discussed.

A symposium was arranged on "An Extension Program for Pasture Improvement," a subject of particular interest to the North. This included a discussion of pasture fertilization, a description of the improvement program in Ohio, in Maryland, and in Iowa, which covered three typical geographical districts where pastures are important. This is a striking case of where an extension program has gone over. Pastures are actually being improved, and farmers today are buying fertilizers and adopting other practices in better pasture management.

The importance of quality in tobacco was brought out in three addresses by E. Y. Floyd of the North Carolina Agricultural Extension Service, R. H. Milton of the Tennessee Agricultural Extension Service, and Ralph W. Donaldson of the Massachusetts Agricultural Extension Service. With the overproduction of specialized crops as cotton, tobacco, potatoes, etc., it increasingly is being shown that profit will depend on quality.

The fundamental changes in soil structure and character caused by different cultural practices were brought out in a symposium "Cultural Changes in Soils" led by M. F. Miller of the University of Missouri. The changes in the form of soil nitrogen; the modification of organic matter; changes in the calcium content; the relation of cultural practices to erosion; the effect of forest removal and reforestation; and the influence of cultural practices on a specific soil type, were discussed by various speakers.

A section was given to the important subject of plant breeding which covered breeding rust-resistant varieties of wheat, cooperative potato breeding, breeding for yields, and other phases of plant breeding. Another section was devoted to a general crops program.

On Thursday evening, November 20, the annual dinner was held at the

THE WINNERS IN THE COUNTY SOIL IMPROVEMENT PROGRAM

Back row, left to right—S. L. Dodd, Hardy Co., West Virginia; E. R. Morrison, Kossuth Co., Iowa; C. M. Collins representing R. J. MacSween, Nova Scotia; G. C. Norcross, Worcester Co., Massachusetts; H. E. McSwain, Charlotte Co., Virginia; Brodie Pugh, Claiborne parish, Louisiana; H. L. Royce, Clay Co., Indiana; J. N. Lowe, Wagoner Co., Oklahoma.

Front row—H. S. Benson, Knox Co., Indiana, (first honors); J. G. Beattie, Walworth Co., Wisconsin; J. L. MacDermid, Orleans Co., Vermont; Gordon Skinner, Haldiman Co., Ontario; R. E. Norcross, New Haven Co., Connecticut; H. M. Critchfield, Lawrence Co., South Dakota; E. A. Cleavinger, Coffey Co., Kansas; J. N. Kavanaugh, Brown Co., Wisconsin; and R. H. Clemens, Wellington Co., Ontario.

Hotel Raleigh, when Dr. W. P. Kelley, President of the Society, presided at the dinner and a general session following and delivered a most instructive, easily understood, and illuminating presidential address on "The Agronomic Significance of Base Exchange." Dr. Kelley is to be highly congratulated on a simple presentation of a difficult subject.

Officers for 1931 were elected as follows:

President, W. W. Burr, the University of Nebraska; first vice-president, A. B. Beaumont, Massachusetts Agricultural College; second vice-president, S. A. Waksman, New Jersey Agricultural Experiment Station; third vice-president, George Stewart, U. S. Forest Service; fourth vice-president, R. I. Throckmorton, Kansas State Agricultural College.

The executive committee reappointed as secretary-treasurer, P. E. Brown of Iowa State College, and as editor, J. D. Luckett of the New York Agricultural Experiment Station.

For outstanding work in agronomy, the following were elected fellows of the society:

Dr. W. P. Kelley, the retiring president; Professor F. S. Harris of Utah State Experiment Station, and Professor J. A. Bizzell, of New York State College of Agriculture.

The winners of the Chilean nitrate of soda nitrogen research awards were announced at the meeting. The sum of $5,000 was divided between Dr. J. K. Wilson of the New York State College of Agriculture, Ithaca; Dr. J. J. Skinner of the Soil Fertility Investigations of the Bureau of Chemistry and Soils, U. S. Department of Agriculture; and Dr. L. J. Willis of the North Carolina Experiment Station, Raleigh.

At a dinner given by the National Fertilizer Association, to which many members of the United States Department of Agriculture and the state agricultural colleges and experiment stations were invited, announcement was made of the winning county agricultural agents in the contest for the best county soil improvement program developed during the year. This contest is sponsored annually by the Association, and a similar contest is sponsored by the Soil Improvement Committee in Canada. Fourteen county agricultural agents in the United States and three agricultural representatives in counties in Canada won prizes. All were guests at the dinner, with the exception of Mr. R. J. MacSween of Nova Scotia who unfortunately could not be present and was represented by C. M. Collins.

The Winners

H. S. Benson of Knox county, Indiana, won the sweepstakes and was given first honors in the competition, and E. R. Morrison of Kossuth county, Iowa, was designated as runner-up.

The other United States winners were: G. C. Norcross, Worcester county, Mass.; Horace E. McSwain, Charlotte county, Va.; James G. Beattie, Walworth county, Wis.; H. M. Critchfield, Lawrence county, S. Dak.; S. L. Dodd, Hardy county, W. Va.; E. A. Cleavinger, Coffey county, Kans.; J. L. McDermid, Orleans county, Vt.; J. N. Kavanaugh, Brown county, Wis.; J. N. Lowe, Wagoner county, Okla.; H. L. Royce, Clay county, Ind.; Roy E. Norcross, New Haven county, Conn.; and Brodie Pugh, Claiborne parish, La.

The Canadian winner of first place was Gordon Skinner of Haldiman county, Ontario; and the second-place winners were R. H. Clemens, Wellington county, Ont.; and R. J. MacSween of Nova Scotia.

Mr. Benson, first-place winner among the American county agents, responded for all of them at the Association's dinner, and emphasized that every county agent who took part in the contest got enough benefit out of it, for himself and his farmers, to make the effort worth while. It was a contest in which everybody won, he declared.

The winning group of county agents appointed a resolutions committee which offered to the National Fertilizer Association and other fertilizer organizations their very cordial appreciation of the opportunity that had been provided them.

They pointed out the several values of the contest as derived by the agricultural agent, by the county in which they work, by other agricultural agents, and by neighboring communities. The resolution concluded with the recommendation that the contest be continued and that copies of resolutions be sent to each of the Directors of the State Extension Service and other county agents.

Soil Survey Meetings

The meeting of the American Society of Agronomy was preceded by two days' sessions of the American Soil Survey Association. This organization, which was holding its eleventh annual meeting, likewise had the largest gathering in its history, with a registration of 175 from its total of 246 members.

While this society has given little attention to fertilizer problems up to this time, the probability that it will do so was indicated by A. M. O'Neal, secretary-treasurer, who is with the U. S. Bureau of Chemistry and Soils station at Houma, La.

"Mapping of soils of the United States," said Mr. O'Neal, "takes into consideration not only the character of the soils themselves, which results in the classification and mapping of the different soil types of each section, but also gives due regard to the cultural features of the problem.

"In connection with the growth of crops on different types of soil, work

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ALFALFA NEEDS PLENTY OF POTASH AS WELL AS LIME

In fertilizer tests on alfalfa, 300 pounds of muriate of potash applied biennially produced a return of 3,047 pounds while the return on the unfertilized plot was only 2,005 pounds. (Figures on signs are first season's yields; cocks are first cutting, second season.)

POTASH AND SAND

By G. E. Langdon

Wisconsin College of Agriculture

HELPING the farmers of Central Wisconsin to find the relation between sands and success is the task of Professor A. R. Albert, who directs the Hancock-Coddington Experiment Station of the Wisconsin College of Agriculture.

In the central part of the state there are great stretches of sandy soils—sandy loams, fine sands, and sands—making up about one-fifth of the entire area of Wisconsin. Mr. Albert believes, however, that all but the poorest of the level sandy soils and all except the hilly and stony sands and sandy loam soils can be cropped successfully by choosing well-adapted crops and building up and maintaining the fertility of the soil. He explains that although crop yields on sands will not be so high as on heavier soils yet on the other hand, tillage costs, taxes, interest on the land investment and the labor losses due to wet weather will also be considerably less than on heavier soils.

After ten years of careful study and experimental work at Hancock, together with cooperative trials carried on by county agents and farmers in that vicinity, Mr. Albert has a number of interesting results and suggestions for farmers of light soils.

He maintains that legumes are the foundation of any plan for permanent light soil improvement on general crop and livestock farms. Legume green manure, hay, pasture, or seed crops (new seedlings not counted) should occupy no less than one-third and preferably one-half of the tilled acreage of the farm every year. Of course, the farmer must remember that the gathering of nitrogen and the production of organic matter depend directly on the favorableness of growth conditions for the legume.

To be sure, the effect of weather on plant growth is largely beyond control, but Mr. Albert emphasizes that the plant food supply in the soil can be improved when necessary. The best of the legumes, like alfalfa, clovers, and sweet clover require lime, potash and phosphoric acid in abundance. Sometimes one, oftener two, and frequently all three of these plant foods need to be supplied to light soils before these crops can make their best growth.

Sands Are Low in Potash

In the first place, sandy soils are naturally low in available potash; and besides, cash cropping of various kinds, without returning much of anything to the fields, has quickly used the more available potash. Dairy farming, in some cases, has also reduced the supply because of manure leaching. For these reasons the removal of potash from the soils has been hastened. At present, legume crops, which require nearly as much potash as lime, are consistently failing unless potash first is supplied in manure or fertilizers. These failures, due to potash starvation, have been blamed to poor seed, wrong varieties, drought, and winter-killing.

"When inoculated legumes on limed sandy ground in seasons of moderate rainfall make poor or spotted growth, potash is usually needed," explains Mr. Albert. "In severe cases, alfalfa leaves may show little round white spots around the outer edge of the leaves. Potatoes show a need for potash by a dark green foliage, leaves somewhat curled down and apparently thicker than normal. Soybeans have irregular wrinkled leaves with yellow spots which turn brown prematurely. Grain which is suffering has not the bright clean straw of the normal plant. Potash is essential to plants in the making of starch and when there is a lack, potato tubers will not develop as vine growth promised and corn is unable to fill out the tips of its ears."

Potash Develops Vigor

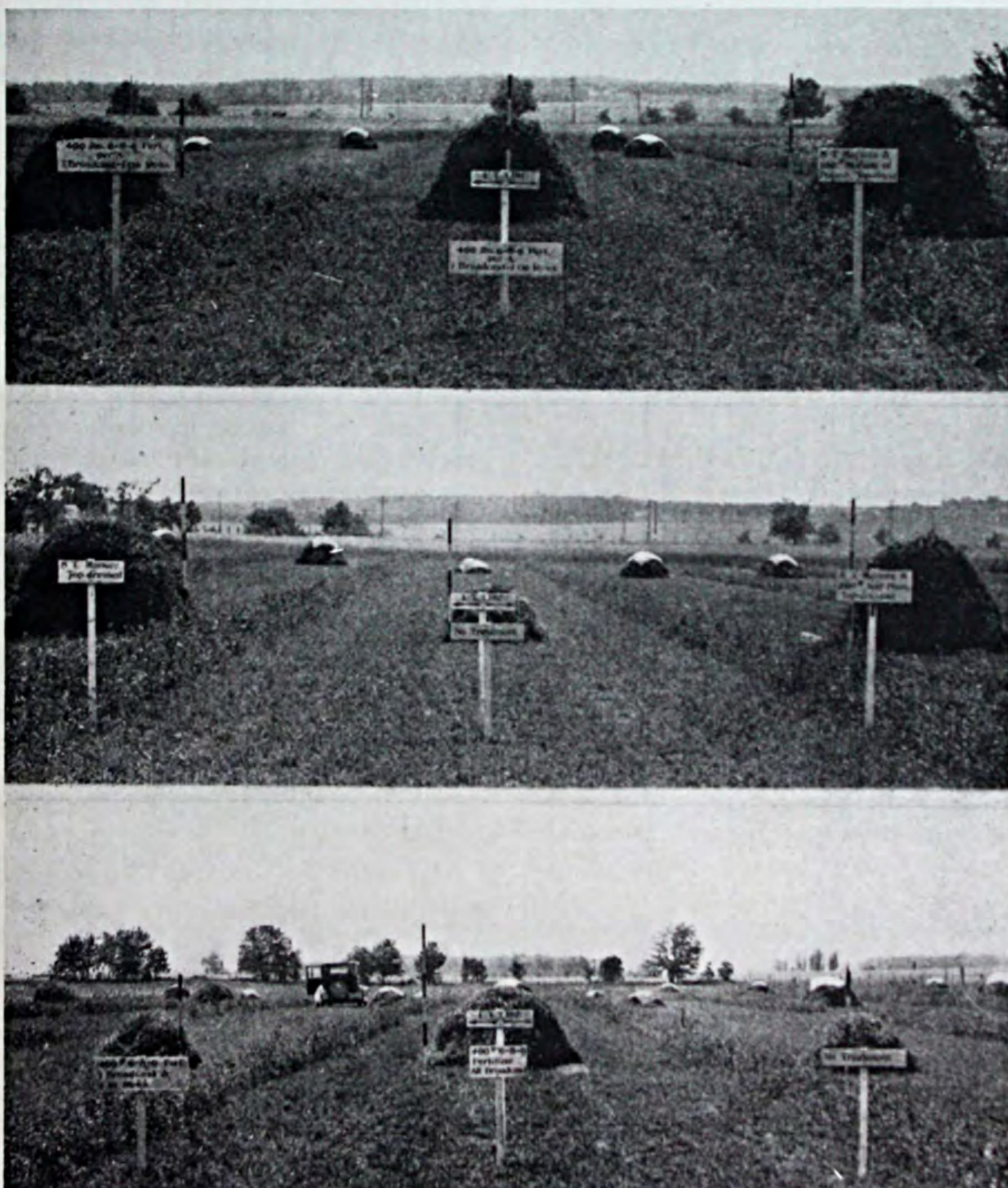
"While winter-killing can and does occur as in the winter of 1927-28, most failures of legume stands are due to a lack of potash. That same winter at the Hancock Experiment Farm, both common alfalfa and red clover carried through stands (about one-third and one-half thinning respectively) on plots where ample potash had been supplied with manure, fertilizers, or both. Where phosphate alone and no manure or other fertilizer were used, the loss of stand was total. This same observation was made on many cooperative fertilizer demonstration plots and by farmers who use fertilizers. In a word, vigorous plants stand more hardship than those on a reducing diet; and an abundant potash supply develops the needed vigor."

Alfalfa is the best hay crop to grow on light soils if they are properly prepared, according to Mr. Albert. Many have found that alfalfa furnishes hay of the highest quality and roots deeply enough to produce a good yield even in dry seasons. This crop involves less labor to maintain and gives a larger net return than any other crop on light soils.

Farmers also think highly of this crop, as indicated by the fact that in 1918, the counties of Adams, Green Lake, Juneau, Marquette, Portage, Waupaca, Waushara, and Wood, in

Wisconsin, had a total acreage of 586 devoted to alfalfa. In 1921 this had been increased to 2,107, in 1924 to 12,006, and in 1927 to 29,480 acres.

The first step in successful alfalfa growing, according to Mr. Albert, is to be sure that the soil contains lime or has been supplied with it in the form of ground limestone, marl, paper-mill or beet-sugar-factory sludges. County agents, high school teachers of agriculture, or the state college of agriculture will test soils for the amount of lime needed. Use enough lime, but not a large excess as it will do no good. Apply lime, preferably six months to a year before seeding, and mix it thoroughly with the soil. Do not plow the land after the first liming.



MAMMOTH CLOVER ON HANCOCK EXPERIMENT FARM FERTILITY PLOTS IN 1927

Fertilizers were applied two years before for corn. *Top*—The 0-8-6 equals the 6-8-6, but manure and potash gave the best yield of all. *Center*—Manure alone was some better than 400 pounds of 6-8-6, but the addition of superphosphate (16%) brought no improvement. *Bottom*—Fertilizers without potash (6-8-0) produced no better crop than was produced on the untreated plots.

"The soil must be fertilized with manure or a potash and phosphate fertilizer. Ten tons of unleached manure supply as much actual potash as 200 pounds of muriate of potash or 500 pounds of an 0-20-20 fertilizer. Since manure is a well-balanced fertilizer for non-legumes, and since light soil farms very seldom produce enough, it is best to use the manure produced for corn, potatoes, etc., and use potash and phosphate fertilizers on alfalfa and other legumes, and compel them to get their nitrogen from the air supplies.

"On sandy loam soils or on well-stocked dairy farms on lighter sands, start the seedlings with 375 to 500 pounds of 0-14-14 or 250 to 300 pounds of 0-20-20 and then top-dress every two years with 150 to 250 pounds of clear muriate of potash, or 300 to 500 pounds of a high potash-low phosphate fertilizer. *This top-dressing is important.*

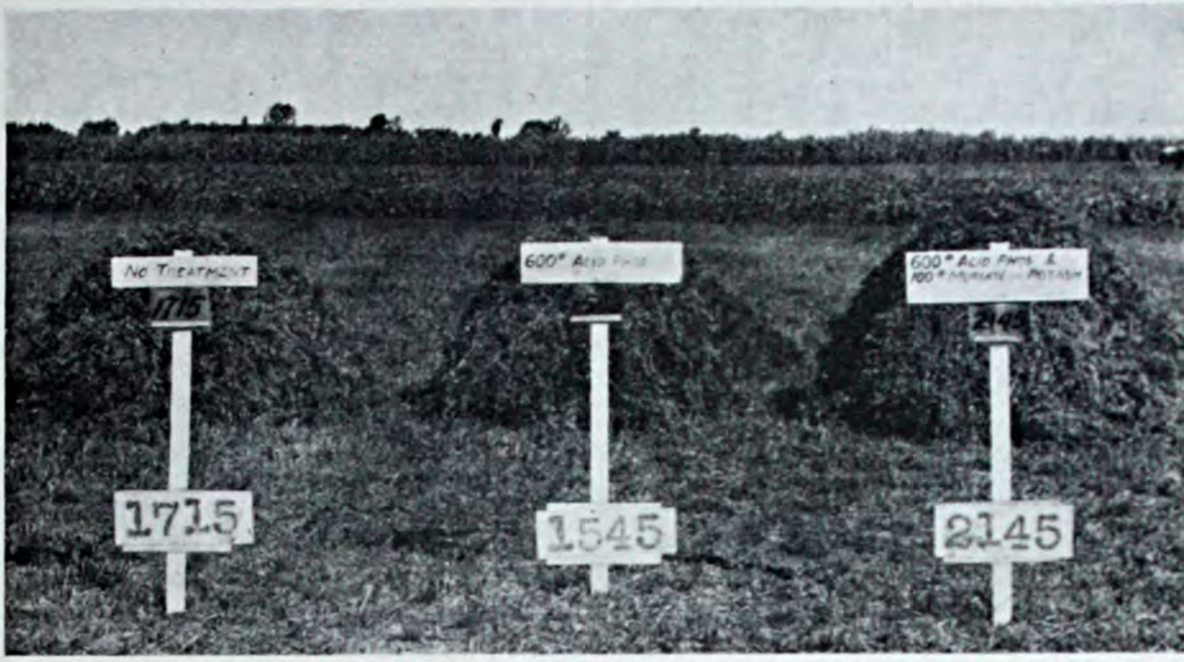
"On sands of fair fertility, but not well manured, use the higher potash analyses such as 0-8-24 or 0-8-32, using 250 pounds per acre for starting seedings and top-dressing at 300 to 400 pounds per acre every two years. Green manuring or barnyard manure is not required, but lime application should be made as suggested, and careful inoculation is imperative.

"When sands or sandy loams are extremely low in organic matter, grow a crop of soybeans first for green manuring and disk them in with the lime or plow them under and then apply lime. Grow the soybean green manure with manure plowed under or 375 to 500 pounds of a high potash-low phosphate fertilizer applied before the soybeans are sown. In this case the alfalfa seeding need not be fertilized further, but top-dressings as above are still called for.

"Straight superphosphates (20%, 24%, or 45%) and clear muriate of potash (50%) may be used instead of the mixtures suggested, either applied separately or home-mixed. The rate of phosphate used depends on its phosphoric acid content, the soil itself, and the amount of phosphorus-bearing feeds purchased, but for average conditions may well be used at the rate of 40 to 50 pounds per acre of 20% superphosphate for each year of the rotation, that is, 250 pounds per acre for a 5-year rotation.

LIME ALONE MAY NOT GROW CLOVER

Note effect of fertilizer treatment consisting of 200 pounds of 50 per cent potash and 100 pounds of 45 per cent phosphate.



ALFALFA RESPONDS QUICKLY TO POTASH

Superphosphates without potash are seldom helpful to legumes. This is a picture of the second cutting, first season. The yields for the first cutting were: no treatment, 1,715 pounds; 600 pounds superphosphate, 1,545; and 600 pounds superphosphate and 100 pounds of potash, 2,145 pounds.

This is a maintenance and improvement ration for sandy livestock farms.

"The rate of muriate of potash application should be suited to the previous manuring history and the soil, using more for the lighter soils and less when manure was used generously. From 150 to 300 pounds per acre applied for alfalfa every two years will cover the needs. Use 300 pounds on very light sandy soils which have not received manure for five to ten years. All the phosphate may well be applied at the time of seeding either in the commercial mixture or as clear superphosphates but it seems better to apply the potash in moderate doses every two years as suggested.

"When manure production becomes larger, a top-dressing with manure can always replace a fertilizer application, but should not be made at the expense of the non-leguminous crops on the farm.

"Initial fertilizer applications are made from one day to a month before seeding, preferably the shorter time, and worked at once. Top-dressings are best made immediately after the first cutting, but can be made after the second cutting or very early in the spring. Do not top-dress fertilizers on frozen ground. It is better but not essential to work in the top-dressings.

"Manures or other nitrogen-bearing fertilizers for top-dressing favor the encroachment of grasses and weeds. Keep inoculated alfalfa stands thrifty with ample and timely potash and phosphate applications and they will be more likely to hold the ground against June grass than when manured or untreated. Fertilization or manuring every two to three years will tend to preserve stands. So-called winter-killing is very frequently due to potash starvation."

Mr. Albert has worked out an interesting set of figures showing the amount of actual potash needed by attainable yields of various sandy land crops. For instance, 2½ tons of alfalfa hay remove from the soil 111.5 pounds of actual potash. We should expect 2½ tons per acre per season. Assuming that the available soil supplies are very low it may be calculated that this acre would require an annual application of 223 pounds of 50 per cent muriate of pot-

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Eye-Mindedness

By A. Larriviere

Teacher of Vocational Agriculture, Sunset, Louisiana

THE saying that farmers are eye-minded has been clearly brought out in the Sunset, Louisiana, community during the last 10 years, as shown by a survey which was made by the writer to determine the extent of fertilizer utilization, 1920 to 1930, indicating an increase of 1,000 per cent.

Ten years ago when fertilizer was stressed in this community, the only thing farmers knew was phosphate fertilizer and a very low grade at that. It was all they wanted to know up to 1928, when special efforts were made by influential farmers and business men, who were in the fertilizer business, to encourage a more judicious use of better balanced fertilizers. They had been studying results of experiment stations and wanted the farmers to benefit from such work. The result was that these fertilizer dealers had to actually give away fertilizer in order to get some of the farmers convinced as to the results which could be obtained. This work has been carried on up to this year and probably will be continued as new facts are being obtained year after year.

Community Interest

The actual cost of one concern for such work last year was $420.00 for fertilizer which was given to various farmers in the community for demonstrations on cotton and Irish potatoes. The advocators of this work were not only interested in selling fertilizer, but also in the general prosperity of their community. Knowing that plant food material was diminishing every year, they saw the need of educating the farming element along that line. They also are educating farmers in maintaining soil fertility through leguminous crops and crop rotation.

In 1928 these men, bankers, and other business men saw the need of also educating the farm boy agriculturally. As a result a Smith-Hughes agricultural department was established. Both fertilizer dealers in the community say that more fertilizers have been sold since 1928 due to the influence of the vocational agriculture department and the boys, who are required to take home projects.

From 1920 through 1927 there were approximately 50 tons of commercial fertilizers, mainly phosphate, sold annually. In 1928 there were 150 tons sold of which approximately 50 per cent were complete fertilizers. The sales of 1929 were 300 tons, 70 per cent of which were complete fertilizers; this year, 600 tons of which 78 per cent were complete fertilizers.

A study of the above figures shows a general trend towards more complete and balanced commercial fertilizers. The survey also shows a great increase in the utilization of this material. It was also found that farmers are demanding a better grade of fertilizer every year.

From experiments which have been conducted locally and from observations made by the writer and others interested, it was noticed that where a high analysis of potash was used on cotton a higher yield was experienced.

In order to better inform the farmers of the community along various lines, these business men join hands with the farmers and attend the adult evening classes which are conducted in the department of agriculture of the Sunset High School.

Cabbage for Kraut

By E. R. Lancashire

Ohio State University

THE subject of cabbage for kraut manufacture needs little introduction. Changing practices and recent research findings are much more interesting to the grower. Cultivation theories, acceptable variety names, planting dates, and plant growing methods are always valuable to those who seek ways of increasing yields and thus stimulating interest in contracting acreage.

Some 4,500 years ago man began to grow cabbage. He has been at the job ever since and has made some radical changes. Many a grower in Ohio can recall when cabbage plants were started several months ahead of the time when they could be safely set in the field. There are still a few growers who stick to the older and more slowly grown type of plant.

Some men buy their plants. Within the last five years one group of cabbage growers tried such a plan for the last time. Their crop that particular year was largely flowers instead of saleable cabbage. They had need of a florist if any profit was to be forthcoming. The growing of cabbage for kraut is a special business which pays the largest dividends to those who understand its needs.

Cabbage will grow on all soil types. Good crops are produced on sands, mucks and clays. Cabbage is about 90 per cent water and the best yields are produced on soils which can supply the needed amount. Such a soil must be fertile and well supplied with organic matter. Good drainage is necessary because the plants cannot stand an over-supply of water any better than they can an under-supply. Acid soils need lime because the crop responds to it and because the club-root disease is most easily controlled by this method.

All soils on which cabbage is to be planted should be tested and enough lime applied to make the soil neutral. For immediate action hydrated lime or high grade, finely ground limestone should be used. This lime needs to be worked into the surface soil so that it will bring about the desired soil reaction in the region occupied by the cabbage roots. Soil samples are analyzed free at the Ohio State Uni-

Intensive farming with heavy fertilization allows two crops of cabbage to be grown in one year.

versity and the amount of lime required by each soil sample is stated.

Fall plowing is especially desirable where sod land is to be used. The vegetable matter will then be partially decayed by spring and the soil will be in good condition to receive the crop. Soil preparation should be made with the idea of conserving all the moisture possible. Early spring plowing, followed by harrowing at intervals to keep weeds under control and to prevent soil cracking, will conserve soil moisture.

Plant Food Needs

Cabbage is very commonly grown on newly plowed sod land which has been top-dressed with stable manure. When grown after a cultivated crop, it is advisable to precede it with a green-manure crop such as rye to be plowed under early in the spring about the time the first joint stage is reached.

The cabbage plant is a gross feeder and it requires a good fertile soil for profitable returns. Since the tests show that the crop responds well to liberal applications of manure and lime the problem of feeding the cabbage plants is a simple one if these materials can be obtained in sufficient quantities. Where this is not possible the use of a 4-12-4 at the rate of 500 pounds per acre applied broadcast and at a depth of 2 or 3 inches is a satisfactory substitute.

The 4-12-4 is suggested for sandy soils, silt loams, clay loams, or clays. For mucks a very much higher proportion of potash is needed and to supply this a 3-9-18 is recommended. The same rate per acre can be used as a starting point.

The use of these chemical fertilizers will prove most profitable when the cabbage field has been built up with legumes. The soil which is neutral and which contains a sufficient amount of organic matter can be made to produce 20-ton yields of cabbage for kraut through the use of chemical fertilizers. Side-dressings of nitrogen can be applied at two-week intervals as needed until the cabbage is half grown. Such treatments are needed whenever the rate of growth is too slow. Where the organic supply of the soil is not sufficient, the amount of fertilizer can be increased from 500 to 1,200 pounds, but the better way would be to select a more fertile field.

Plants for the late crop are usually grown in especially prepared seedbeds, adjacent to or nearby the field in which they are later to be set. The seedbed should be well prepared, fertile, and removed from sources of disease and insect infection if possible. From ¼ to ½ pound of seed should be seeded in rows 6 to 8 inches apart to provide enough plants to set an acre. This means about 20 seeds to the foot, which will provide sufficient plants to allow selection of the largest and most vigorous for transplanting. Plant selection is important when plants are to be transplanted direct from the seedbed to the field. The Pennsylvania Experiment Station in a three-year experiment with Danish Cabbage obtained an increase in yield of over eight tons per acre by using large plants in place of small ones.

Seedbed Preparation

Long Island growers sow seed in field beds and the first essential in the preparation of a good seedbed is that it be made well in advance of the date of sowing. The land should be plowed, harrowed, fertilized, and smoothed so that it is all ready for seeding, and then it must be allowed to lie at least two weeks to be settled and packed by rains. After the bed is properly settled all the preparation that is necessary before sowing is to scratch the surface with a rake or weeder to give a scant inch of loose soil. Many make the mistake of using a harrow and stirring the soil thoroughly to a depth of three inches with the result that this loose soil soon dries, leaving the freshly sown seed without moisture. Further, where there is so much loose soil the drill sinks in and plants the seed too deep. With a well-prepared bed, however, the seed is sown about three-fourths of an inch deep and lies on soil which is moist and undisturbed. Seed sown in this way will germinate and come up during dry weather because the solid bed on which the seed lies is moist. In addition, the seed is sown shallow enough so that a rain will not wash it out, nor is it so deep as to have difficulty getting above ground.

Cabbage plants for the late crop can be grown in the open. The seed is sown about five weeks before time for planting in the field. Heavy fertilization of the seedbed is not desirable since a rich soil is likely to produce too rapid growth.

Cabbage varieties used for the Ohio kraut crop are Wilt Resistant All Seasons, Resistant Marion Market, Globe, and Allhead Select. These varieties are all wilt resistant. About one-half the plantings are made with All Seasons. Marion Market is a selection from Copenhagen Market. Globe is a selection of Glory.

Strain tests with cabbage seed both at Cornell and at Penn State have shown that strains of a given variety from various sources often vary from 40 to over 100 per cent in yield. Growers are urged to use every care in choosing seed for commercial planting. It is a good practice to try out the seed a year in advance.

A typical scene at a factory during the kraut-making season.

Cabbage is a cool season crop hence most of its growth is made late in the growing season. Success depends on the temperature during July, August, and September. Seed sown April 15 to May 1 will permit setting between June 1 and June 15. The plants should be watered well before they are removed from the seedbed.

Maximum yields are usually not possible when the plants are set in checkrows to allow cross-cultivation. It has been demonstrated experimentally that standard late varieties should be set no farther apart than 18 inches in the rows 30 inches apart. Horsedrawn transplanters save labor and aply water automatically about the roots of each plant. Machine transplanters do better work than is usually done by hand. They open the furrow, apply water around the roots, and pack the soil around the plant.

In the cultivation of cabbage great care must be exercised to prevent the

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The Inquiring Mind *and the* Seeing Eye

By Dr. A. S. Alexander

University of Wisconsin

FOR almost 50 years I have watched from the side-lines, so to speak, the initiation, rise, development, amplification, and matchless achievements of one of the greatest governmental executive organizations the world has ever known. I refer to the Bureau of Animal Industry, of the United States Department of Agriculture, and the work of its triumphant triumverate of chiefs—Dr. D. E. Salmon, (1884-1905); Dr. A. D. Melvin (1905-1917), and Dr. John R. Mohler, the present incumbent of the position.

Few people, comparatively speaking, understand or appreciate the magnitude, complexity, and difficulties of the task allotted to the Bureau of Animal Industry, and the rare scientific, practical, professional, and executive ability necessary in the chief and personnel of the organization. Presidents have come and gone, each in his way the personification of political sagacity and efficiency; but not one of them has had to originate, institute, organize, and supervise measures more vital and necessary than those to which Drs. Salmon and Melvin conscientiously and unselfishly devoted the best years of their lives, and which Dr. Mohler, since 1917, has carried on, extended, and made eminently successful.

War on Disease

The work of the Bureau involves the building up of the animal industry of the United States, the conserving and safeguarding of the health of our livestock and, more important still, the protection of the people from maladies which might be contracted from animals and their products.

From all sides, our animals are threatened with infectious and contagious diseases, and these insidious dangers must be warded off and kept out of the country. One of the dread diseases which might gain entrance, were it not for the watchfulness and efficiency of the Bureau officials, is rinderpest which, in 1711 and 1714, spread like wild fire in Europe, killing 1,500,000 cattle. The disease still occurs in some European countries and the Philippine Islands, but never has gained a foothold in America. Contagious foot-and-mouth disease is another menacing foreign malady. It has appeared in the United States in 1870, 1880, 1884, 1902, 1908, and 1914, but invariably has been stamped out by the Bureau experts.

As recently as 1924, two outbreaks of foot-and-mouth disease gave the Bureau a tremendous fight, but the battle was won and the ailment quickly eradicated. Great battles against other diseases also have been fought and today incessant warfare is being waged against tuberculosis, hog cholera, and contagious abortion, with success in sight. In a thousand other ways the Bureau also is rendering magnificent service.

A veterinary division was established, in 1883, in the U. S. Department of Agriculture, by Dr. D. E. Salmon, and that year also saw the institution of a pathological laboratory and a government experiment station. On May 29, 1884, the U. S. Bureau of Animal Industry was established by Act of Congress, with Dr. Salmon in charge.

It was the prevalence of contagious pleuropneumonia in American cattle, and the embargo placed upon them by the British government, that chiefly led to the establishment of the Bureau of Animal Industry and brought Dr. Salmon into prominence. On July 15, 1884, the disease was discovered in Illinois, where it had come from Baltimore, Maryland. It had existed for eight months west of the Allegheny mountains, before it was discovered, and had spread in three states. In March, 1885, it was discovered in Missouri and Kentucky, and exposed cattle had been shipped to many different parts. Early in 1886 it appeared in dairy herds in the city of Chicago, and especially in the great stables of the distilleries, where hundreds of cattle guzzled slop in the most unsanitary conditions, and the disease proved deadly.

It was in the Shufeldt distillery stables that I first met Dr. Salmon, busy fighting the disease. Later, Dr. James Law was placed on charge of the eradication work in Illinois. That was a dirty, strenuous job, but it was successfully consummated and, eventually, the disease also was suppressed in New York, New Jersey, Pennsylvania, and Maryland, so that on September 26, 1892, Hon. J. M. Rusk, Secretary of Agriculture, declared the United States free from pleuro-pneumonia.

It cost the national government $1,509,100 and about five years time to eradicate the disease. The United States was the first of the large nations of the world which, up to that time, had been able completely to extirpate the disease, and Dr. Salmon deserves much of the credit for the accomplishment, together with his splendid coterie of workers in the field. It was the first great accomplishment of the Bureau of Animal Industry, and it has had many similar triumphs since that day.

Now let us look for a moment at the biographies of the three great veterinarians who have worked so efficiently for the country.

DR. JOHN R. MOHLER

Present Chief of the Bureau of Animal Industry

Dr. Daniel Elmer Salmon was born on a farm at Mount Olive, Morris county, New Jersey, July 23, 1850. After a preliminary training he became a student under Professor James

Law at Cornell University, and finished his veterinary studies at Alford Veterinary School, near Paris, France, where he came under the influence of the great Pasteur and was given the veterinary degree. Returning to America, he practiced for a time in Newark, New Jersey, and in 1876 was granted the degree of Doctor of Veterinary Medicine by Cornell University. In 1879 he was appointed inspector of the State of New York, under Dr. James Law, to help stamp out pleuropneumonia.

In 1883 he was called to Washington to establish a veterinary division in the Department of Agriculture and in 1884 organized the Bureau of Animal Industry. As its first chief, his work embraced research and the enforcement of regulatory laws. Under Dr. Salmon, the Bureau grew to a department having approximately 5,000 employees, and its activities were developed in all phases of livestock production and the related industries. Nineteen divisions and offices were established, and the ramifications of their work extended into nearly every state of the Union and into some foreign countries.

In 1905 Dr. Salmon resigned and in 1906 became chief of the veterinary department of the University of Montevideo, in Uruguay; but his health failed there and he returned to the United States where he died at Butte, Montana, August 30, 1914.

Dr. Alonso D. Melvin

Dr. Alonso D. Melvin was appointed Chief of the Bureau in 1905 and held the position until 1917. He was born at Sterling, Illinois, October 28, 1862, educated in the grammar school and business college of that city, and trained in practical livestock farm work. Then he took the course at the Chicago Veterinary College, graduated there in 1886, and immediately entered the service of the newly organized Bureau of Animal Industry. In 1887 he was transferred to Baltimore, and three years later was sent to Liverpool, England, to inspect animals for the United States. In 1892 he was recalled and placed in charge of meat inspection in the packing houses of the Union Stock Yards, Chicago, Illinois. In 1899 he was made Assistant Chief of Animal Industry and was appointed head of the Bureau on the resignation of Dr. Salmon in 1905.

Under Dr. Melvin, some of the most important campaigns of the Bureau were carried out. He instituted and successfully conducted the eradication of the Texas fever tick and, at the time of his death, 6 of the 15 states originally quarantined in 1906 were pronounced free from the parasite, with the work of elimination about complete in several other counties. Under his direction vigorous campaigns against hog cholera and animal tuberculosis were instituted and conducted, and the system of accrediting herds free from tuberculosis adopted. He was also active in promoting and organizing the dipping system for the eradication of scab in cattle and sheep of the range country, and in stamping out dourine of horses and instituting the war against contagious abortion.

Dr. Melvin was an eminently successful executive and was esteemed for his "sterling qualities as a man, his nobility of character, his gentle and sympathetic nature, and his loyalty to the purposes of the Bureau, which endeared him to all." He died suddenly in Washington, D. C., December 7, 1917.

Dr. John R. Mohler

Dr. John R. Mohler, the present Chief of the Bureau, was born in Philadelphia, Pennsylvania, May 9, 1875. Following his graduation from the Central High School in 1892, he attended Temple College for one year. He then matriculated in the University of Pennsylvania and was grad-

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Mr. O. D. Middlebrooks of Hope, Arkansas, grew in 1930 the largest watermelon ever grown. The melons were fertilized with 75 pounds of manure per hill, 500 pounds of cottonseed meal per acre, 800 pounds of 4-8-6 per acre as a side-dresser when the melons began to vine, and one ton of 14-0-10 per acre as a side-dresser applied in several applications.

WATERMELONS!

By Charles Kilpatrick

Ft. Smith, Arkansas

BACK in 1925 Hugh Laseter of Hope, Hempstead county, Arkansas, startled the watermelon growers of the world by producing a melon that tipped the scales at 136 pounds. Because of its phenomenal weight, this melon was sent to the President of the United States, Calvin Coolidge. Since then through the efforts of County Agent Lynn Smith, cooperating with the Chamber of Commerce and business men of Hope, Hempstead county has become widely known as a trucking and watermelon growing section. Farmers have turned from cotton to a safer system of farming. In 1929 Hempstead county shipped 450 carloads of watermelons, 350 cars of cantaloups, 100 cars of radishes, and 19 cars of potatoes. Dairying also plays an important part in the farming system of this county.

Because of the importance of this section in growing watermelons, the business men of this county, cooperating with the farmers, sponsor a watermelon festival annually. Thousands of

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The Different Types of Response to Pasture Fertilization

By J. B. Abbott

Agronomist, National Fertilizer Association, Bellows Falls, Vermont

THE results of the pasture fertilization experiments started by Dr. Sir William Somerville at the Northumberland County Experiment Station at Cockle Park in England in 1897, plus the known general phosphorus deficiency of most upland soils in America, have led to the more or less stereotyped recommendation to top-dress pasture land with phosphates. Without doubt that recommendation is sound enough so far as it goes, but in many cases it does not go far enough. Something in addition to phosphoric acid may be, and very often is, needed.

Two years ago, R. A. Payne, a representative of N. V. Potash Export My., Inc., and I planned and, with the assistance of numerous agronomists in the fertilizer industry and at the agricultural colleges, carried out a simple test designed to throw some light on what treatment in addition to phosphoric acid is required to give the desired response on pasture land. The results were published, under the title "Pasture Top-Dressing with Fertilizer and Lime in the Hay and Pasture Belt," by the National Fertilizer Association.

The responses secured from the different treatments in 103 tests showed very clearly that lime, potash, and nitrogen, respectively, added in that order, markedly increased the average yield; but the average does not accurately portray the real situation as it involves averaging cases where a given treatment gave a large response with cases where it gave no response at all.

Three Types of Response

Examination of the data shows that the responses fall into three general types. The first type of response, hereinafter designated as the Type 1 response, is fairly well in line with the stereotyped recommendation at least to the extent that application of phosphorus or lime and phosphorus brought in a satisfactory stand of white clover and produced a satisfactory increase in total yield and protein content.

This Type 1 response seems to have been secured most consistently in the case of soils with a considerable amount of clay in their make-up and in the case of loams which have not been very badly exhausted. Addition of potash to phosphoric acid in those Type 1 cases produced only a comparatively small increase in yield. Addition of nitrogen, of course, did produce a considerably increased yield, as it almost always does on grass land.

The second type of response, hereinafter designated as the Type 2 response, was entirely out of line with the stereotyped recommendation in that neither phosphorus alone nor phosphorus and lime gave a really satisfactory response, but the addition of potash to the lime-phosphorus treatment gave a very satisfactory response in terms of increased growth of clover and increased yield of dry matter and protein. This Type 2 response appears to have been secured somewhat oftener, on the whole, than the Type 1 response and is particularly characteristic of sandy and light loam soils and even rather heavy loam soils which have been seriously depleted in fertility. In some cases of Type 2 response where lime, phosphorus, and potash brought in a perfect mat of clover, grass was almost crowded out by the clover, in consequence of which addition of nitrogen produced only a comparatively slight increase in yield.

These results seem to indicate pretty clearly that a good many cases of disappointment in results secured by applying phosphorus or lime and phosphorus to pasture land might have been avoided by including potash in the treatment, and at comparatively small additional expense.

The third type of response, hereinafter designated, as the Type 3 response, was the type of response secured where none of the treatments succeeded in bringing in a dense stand of clover. It is characterized by failure to get a really satisfactory response until nitrogen is included in the treatment but an excellent response to high-nitrogen complete fertilizer.

Doubtless there are numerous reasons for the failure to establish a full stand of clover, among the most important of which probably are absence of a sufficient stand of clover to begin with and droughty soil. In some cases where there was an almost complete absence of clover to begin with, surface seeding has proven an effective treatment, particularly in the case of soils well supplied with moisture and of the heavier types. Surface seeding has not, however, proven generally successful in the case of soils which are at all seriously sub-

TYPE 2 RESPONSE

Farm of W. R. Tillotson, Middlesex, Vermont—Cuttings made July 8, 1930—lime, 1½ tons per acre—fertilizer treatments at the rate of 1,000 pounds per acre.

Left to right

Treatment	Green Weight Per Acre
5-10-10 and lime	8,470 pounds
0-10-10 and lime	13,008 "
0-10-0 and lime	4,840 "
0-10-0	2,724 "
Check	1,513 "

(Note the big increase on the L-P-K plot, which was due to the white clover brought in by potash.)

ject to drought, nor in my opinion is it likely to prove feasible to maintain a permanent stand of clover year after year on such soils.

It is perfectly easy to grow excellent clover on pure sand with appropriate mineral fertilization under greenhouse conditions, but growing clover, except in the most favorable seasons, on such soil under pasture conditions and dependent upon rainfall for moisture, approaches the impossible. In favorable seasons there may be a very good stand of clover, but there are entirely too many seasons of the other kind to permit dependence upon clover for forage and for maintenance of nitrogen supply on such lighter soils. The mineral fertilization-clover system of pasture management appears to be pretty definitely limited to moderately heavy soils with a rather dependable moisture supply.

It is, of course, impossible in the light of our present knowledge to prescribe the most economical treatment for every different pasture or even soil type; but such results as we have would seem to point to the generalizations:

I—That the Type 1 response, that is, good clover brought in by phosphatic fertilization, is likely to be secured only on clay soils, relatively new soils, or in connection with manure;

II—That the Type 2 response, that is good clover brought in by treat-

(*Turn to page 54*)

TYPE 3 RESPONSE

Farm of Enos Granger, Towanda, Pennsylvania—Cuttings made June 19, 1930—lime, 1½ tons per acre—fertilizer treatments at the rate of 1,000 pounds per acre.

Left to right

Treatment	Green Weight Per Acre June 19, 1930	Green Weight Per Acre 3 cuttings 1929
Check	2,118	1,739
0-10-0	2,118	1,815
0-10-0 and lime	3,025	2,723
0-10-10 and lime	5,445	4,575
5-10-10 and lime	15,125	11,193
Check	2,118	1,739

(Note white clover in L-P-K plot and growth of Kentucky Bluegrass on complete fertilizer plot.)

Grazing that Makes A Pasture Stay Good

By George B. Mortimer

Professor of Agronomy,
Wisconsin College of Agriculture

IF a pasture is bad, its plants are tired. Mostly, they become tired for two reasons. A depleted soil will reflect itself in hungering, weak plants, that attempt to "hang on" in accordance with Nature's immutable law,—the propagation of the species. *An infertile soil makes tired plants.* That is one reason. Fertilization is the surest cure for that kind of plant fatigue.

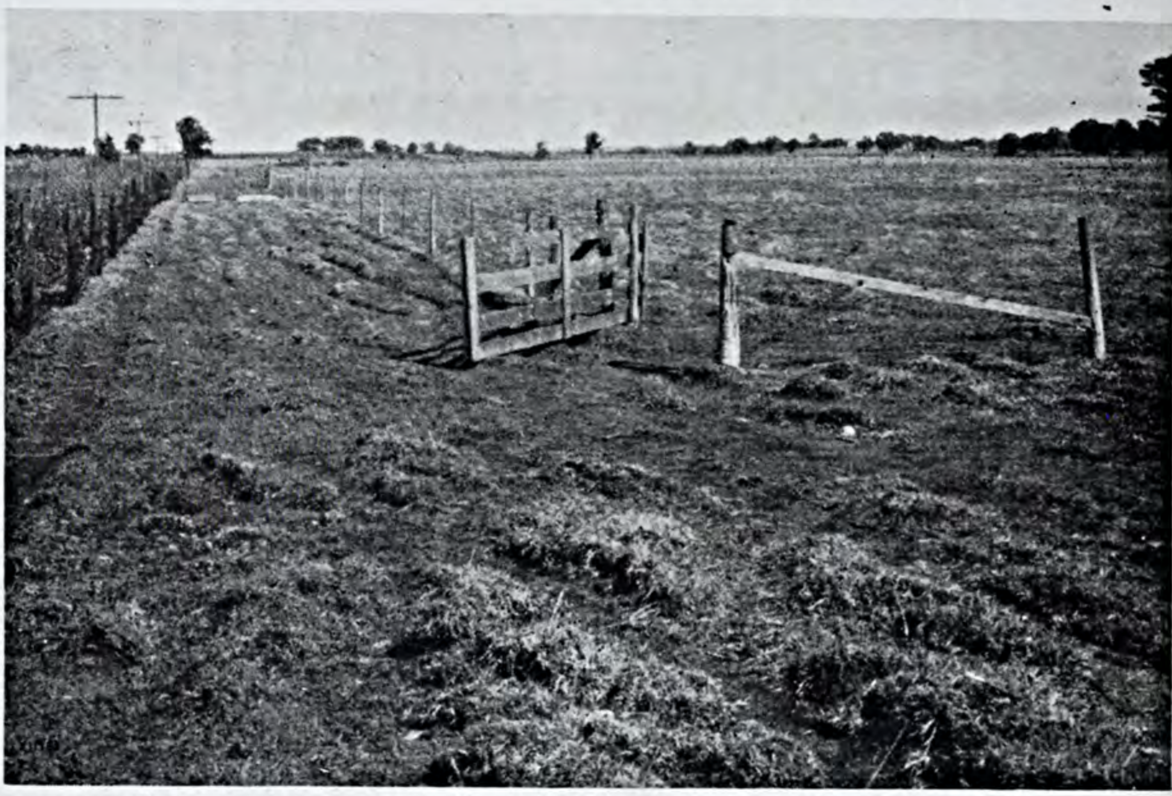
Grazing at best is a destroying practice. On the one hand, it slowly and silently tends toward under-nourishment because it attacks soil fertility, and on the other, because the pasture is repeatedly forced into a state of partial defoliation, keeping the plants in a continued, attempted adjustment to it. *Grazing that is not based upon scientific control may be and frequently is a second cause for tired pastures.* No plant can remain bright and active if forced to tune its life repeatedly to the strings of infertility and a high degree of defoliation. Fertilization, no matter how suitably and carefully done, will not have its full effect in driving out that "tired feeling" unless accompanied by more considerate grazing than is ordinarily the custom.

What Is Scientific Grazing?

It may be difficult at present to say just what scientific grazing is, but this much may be safely said—any form of grazing not under control is not being scientifically done. A pasture will remain in good proportion as the two master factors, fertilization and grazing methods, are observed. It is upon these two that pasture management is largely based.

In any pasture, there is always present the ever-operating, grazing animal. As far as the health of the pasture is concerned, there is little doubt but that grazing influences may be made to parellel those of soil and season in relative importance, and they probably bear equally significant relationships to its improvement and maintenance. The benefits of a fertile soil should not be overshadowed and offset by bad, grazing practices.

The effect of the grazing animal upon the health of the pasture should always be given due regard, even though the evidence that will ultimately define scientific grazing is not yet all in. A sufficient number of its premises, however, have been established to warrant a change from the pioneer ways of no control to a conscious, intelligent control, both for the benefit of the animals and the pasture likewise. *An advance from uncontrolled to controlled grazing should parallel and support the practice of fertilization if its rewards are to be had in full.* It is one thing to grow lots of superior summer feed, but quite another to harvest it through grazing so that both animals and pasture are given the maximum consideration.



To graze a pasture rotationally, each enclosure should open into a common lane.

The tenacity with which the perennial, creeping grasses cling to life even under the most drastic treatment; the traditional grip of pioneer practices; and a limited appreciation of plant physiology and plant chemistry, may all be offered as reasons for the careless practices in vogue. Pastures too early grazed; pastures over grazed; pastures half grazed; pastures that by mid-summer present a mosaic of over-eaten and under-eaten patches; pastures with their gates always open, all belong to uncontrolled grazing practices. They are its ininheritance. Keeping stock on a pasture throughout the season on the theory that the "last bite" must be lifted even though the animals must spend more energy and time in searching for it, than it can ever compensate them, is bad for both pasture and livestock.

If scientific investigation develops the notion that two cuts for alfalfa are better than three, we immediately seize onto it and plan accordingly. It seems to make a difference what the plant is and where it is growing. Just because plants happen to be unfortunately borne in a pasture is little reason for subjecting them to a practice that too often borders on persecution. A horse that is well fed and cared for will do maximum work. This is equally applicable to a pasture. At its best, grazing with its inevitable partners, tramping and hoof cultivation, is pretty drastic treatment.

Uncontrolled grazing is hazardous for the life of any pasture. Pasture turfs of creeping plants like Kentucky bluegrass and white clover become thin and worn through extreme early grazing, through overstocking at any time of the season if repeatedly practiced, and there is also evidence to show that permitting growth to run into stemminess and seed heads tends to thin out the turf.

The Grazing Stage

Somewhere between the two extremes of early or premature grazing and late or deferred grazing, there must be a stage of growth at which pasturing may be started, without serious injury to the plants. No doubt the object of any grazing scheme should be to take away the largest, seasonal amounts of grass nutrients from the pasture, and to do it in such a way that the health of the plants is not too much impaired. When it is learned how this may be best done, scientific grazing will be understood.

Next to impoverished soils, too early grazing each season is probably the second important explanation for the low carrying capacity that many natural pastures have. It is a temptation to turn stock out as early as possible. That shouldn't mean, however, that the "high sign" for it is the first greening over of the pasture. Empty barns and the rush of seeding the harvested crops too frequently accentuate the urge. Shortage in barn feeds is not much justification for turning out too soon, for the damage that may be done the pasture later in the season is frequently its penalty. It amounts to little more than shifting feed shortages.

A pasture should not be disturbed in the spring until its plants have had time to develop new roots along with the top growth, the energy for which is furnished by storage foods from the previous season. Eating off the first leaves as they appear makes additional demands upon storage energy and repair materials. To make matters worse, earliest growth is not commonly accompanied by continuous, good growing weather, and nitrogen, so essential for new growth and repair, is only slowly being released at this time because soil temperatures are still too low for rapid nitrification. This makes premature grazing doubly bad.

It all tends to keep the grass at a disadvantage, with the net results of limited seasonal grazing, weed encroachment, damage from drought, and an ultimate thinning out of the turf. This picture is altogether too common to need much description. Most authorities agree that the injury caused by repeated, premature grazing is the most common and pronounced of all grazing ills. Its effects are quickly produced, and they will be felt for a long time. Premature grazing is almost equivalent to over-stocking a pasture; the plants never being able to get ahead of the grazing animals.

A good lesson upon the effects of premature grazing and over-stocking of pastures may be drawn from some of the valuable investigational work

(*Turn to page* 51)

This pasture has been properly grazed and is now left in good condition for the winter's rest.

The Earning Power *of* Said Land

By John Fields

President, the Federal Land Bank of Wichita

PERSONS in the West, lending money for eastern interests years ago, frequently received letters from headquarters in the East admonishing them not to make loans on farm property for more than half the price at which the farm would sell at the time the loan was made. With land values steadily enhancing for a long series of years, such advice seemed to be conservative, yet it proved to be an expensive basis for many who made loans as well as for many who accepted them.

The Federal Farm Loan Act in 1916 designated a different basis which might or might not result in a similar valuation. It provided that for the purpose of making a loan, "the value of the land for agricultural purposes shall be the basis of appraisal and the earning power of said land shall be a principal factor." This injected a decidedly stabilizing factor into land appraisals. After all, if a property cannot earn and pay for its keep, what is the incentive for owning it? The earning power of land is the net amount which the owner should receive from rents on the customary basis after paying taxes and making sufficient deductions for insurance and depreciation of improvements.

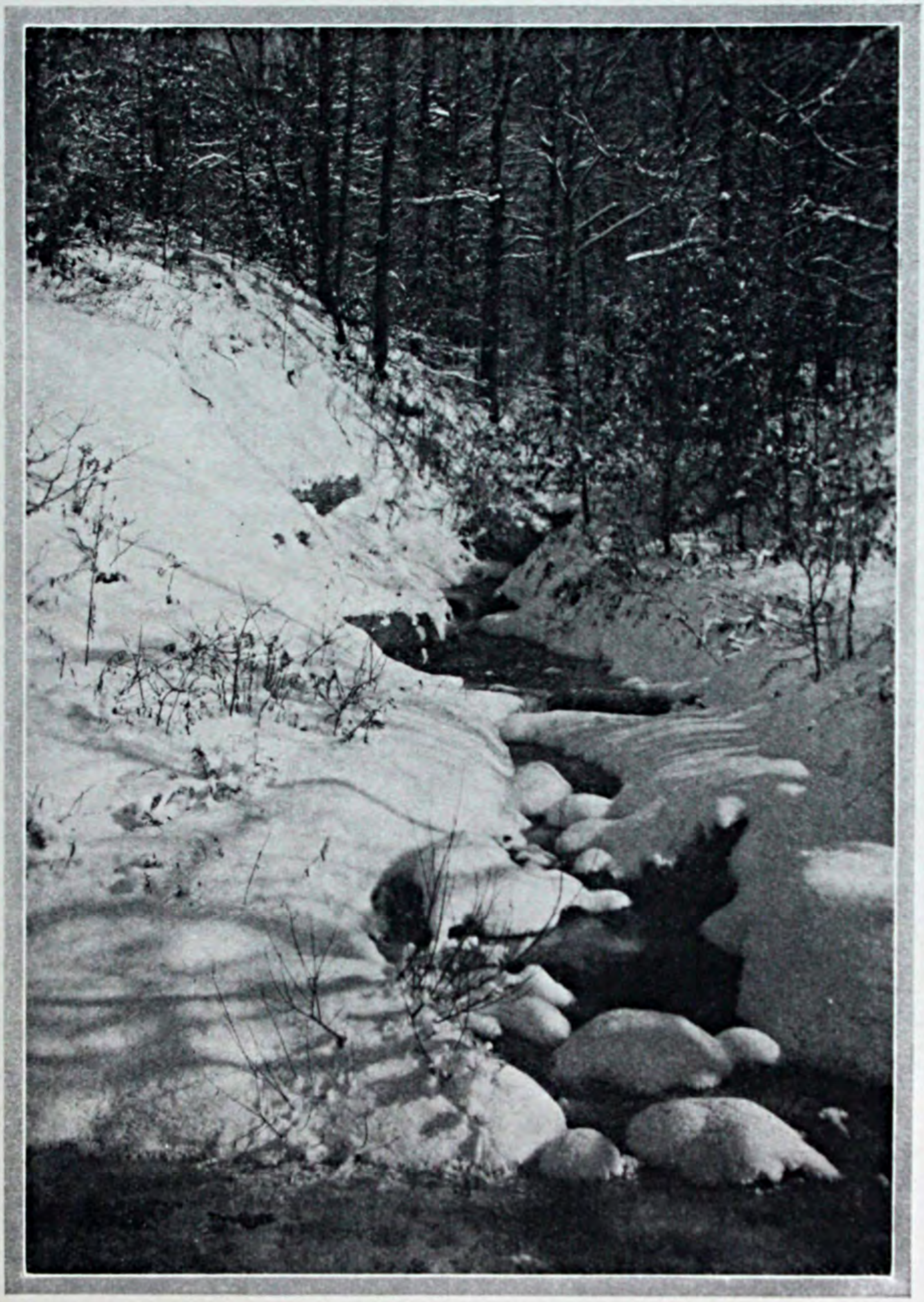
The record of the production of a farm for the past 10 years is a fair indication of what may be expected during the next 10 years. If the average gross receipts on a rental basis on a farm for 10 years have been $500 and the taxes are $100, and the farm has improvements on it worth $2,000, the net returns from rent will be $300, after deducting 5 per cent for insurance and depreciation on improvements. The farm, as security for a loan from the Federal Land Bank, will be worth $3,750 if the current rate of interest in the locality where the farm is situated, is 8 per cent. If interest rates in the locality are 6 per cent, the farm will be worth $5,000.

Valuations determined on this basis are sound. Loans made on such a basis will be safe loans, being secured by lands with sufficient earning power to take care of the fixed charges against the land and to pay the interest on the farm's full value. The farm, of course, should be capable of making a sufficient return in the hands of the average farmer to make it possible for him to pay taxes, depreciation, and interest and to have enough left to be able to live up to the standard of the community.

Considerations for Appraisal

In appraising land for long-term loans such as the Federal Land Banks make, the appraisal committees of the local national farm loan associations cannot stress too strongly "the earning power of said land" over a series of years. They must keep in mind the crops which the particular farm is capable of producing as well as the

(*Turn to page* 50)



Peace on Earth

PICTORIAL

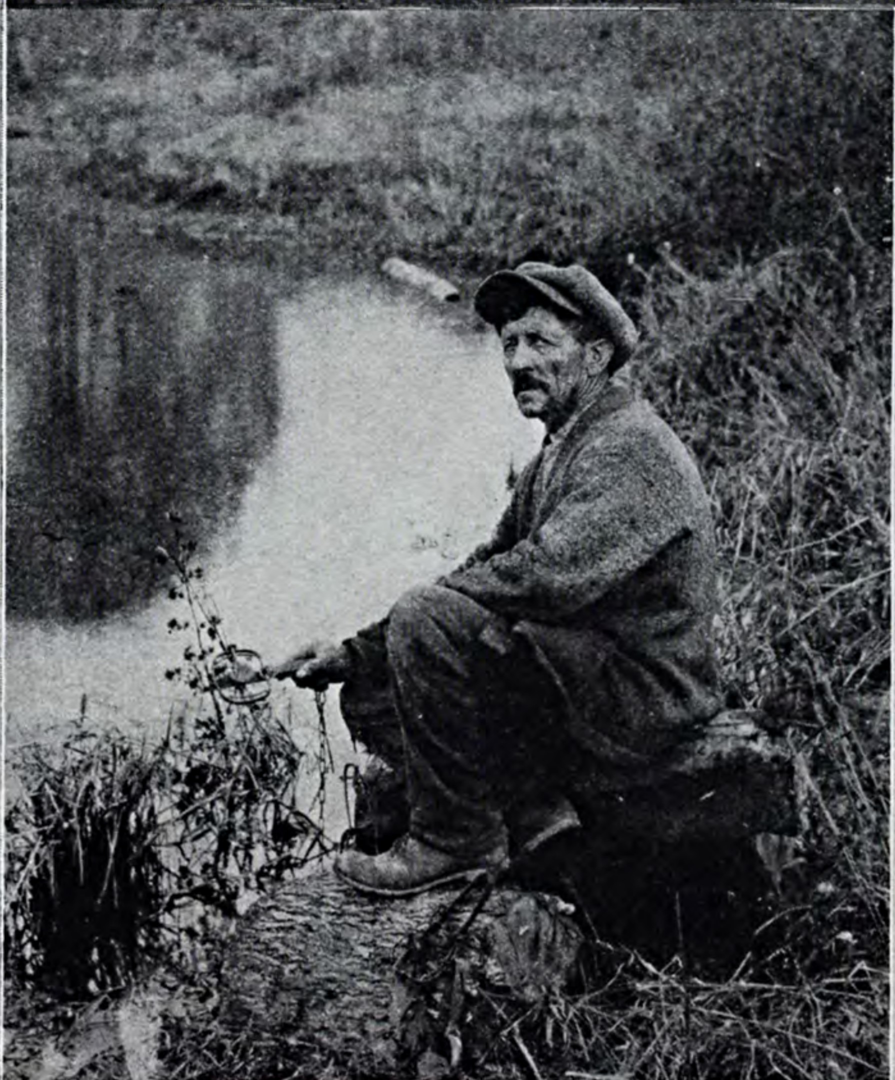
WISCONSIN POTATO GROWER

A feature of the nineteenth annual meeting of the Wisconsin Potato Growe hibit pictured above. This exhibit was prepared by Professor F. L. Musbach o son, Price county, and L. G. Sorden, Oneida county; Jens Ahrenholdt of the S

The many people viewing this exhibit had forcefully brought home to ther Farmers in several counties frequently increased their yields of U. S. No. 1 po 3-9-18, 3-12-12, and 3-20-20.

OW THAT FERTILIZERS PAY

ociation held at Eau Claire, Wisconsin, October 28-31, was the fertilizer ex-
Marshfield branch, Wisconsin Experiment Station; County Agents A. M. Jacob-
Railway; and H. G. Frost of the N. V. Potash Export My., Inc.
large profits that are to be obtained from the intelligent use of fertilizers.
nearly 100 bushels per acre by the use of such well-balanced fertilizers as

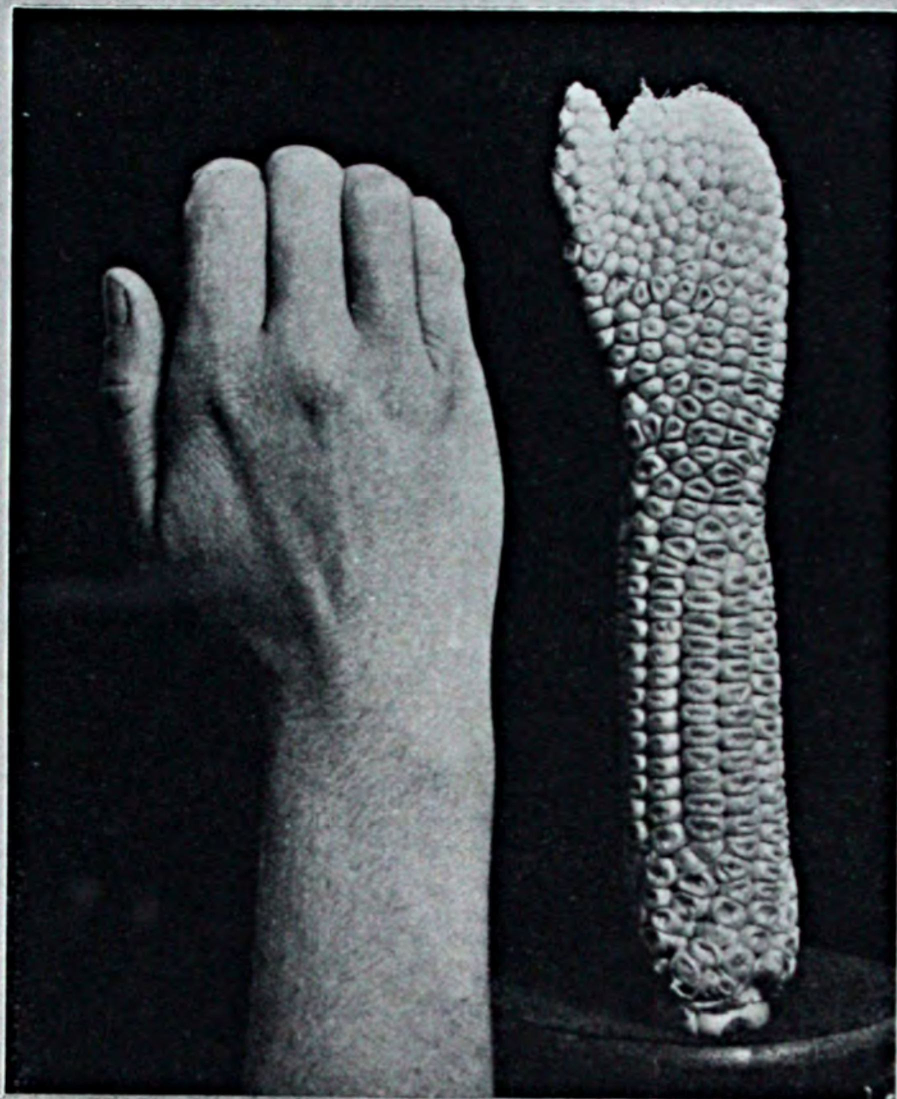


Above: A hungry raccoon can fish as well as hunt, and a nice, plump "crawdad," surprised in its hiding place under a stone, is a juicy morsel for a 'coon's piqued appetite. Note the faraway look of one who is feeling for something in the dark.

Left: While fur farming is now established in the United States as a permanent agricultural enterprise, a large percentage of the annual fur crop is still harvested by itinerant trappers. This man is setting his traps along a stream in northern Indiana.

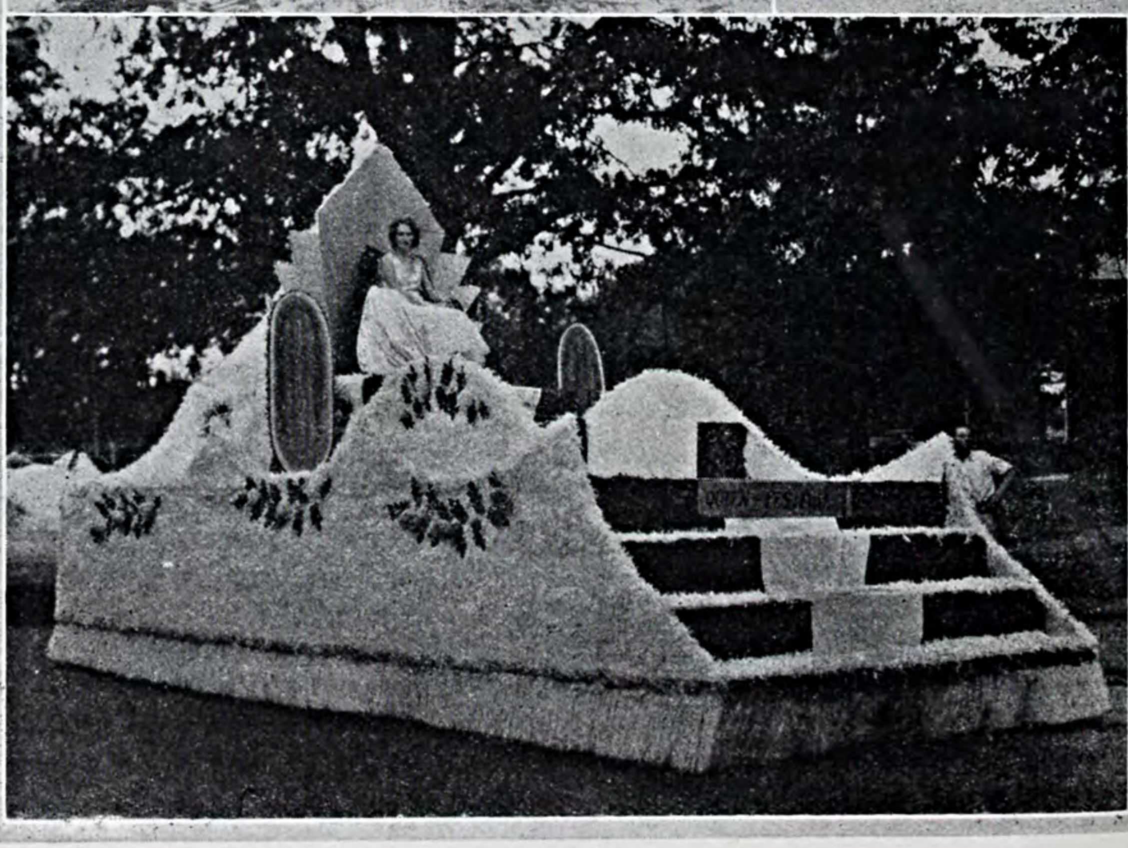
Right: This freak ear of corn was found by Capt. Frank C. Jedlicka in his field near Fort Collins, Colorado.

Below: The huge size of an apple recently found in the Oregon State College orchard was more clearly realized when compared with a common-sized apple and a real Hallowe'en pumpkin. The apple dropped of its own $2\frac{1}{4}$-pound weight from a 15-year-old Spokane Beauty tree, and was said by horticulturists at the college to be the largest apple they ever had seen. Measured around one way, it was $16\frac{5}{8}$ inches and around the other way, 17 inches.



Left: When foxes began to devour the chickens and pigs of farmers near Greenfield, Indiana, the farmers formed a series of fox drives, each time enc'rcling an area of 10 miles. These two girls, who participated, are displaying one of the kill.

Below: The Queen of the 1930 Watermelon Festival held at Hope, Arkansas, was provided with a fitting conveyance. **A story of the famous watermelons grown in this section is to be found on page 23 of th's issue.**



The Editors Talk

Common Sense

At the close of the year, our minds automatically turn back in retrospect over the advancement we have made as individuals, as an industry, a community, and as a nation. We in agriculture have a lot to consider.

It cannot be denied that the past year has witnessed a sharp reduction in farm income due to a combination of low prices and small crops. Largely because of the present low level of farm prices, much space has been given by the press to articles which featured revolutionary changes in costs of production, in the areas to be devoted to crop production, and in consumer preferences.

In considering these so-called "revolutions" perhaps nothing better is to be found than the common sense comments of Professors G. F. Warren and F. A. Pearson of Cornell University, which appeared in the November issue of *Farm Economics.* For instance, they sound a note of encouragement on the wheat situation as follows:

> "It may be true that a few farmers in western Kansas have materially reduced their costs, particularly in years when it rains, but this area cannot raise enough wheat to feed the world. . . . . nor have the writers seen evidence of vast new areas that are going to be used for wheat growing in any country. Other statements have emphasized that consumers no longer care for wheat. It is doubtless true that with very high wages, some persons will use more milk, eggs, fruits, and less wheat. It is equally true that there are vast populations in the world whose wages are just rising high enough so that they can eat wheat instead of rye and rice.
>
> "For centuries, wheat has been very stable when compared with the general price level, in spite of the opening of the United States and Canada, and in spite of the grain harvester. It is easy to introduce one or a thousand tractors. It is not so easy to permanently change the relative values of basic farm products."

Such statements of fundamental conditions as those quoted above make it appear obvious that the present very low level of farm prices is only a temporary condition. It is very probable that the next few years will witness a gradual return to the normal relationship between farm prices and the general price level.

It is pointed out, however, by Professors Warren and Pearson that although wages have declined somewhat, it is not expected that much of a permanent drop will take place. In order to be able to pay relatively high wages and still profit by the use of hired labor, the writers believe that:

> "The chief ways of doing this are by obtaining more milk per cow, higher crop yields per acre, and by using labor more efficiently.
>
> "In order to get more milk per cow, it is necessary that cows be culled more severely and that those that are kept be fed more efficiently.
>
> "The most important way of getting more crops per acre is to dis-

continue raising crops on land that will not give good yields. Fertilizer is cheap and should be used liberally on the land that is farmed.

"More attention must be given to good seed, disease control, timeliness in farming operations, etc. It does not pay to use high-priced labor unless all other factors are arranged so as to get high yields.

"Land that will not pay for farming with high-priced labor may be used for pasture, reforested, or left idle. There are a considerable number of farms on which the soil is of such a nature that profitable operation is not possible. The best use for such lands is for state forests."

Out of all these comments, we have this to conclude, that in forming an agricultural picture for the year 1930 some good common sense will help us to get the right perspective and thereby enable us to prepare more intelligently for the future.

New Soil Handbook

The American Soil Survey Association met in Washington on Tuesday and Wednesday, November 18 and 19. Their program covered a wide range of subjects. But one of the most outstanding decisions made at the meeting of the Association was the approval of new methods for reports. A practical working handbook by which farmers can determine the location, judge the value, and learn the best uses of the different soils on the farms in every county, mapped by the soil survey of the United States Department of Agriculture was decided upon. It will be the result of changes which were proposed in the soil survey reports.

The new type of soil survey, upon which the Association agreed, includes the practical features which have been so welcome to farmers in the reports on the thousand counties already mapped by the Bureau of Chemistry and Soils and the states. Future reports, however, will emphasize grouping of certain related soils in every county and will connect the soil features with the agricultural opportunities in the areas surveyed in a way that will be better understood by the farmer.

W. E. Hearn, Inspector of District No. 2 for the Bureau of Chemistry and Soils, in presenting to the meeting the new scheme of constructing soil-survey reports, said, "The new method of writing soil surveys not only gives a picture of every individual soil type in a county; it also shows the best adaptation of certain crops to whole groups of soils, and should prove serviceable in organizing a more profitable agriculture both for local communities and for states."

The plan was worked out under the direction of Dr. Curtis F. Marbut, Chief of Soil Survey of the Department of Agriculture, whose services to soil science were recognized recently by the award of the Cullum Geographical Medal of the American Geographic Society, and who was introduced at the annual banquet of the Association as "the premier soil scientist of America if not of the world." We are very glad indeed to add our cordial endorsement of this introduction.

The United States leads the world in the extent and practical usefulness of its soil survey, according to Dr. Charles F. Shaw, in charge of soil survey at the University of California, who stated that Europe is groping for a common terminology in its soil science and that American soil surveyors are to be congratulated on their approach to a uniform and scientific nomenclature.

Standard Analyses and Crop Needs

Can the movement to standardize fertilizer analyses to half a dozen such analyses for any one state be justified? Very truly one hundred or so different analyses being manufactured in one fertilizer center is a wasteful mistake, but is it practical or possible to correct this mistake by going to the other extreme of over-simplification?

It is a question that is at least open to discussion. Is it possible, therefore, from a practical viewpoint, to expect to reduce the fertilizer analyses used to a very few? In determining the most profitable fertilizer practice for any specific farm or field there are at least three very definite variables, namely: the soil, the crop, and the climate. Even in addition to these three variables, the previous treatment of the soil is a very important influence.

In any case, on what thoroughly reliable basis have the standard analyses recommended over the country as a whole been determined? Truly some of them are founded on sound experimental evidence. But it is quite possible that others are founded on a compromise of experimental work, general experience, relative prices of crops and fertilizer materials, and other considerations.

For these reasons it is very encouraging that at the recent meeting of the American Society of Agronomy a symposium was devoted to diagnosing soil deficiencies and crop needs. This is probably a sounder approach to the problem of the most profitable fertilizer practices than yet has been made. Certainly excellent field experimental work has been conducted in many states, but obviously the results so obtained have a legitimate application on a limited number of the thousands of soil types on which crops are grown. In applying such results in a general way over large crop areas, there is still an element of probability that such fertilizer practices may or may not be the most profitable. A farmer today must, in necessity, look not simply for a profitable fertilizer practice, but for the *most* profitable fertilizer practice, which is quite a different thing.

Should, therefore, shorter and cheaper methods of determining soil deficiencies and crop needs be organized, a great deal more undoubtedly would be learned of the actual needs of the crop under a great variety of conditions than yet has been learned from the slower and more limited method of field experiments, important as such experiments are.

The methods discussed in the symposium were the existing chemical methods; pot experiments, with particular reference to the Mitscherlich method; the value of the Neubauer method; what field experiments have contributed; and the diagnostic value of plant symptoms in determining nutrient deficiencies of soils. While a lot of work yet has to be done with regard to such methods, the results so far obtained do justify the hope that the diagnostic value of some of them may be put on a sufficiently reliable and practical basis to afford sound information regarding the nutrient needs of crops under a great variety of soil, crop, and climatic conditions.

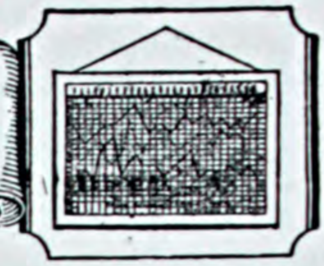
If some of this work could be organized on a large scale, and the methods perfected for conditions in American agriculture, such work would undoubtedly make a very definite contribution to solving some of the problems of fertilizer practices. Certainly the American Society of Agronomy is to be congratulated on bringing before workers in the soil and fertilizer field an up-to-date survey of existing methods for determining the plant food requirements of soils and crops.

We have thoroughly enjoyed the year with our readers and contributors, and now as we picture you around your Yuletide hearths, we wish each and every one of you—

A Merry Christmas

—The Editors.

AGRICULTURAL DEVELOPMENTS



GREENHOUSE TOMATOES GAIN FAVOR ON WINTER MARKETS

The increasing favor of greenhouse tomatoes on the winter markets is accounted for by the fact that greenhouse tomatoes ripened on the vine are usually better than those grown out of doors in the winter and spring, picked green and shipped all the way from the South Atlantic and Gulf Coast States, according to the United States Department of Agriculture in Farmers' Bulletin 1431, entitled "Greenhouse Tomatoes."

Most of the greenhouse vegetables of the country are grown in the New England, Middle Atlantic, East North Central and West North Central States.—*U. S. D. A. "Marketing Activities,"* Nov. 26, 1930.

FLORIDA FREED FROM FRUIT FLY QUARANTINE

The Federal quarantine on Florida products, on account of the Mediterranean fruit fly, was lifted November 15, following conferences of Department of Agriculture officials with Florida officials, including Governor Carlton and members of the state plant board.

Grove owners are no longer required to pick up and dispose of "drops," culls, and windfalls. However, intensive field inspection by the Federal forces will be continued indefinitely in respect both to fruit in the groves and in packing houses, as a precaution against the spread of any infestation which may develop in the future.—*U. S. D. A. "Marketing Activities,"* Nov. 19, 1930.

AMERICAN WHEAT EXCELS ACCORDING TO TESTS

The United States produces some of the best wheat in the world, says the Bureau of Agricultural Economics, reporting the results of milling and baking tests of wheats grown in 38 countries, in *Technical Bulletin* 1927, just issued.

"From both a milling and baking standpoint, the best quality hard red winter wheat is produced in the United States. The hard red winter wheat grown in Argentina appears to be of lesser milling value than that grown in the United States. The baking quality of the flour milled from Argentine wheat, although not the equal of that milled from the hard red winter wheats of the United States, is of fair quality. The flour milled from the Russian hard red winter wheat appears to be lacking in baking strength." The bulletin gives the results of tests of 412 varieties of wheat.—*U. S. D. A. "Marketing Activities,"* Nov. 26, 1930.

WE ARE EATING MORE DAIRY PRODUCTS

Consumption of dairy products has taken a strong upward tendency in recent years. Per capita consumption of butter last year is computed at 17.61 pounds compared with 14.7 pounds 10 years ago; cheese, 4.62 pounds last year against 3.50 pounds in 1920; condensed and evaporated milk, 16.58 pounds against 10.17 pounds in 1920; and ice cream, 3 gallons compared with 2.46 gallons in 1920.—*U. S. D. A. "Marketing Activities,"* Nov. 19, 1930.

Cabbage for Kraut

(*From page* 19)

destruction of the roots, therefore only very shallow cultivation should be given after the plants have attained considerable size. Many of the roots of the cabbage plant grow within two inches of the surface of the soil and these run almost horizontally. Before the plant is half grown the roots cross in the centers between the rows, and if deep cultivation is given more harm than good may be done. Sufficient cultivation should be given to keep down weeds and keep soil from crusting and cracking. After the plants are half grown, cultivation is not so important unless weeds are troublesome. Cultivation should cease when it is impossible to perform the operation without injurying the plants, since there is evidence that little moisture is lost from the soil by evaporation from the surface when the plants are large. There is also evidence that cultivation destroys the roots near the surface.

When the plants are small, cultivation may be done by gang cultivators or by any ordinary shovel cultivator, but when the plants get larger only light cultivators should be used. A harrow-like cultivator may be used to good advantage after the plants are well established. In fact if the ground has been well prepared, the light cultivator is best for all cultivation. Hand-hoeing or hand-weeding is usually necessary to keep the weeds down between the plants in the row.

Profitable yields of cabbage for kraut depend upon a combination of fertile soil, proper use of organic and inorganic fertilizers, correct water supply, cool temperature during last of the growing season, and good cultural practices. Where the grower studies the job of producing this crop and where he has satisfactory temperature and moisture conditions, yields of 18 to 20 tons or more per acre can be produced. Cabbage responds to good treatment.

Meaty Nuts

(*From page* 6)

tilizer treatment was being followed.

That Mr. Ward is keeping up-to-date in his study of fertilizer is proven by the interesting test he is making on a new method of applying the fertilizer. On 70 walnut trees the fertilizer is applied in trenches dug around the tree. These trenches are one foot wide and one foot deep, and are dug from four to six feet away from the tree trunks. Mr. Ward will be able to decide on the effect of fertilizer applied in this way as compared with the usual method of plowing it under.

Incidentally, Mr. Ward is very enthusiastic over a small planting of tomatoes which he set out and fertilized with 3-10-10 fertilizer. He used about one sack of the fertilizer on 500 plants. On this small planting, during the best six weeks of the season, he harvested 1,000 pounds per week. He received about two cents per pound for the tomatoes, which meant an income for the period of $20 per week.

Results like these appeal strongly to men like Mr. Ward, who are running their farm business along efficient lines.

Peanuts in India

By J. J. De Valois

Agricultural Missionary, Katpadi, South India

EVERYTHING that goes to the Orient must undergo some change or other before it becomes acclimated. This the peanut did by changing its name to "Groundnuts" when it invaded India. But if its name underwent a change in the process, it in turn almost created a revolution in the agricultural practices of the land of its adoption.

About 25 years ago the growing of indigo for dye purposes was common in southern India. When it was found that synthetic dyes could be produced more cheaply than vegetable dyes and that they were nearly as satisfactory, the dye factories had to close their doors and many cultivators felt that their best commercial crop had gone bankrupt. To the rescue came the peanut.

It was not many years before the Indian cultivator forgot all about the "flesh-pots" of the dye factory because he was too busy counting the rupees his new crop brought him. Thousands of acres of sandy loam that had never felt the point of a plow were put under this creeping legume. The grazing grounds of the Indian zebu cattle were thus encroached upon to such an extent as to cause acute forage problems in many areas.

During the hot summer months, when few crops are grown, the Indian farmer (ryot) spends his time very profitably carting silt deposits from the many artificial lakes onto his fields. This so-called tank silt contains a large proportion of humus and is also rich in lime. Furthermore this clay improves the physical condition of the soil and makes it more retentive of moisture. From 50 to 100 cart-loads of tank silt are frequently applied per acre, often coming from 8 or 10 mile distances. Ashes also are considered a very valuable manure for this crop and often are imported by rail from the large cities. Very little manure is used for

An Indian farmer and his family.

Hand shelling of peanuts was formerly a very common practice, but now machine hullers have largely replaced the beaters.

the crops because there is not enough to go around and experience has shown that it can be applied more economically to the intensive irrigated crops.

Although groundnuts are grown primarily as a rain-fed crop, large acreages are sown in irrigated fields in rotation with cereals. When sown under irrigation the kernels are hoed in at the last weeding of the millet crop in February or March. After the millet is harvested in April, the peanuts are irrigated from wells during the hot season and are ready for harvest in July or August.

The rain-fed crops are sown in June or July after the first good shower that brings such welcome relief from the blazing tropical heat of summer. No time is wasted, and every available working animal is yoked to the crude country plough. One preliminary ploughing is given, and then the seed is dropped in every third furrow. This requires about 100 pounds of kernels per acre. After this the field is leveled with a long plant or a tree branch. Indian farmers like to work in gangs, and so several neighbors usually join together and 10 or 12 ploughs follow one another up and down the field.

Mixed sowing is also practised whereby a quick growing native cereal is sown with the peanut and is harvested about the time the groundnut fully covers the ground. The chief objections to this method are excessive shading of the ground and the removal of too much moisture for the good of the groundnuts.

Hand Labor Is Cheap

The growing of peanuts is entirely a hand labor task done chiefly by women. They intercultivate the growing crop twice or thrice using small hoes with a blade five inches long and an inch wide. The handle is a foot long. These women squat in the field and hoe at arm's length before moving. Fifteen or twenty women coolies can hoe an acre a day. Their wages are about six cents with a free meal at noon.

Because the groundnuts returned such a good profit, the Indian peasants worked a good thing to death.

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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

An extensive series of experiments to determine the best fertilizer ratio for truck crops on several soils in Florida is reported in Florida Agricultural Experiment Station Bulletin 218, "Fertilizer Experiments with Truck Crops" by J. J. Skinner and R. W. Ruprecht.

The work with celery and lettuce conducted on the Schreiner triangle plot basis show that four or five tons of fertilizer is used profitably on these crops when grown on these soils. Increasing the nitrogen up to 6 per cent increased the yield. Phosphoric acid had little influence on this soil, while increasing potash increased the yield regularly in each case. From these results the authors point out that four to five tons of 6-2-8 gave the highest average yield on this soil.

Another experiment with tomatoes on a different soil showed that 4-8-8 was the most satisfactory analysis. The experiments on amounts of fertilizer per acre are not so definite, but data indicate that one to two tons per acre are the most profitable amounts to use. Further experiments on a soil generally found very unproductive, except when barnyard manure was used showed that manganese deficiency apparently was the trouble. Whenever no manure or manganese was used, yields were very low. When manganese was used with fertilizer, yields were satisfactory even if no manure was used.

This excellent and interesting bulletin contains other similar information of value to practical farmers as well as scientists interested in growing truck crops on light soils.

The results of the "Fertilizer and Crop Rotation Experiments" are brought up-to-date in the Rhode Island Bulletin No. 224 by T. E. Odlands, S. C. Damon, and J. L. Tennant. Of the five rotations studied, the 3-year rotation of potatoes, rye and mixed hay was the most profitable over the last 10 years. A 6-year rotation of corn, potatoes, and alfalfa four years, and a 4-year rotation or corn, potatoes, rye and mixed hay were about the same and rather poor seconds to the best rotation. The poorest rotation consisted of corn, potatoes, rye and straight grass hay—no clover in rotation.

Studies with high and low phosphoric acid and potash application in a rotation show that corn responded to extra phosphoric acid, while potatoes, and the hay crops, clover and alfalfa responded to extra potash on this soil.

This bulletin, the third published with results of this interesting and valuable experiment, warrants study by all interested in practical and scientific agriculture.

"Fertilizer and Cottonseed Meal Analyses Report," Dept. of Conservation and Inspection, Little Rock, Ark., Season 1929-1930.

"Use of Commercial Fertilizers in the Growing of Cotton," Agr. Exp. Sta., Raleigh, N. C., Agronomy Information Cir. 53, *Aug.,* 1930, *J. J. Skinner.*

"A Field Test of Different Sources of Phosphorus," Pa. State Col., State College, Pa., Bul. 252, *May,* 1930, *C. F. Noll, F. D. Gardner, and C. J. Irvin.*

"Commercial Fertilizers in 1929-1930 *and*

Their Uses," Agr. Exp. Sta., College Sta., Tex., Bul. 415, Sept., 1930, G. S. Fraps and S. E. Asbury.

"Home Mixing of Fertilizers," U. S. D. A., Washington, D. C., Leaflet 70, Nov., 1930, C. C. Fletcher.

Soils

"Soil Survey of Montgomery County, Alabama," U. S. D. A., Washington, D. C., No. 12, Series, 1926, J. F. Stroud, W. W. Strike, W. E. Tharp, R. T. Avon Burke, and B. H. Williams.

"Soil Survey of Bartow County, Georgia," U. S. D. A., Washington, D. C., No. 11, Series, 1926, G. L. Fuller and H. H. Shores.

"Liming Indiana Soils," Dept. of Agr. Ext., Purdue Univ., Lafayette, Ind., Leaflet 152, July, 1930.

"Part 1—Soil Survey of Putnam County, Indiana," "Part 2—The Management of Putnam County Soils," U. S. D. A., Washington, D. C., No. 27, Series, 1925, Earl D. Fowler, H. R. Adams, A. T. Wiancko, and S. D. Conner.

"Soil Survey of Prince Georges County, Maryland," U. S. D. A., Washington, D. C., No. 30, Series, 1925, S. O. Perkins and S. R. Bacon.

"Soil Survey of Dukes and Nantucket Counties, Massachusetts," U. S. D. A., Washington, D. C., No. 28, Series, 1925, W. J. Latimer.

"Soil Survey of Kent County, Michigan," U. S. D. A., Washington, D. C., No. 10, Series, 1926, Robert Wildermuth and L. Kraft.

"Soil Survey of Muskingum County, Ohio," U. S. D. A., Washington, D. C., No. 26, Series, 1925, S. W. Phillips, H. M. Smith, G. W. Conrey, W. B. Oliver, Ivan Hodson, and R. E. Blaney.

"Soil Survey of Milam County, Texas," U. S. D. A., Washington, D. C., No. 25, Series, 1925, Wm. T. Carter, M. W. Beck, E. H. Templin, and H. W. Hawker.

"Some Methods for Detecting Differences in Soil Organic Matter," U. S. D. A., Washington, D. C., Tech. Bul. 211, Oct., 1930, Edmund C. Shorey.

"Surface Irrigation in the Eastern States," U. S. D. A., Washington, D. C., Farmers' Bul. 1635, Sept., 1930, F. E. Staebner.

"Method and Procedure of Soil Analysis Used in the Division of Soil Chemistry and Physics," U. S. D. A., Washington, D. C., Cir. 139, Oct., 1930, W. O. Robinson.

Crops

More evidence of the effect of fertilization on crop quality is found in an article "The Relation Between Mealiness in Potatoes and the Amount of Potash in the Fertilizer" reporting the research work of Bernice Neil and Margaret Whittemore of the Rhode Island Agricultural Experiment Station and appearing in the October issue of the American Potato Journal. Among other results summarized, the authors state that boiled, mashed, or baked potatoes were more mealy when fertilized with a high than with a low quantity of potash.

Interesting information comes from one of the grape centers of the United States in the appearance this month of Pennsylvania Bulletin 260 "Growing and Marketing Grapes in Erie County, Pennsylvania," by J. T. Vandenburg, Jr. and G. P. Scoville. In the survey the authors found that 80 per cent of the growers used fertilizers on grapes and about the same percentage of the acreage was covered. Sodium nitrate, ammonium sulphate, superphosphate, and a complete fertilizer formula 5-8-8 were in most common use, with the 5-8-8 proving the most popular of the treatments used.

A comprehensive treatise of burley tobacco culture by R. H. Milton of the Tennessee College of Agriculture was another important crop bulletin received this month. This bulletin's number is Publication 161. Included in the discussion are the various phases of successful culture, from the plant bed to loading and hauling. In observations on successful fertilization of the crop in Tennessee, the author notes that "a mixture of 400 pounds of superphosphate, 200 pounds nitrate of soda, and 100 pounds sulphate of potash ordinarily gives good results. It is best, however, to mix together only the superphosphate and potash salt for application before the plants are set in the field and to apply the nitrate by itself as a top-dressing soon after the plants are set out. . . . On worn soils, some growers are applying 100 pounds nitrate of soda and 100 pounds of potash salt per acre in the row or as a side-dressing."

"Growing Hairy Vetch and Austrian Win-

ter Peas for Soil Improvement," Ala. Polytechnic Institute, Auburn, Ala., Cir. 115, Aug., 1929 (Rev. Aug. 1930), M. J. Fonchess, J. C. Lowry, and J. B. Wilson.

"Fortieth Annual Report Fiscal Year Ending June 30, 1929," Ala. Polytechnic Institute, Auburn, Ala.

"Drought Emergency Recommendations," Ext. Service, Univ. of Ark., Little Rock, Ark., Ext. Cir. 285, Aug., 1930.

"Monthly Bulletin of the Department of Agriculture," State of California, Sacramento, Calif., Vol. XIX, Nos. 9-10, Sep.-Oct., 1930.

"Growth Behavior and Maintenance of Organic Foods in Bahia Grass," Agr. Exp. Sta., Gainesville, Fla., Bul. 219, Aug., 1930, W. A. Leukel and J. M. Coleman.

"Experiments in Forcing Gladioli," Agr. Exp. Sta., Urbana, Ill., Bul. 357, Oct., 1930, F. F. Wienard and S. W. Decker.

"Forty-second Annual Report of the Agr. Exp. Sta. of the University of Kentucky for the year 1929," Univ. of Ky., Lexington, Ky.

"Sweet Clover for Kentucky," Ext. Div., Univ. of Ky., Lexington, Ky., Cir. 218, Apr., 1930, E. J. Kinney.

"Home Garden and Orchard Suggestions," Div. of Agr. Ext., La. State Univ., Baton Rouge, La., Ext. Cir. 141, July, 1930, George L. Tiebout.

"It Pays Extra Dividends, Invest in a Good Lawn," Ext. Serv., Univ. of Md., College Park, Md., Cir. 81, Sept, 1930, W. R. Ballard.

"American Potato Journal," The Potato Assn. of America, E. Lansing, Mich., Vol. VII, No. 11, Nov., 1930.

"Alfalfa as a Rotation Crop," Agr. Exp. Sta., Univ. Farm, St. Paul, Minn., Bul. 265, May, 1930, P. E. Miller and R. O. Bridgford.

"Some Effects of Defloration on Fruit Spur Composition and Fruit Bud Formation in the Oldenburg Apple," N. H. Agr. Exp. Sta., Durham, N. H., Tech. Bul. 41, June, 1930, C. F. Potter, H. R. Kraybill, S. W. Wentworth, J. T. Sullivan, and P. T. Blood.

"The Relation of Hydrophilic Colloids to Hardiness in the Apple as Shown by the Dye Adsorption Test," N. H. Agr. Exp. Sta., Durham, N. H., Tech. Bul. 44, Aug., 1930, Stuart Dunn.

"Winter Legumes for Soil Improvement," N. C. Agr. Ext. Serv., State College Sta., Raleigh, N. C., Ext. Cir. 178, Sept., 1930, E. C. Blair.

"Silage and the Trench Silo," Agr. Ext. Div., N. D. Agr. Col., Fargo, N. D., Cir. 93, Aug., 1930, R. C. Miller and F. W. Christensen.

"The Bimonthly Bulletin," Ohio Agr. Exp. Sta., Wooster, Ohio, No. 147, Nov.-Dec., 1930.

"Gladiolus and Dahlias," Agr. Ext. Service, Ohio State Univ., Columbus, Ohio, Bul. 100, Aug., 1930, Alex Laurie.

"Annual Report of the Belmont County Experiment Farm, 1929," Ohio Agr. Exp. Sta., Wooster, Ohio.

"The Pennsylvania Agricultural Experiment Station 43rd Annual Report, For the Fiscal Year Ending June 30, 1930," Pa. State Col., State College, Pa.

"Annual Report Rhode Island State College Extension Service, 1929," R. I. State Col., Kingston, R. I., Bul. 53, June, 1930, Geo. F. Adams.

"Cropping Systems for the Blackland Belt of Central and North Texas," A. and M. Col. of Tex., College Station, Tex., C-74, E. A. Miller.

"Greenhouse Tomatoes," U. S. D. A., Washington, D. C., Farmers' Bul. 1431 (Rev., Aug., 1930), James H. Beattie.

"Broom Corn—Growing and Handling," U. S. D. A., Washington, D. C., Farmers' Bul. 1631, Sept. 1930, John H. Martin and R. S. Washburn.

"Fall-Sown Oat Production," U. S. D. A., Washington, D. C., Farmers' Bul. 1640, Nov., 1930, T. R. Stanton and F. A. Coffman.

"Growing Trees for Forest Planting in Montana and Idaho," U. S. D. A., Washington, D. C., Cir. 120, Aug., 1930, D. S. Olson.

"Grain Drying at a Country Elevator," U. S. D. A., Washington, D. C., Cir. 127, Aug., 1930, W. M. Hurst and R. H. Black.

"Handling Livestock During Drought," U. S. D. A., Washington, D. C., Cir. 140, Sept. 1930, E. W. Sheets and William Jackson.

"Profits from Farm Woods," U. S. D. A., Washington, D. C., Misc. Pub. 87, Sept., 1930, W. R. Mattoon.

"Apple Thinning Experiments," Agr. Exp. Sta., Burlington, Vt., Bul. 308, June, 1930, M. B. Cummings, E. W. Jenkins, and R. G. Dunning.

"Studies in Tolerance of New England Forest Trees," Agr. Exp. Sta., Burlington, Vt., Bul. 310, May, 1930, W. R. Adams, Jr.

"Department of Agriculture Immigration of Virginia," Richmond, Va., Bul. 275, Nov., 1930.

"Physiological Investigations on the Resistance of Peach Buds to Freezing Temperatures," Agr. Exp. Sta., Morgantown, W. Va., Bul. 236, Aug., 1930, H. L. Crane.

Economics

Citrus fruit production has increased rapidly in the United States during recent years. Interstate shipments from California have more than doubled, while shipments from Florida and for the United States as a whole have increased more than three-fold during the last 20 years. Since the citrus-producing areas are relatively distant from the principal markets, transportation charges account for a large proportion of the price paid by consumers, and consequently are an important factor in determining the prices received by producers of citrus fruits.

"A Study of the Cost of Transportation of Florida Citrus Fruits With Comparative Costs from other Producing Areas," by Marvin A. Brooker (Florida Agricultural Experiment Station Bulletin 217), gives a comparison of freight rates on citrus fruit from California and Florida to the principal markets during the period 1900 to 1928. This study also includes data on production trends in other countries; prices received for citrus by Florida producers; and the geographical distribution of consumption.

Probably the most important single problem of the southern farmer is that of farm credit. "Farm Credit in North Carolina—Its Cost, Risk, and Management," by David L. Wickens and Garnet W. Forster (North Carolina Agricultural Experiment Station Bulletin 270), deals with the various phases of the problem in that state. The amount and use of credit, its costs to different types of farmers and from different sources, the institutions advancing credit, and possible improvements in existing credit conditions are all discussed in this bulletin.

"Farming Systems for Eastern Washington and Northern Idaho," Agr. Exp. Sta., Pullman, Wash., Bul. 244, July, 1930, Geo. Severance, Byron Hunter, and Paul Eke.

"Farm Practices in South Central Mississippi With Suggested Changes," Agr. Exp. Sta., A. & M. Col., Miss., Bul. 276, Dec., 1929, Lewis E. Long and R. S. Kifer.

"Farm Management and Net Income," Agr. Exp. Sta., A. & M. Col., Miss., Cir. 89, June, 1930, Lewis E. Long.

"Successful Farming Practices in the Billings Beet Region," Agr. Exp. Sta., Bozeman, Mont., Bul. 232, Sept., 1930, E. J. Bell, Jr.,

"The Cost of Developing an Apple Orchard," Agr. Exp. Sta., Wooster, Ohio, Bul. 456, Aug., 1930, C. W. Ellenwood.

"Some Factors Affecting the Movement of Ohio Wheat," Agr. Exp. Sta., Wooster, Ohio, Bul. 458, Sept., 1930, L. G. Foster.

"Taxation as Related to the Property and Income of Ohio Farmers," Agr. Exp. Sta., Wooster, Ohio, Bul. 459, Sept., 1930, H. R. Moore.

"Ohio Agricultural Statistics for 1929," Agr. Exp. Sta., Wooster, Ohio, Bul. 460, Sept., 1930, G. S. Ray, A. R. Tuttle, and R. E. Straszheim.

"The World Wheat Outlook, 1930, and Facts That Farmers Should Consider," U. S. D. A., Washington, D. C., Misc. Pub. 95, Aug., 1930.

Diseases

"Halo Spot of Beans and Kudzu," Ga. Exp. Sta., Experiment, Ga., Bul. 161, June, 1930, B. B. Higgins.

"A Study of Meadow-crop Diseases in New York," Agr. Exp. Sta., Ithaca, N. Y., Memoir 130, June, 1930, James G. Horsfall.

"Black-rot of Cabbage and Its Control," Agr. Exp. Sta., College Station, Tex., Cir. 57, Aug., 1930, W. J. Back and J. J. Taubenhaus.

"The Bacterial Blight of Beans Caused by Bacterium Phaseoli," U. S. D. A., Washington, D. C., Tech. Bul. 186, July, 1930, W. J. Zaumeyer.

"Experiments on the Control of Tomato Yellows," U. S. D. A., Washington, D. C., Tech. Bul. 189, July, 1930, Michael Shapovalov and F. Sidney Beecher.

"Strawberry Diseases," U. S. D. A., Washington, D. C., Farmers' Bul. 1458, July, 1930, Neil E. Stevens.

Insects

"Fighting the Corn Borer with Machinery in the Two-Generation Area," U. S. D. A., Washington, D. C., Cir. 132, Aug., 1930, C. O. Reed, R. B. Gray, L. H. Worthley, and D. J. Caffrey.

Peanuts in India

(*From page 44*)

Year after year peanuts were grown after peanuts without any other rotation. The result has been that many fields have become peanut poor, some to the extent of being entirely unprofitable for further crops of this kind. Diseases and insects have gained such a foothold in the fields that the crop no longer has a chance. Some of these pests attack the roots,

The shelled nuts are hand sorted before they are bagged and sent off to France for the production of olive oil.

some the flowers, vines, stems, or leaves. Many of the pods are found to be "duds," mere shells with nothing in them.

The heaviest cost in the cultivation of groundnuts is that of harvesting the crop. Various methods have been tried, but as yet nothing has been found as satisfactory as that of hand hoeing and picking. "Cooly" is cheap in India, but even so this slow laborious method is far from economical. The ground is thoroughly gone over on hands and knees digging around each vine, then pulling it up and hand picking the pods from both soil and plant. By this method 75 coolies are required to harvest an acre a day. This is usually done by contract, giving from one-sixth to one-tenth of the quantity gathered.

Another method is to grub the soil twice with a worn-out country plow which thus gathers most of the vines and loosens the soil.

In some places where irrigation facilities are available, another method is used. First the vines are gathered and the land is allowed to dry for 15 days so that the pods may become well dried. The field is then watered and ploughed several times. After this the field is flooded and the soil is worked up into a good puddle, until most of the dry pods float. They are then swept to one corner of the field and skimmed off. The work must be done as rapidly as possible as otherwise the pods will become saturated and sink to the bottom. By this method one man and a pair of cattle can harvest one-twelfth of an acre a day.

In some areas where fodder is abundant, cattle may be allowed to graze off the field before harvest. In most regions, however, this is not done as the vines are too badly needed for cattle feed. As a rule the people do not appreciate the value of the leaves and allow the vines to weather so badly that all the leaves shatter while the dry, woody stems are carefully stacked and cared for. About a ton of vines are produced from an acre and, if conserved, make valuable fodder.

Formerly the pods, when dry, were beaten with sticks to separate the kernels from the pods. More recently, however, hullers are coming into common use all over the country. The advantage of machine hulling is that fewer kernels are broken and a better quality product results. The market discriminates against hand-hulled nuts.

After hulling, the peanuts are all sacked by hand and sent off to the larger markets. There are many European firms with representatives all over the country who buy up the majority of the crop for export. In the Madras Presidency peanuts stand third in order of export value of all agricultural produce. Only raw cotton and hides and skins exceed them in importance.

France is by far the biggest purchaser of the Indian groundnuts. France prefers to get the product in the form of kernels instead of oil and facilitates this by imposing a heavy duty of about $20 per ton on Indian groundnut oil, whereas it allows groundnut seeds to be imported duty free. Because of this fact India yearly loses thousands of dollars worth of fertility contained in the peanut cake while France enriches herself by this amount.

Belgium, Italy, Germany, and Great Britain follow in order as buyers of the Indian peanut.

India is not fortunate enough to have the indispensable peanut vender at the baseball games, the reason being that there is no baseball. Although large quantities of nuts are eaten, the consumption could profitably be doubled and quadrupled to help balance the starchy rice diet.

Peanut oil is extracted by crude, home-made mills under natural pressure. The peculiar crunching, squeaking noise that penetrates the quiet morning air is a part of India. Hydraulic mills are not yet in ordinary use.

Peanut oil is used a great deal for cooking. Still more universal, perhaps, is its use for open lights in the homes of the humble peasants. The luxury of kerosene oil and covered lamps or lanterns is only beginning to invade the stronghold of India's conservatism.

The peanut cake is used quite universally for a concentrate in cattle feeding. It is excellent for this purpose. The pity is that so few of India's cattle can be fed on such expensive feed with profit because of their poor quality and low economic value. The cake is also used in considerable quantities as a highly concentrated fertilizer for specialized crops such as sugar cane. It is to be wished that this use might be widely extended.

What India needs preeminently is good, solid, research work to open up for the country means of getting greater value for the product from our humble friend the groundnut, as well as other agricultural products. When one considers the scores of products that can be made from the peanut, we wish the Indian peasant could utilize some of his spare time in producing them.

The peasant, as he ploughs his lonely furrow or weeds his solitary field, never dreams of the products which his peanuts actually do produce such as: shoe polish, soap, dandruff remover, peanut coffee, breakfast foods, patent medicines, tonics, olive oil such as France is able to produce from it, biscuit meal, soups, palatable "grits," baby food, or face powder. If he did, and he were shown the way, he would readily respond and would soon be on the way to getting more out of this friendly crop than hard work and a mere pittance of five or ten cents for a day's work. I wonder whether privileged scientists of the West do not have a duty to the Indian peasants in this respect?

The Earning Power of Said Land

(*From page* 30)

average yields and prices over a series of years. They must consider the kind of livestock that can be carried by the farm and the probable sales. In going over the farm they should observe closely the number of acres of good crop land, the number in pastures, orchards, timber or waste, the character of the soil, rainfall, drainage, possible overflow, susceptibility to erosion, the carrying ability of pasture land, prevalence of insect pests, plant diseases, the conditions of the roads, the water supply, accessibility to markets, transportation, and hired help. Amount of taxes and the possibility of additional assessments also are important factors. In certain territories the character of the soil is even more important than in others, for wind or water erosion can play havoc with a farm during the lifetime of a long-term loan. If a loan is to be made on this character of land, the soil must have been terraced and the terraces maintained for several years.

Also entering into the question of the value of a farm is the question of the saleability, church and school facilities, and the character of the neighborhood.

Credit standing of the borrower and his equity on the farm are assuming increasing importance. A study of the various reasons why farmers fail indicates that one of the principal reasons is excessive indebtedness and lack of sufficient equity in the farm at the time they secured their loans.

Once a loan is obtained from a Federal Land Bank, the bank insists that the collateral offered for the mortgage, that is the farm land and buildings, be maintained. This applies not only to the fertility of the soil and protection from erosion, but to the buildings as well.

Some interesting figures were compiled recently by the Federal Farm Loan Board on the value of farms upon which the Federal Land Banks have made loans during the last 13 years. They show that the average appraised value of farms, the mortgages upon which were offered as collateral for bond issue, was $36.68 per acre of land, with buildings $10.17 per acre, making a total of $48.85. The amount lent per acre was $17.10, or 36.5 per cent of the total average valuation. These loans have been reduced by amortization and special payments an average of 8 per cent, so that the average loan now is $15.73. As the average reduction in the value of the farms securing these loans has been about 10 per cent, which is considered a conservative estimate based upon the depreciation of land values throughout the United States, by years, since the loans were placed on the books of the bank, the average value per acre now would be $42. The present average loan per acre would be 37 per cent of the latter per acre value.

Thus, the Federal Land Banks, by pursuing a policy based more upon the "earning power of said land" than upon the selling price, find themselves today with loans on the average well within the maximum permitted by the Federal Farm Loan Act, which is 50 per cent of the appraised value of the land for agricultural purposes plus 20 per cent of the value of the insured, permanent improvements to the farm.

Grazing That Makes a Pasture Stay Good

(*From page 29*)

of Stapledon, Director of the Welsh Plant Breeding Station. He showed that with orchard grass (cocksfoot) cut nine times in 1922 the dry matter weight of roots averaged but 6 grammes a plant at the end of the season. Other plants treated the same as these in 1922 but allowed to grow naturally up to August 17, 1923, had roots whose dry matter weight a plant averaged 19 grammes, which showed that the drastic treatment of 1922 had produced very serious injury. He also cut some plants but twice in 1922, allowing them to recuperate up to August 17, 1923. These averaged 28 grammes for root weights.

While this is a specific trial for one kind of grass only, conducted under a given set of soil and seasonal conditions, and also recognizing that cutting is not exactly the same in its effects as grazing, it still carries a very significant lesson generally applicable to all kinds of pasture plants. Grazing may be so drastic, both from being prematurely done, and overstocking at any time, that pastures suffer for a long time. A fertile soil assists in overshadowing and offsetting the injury, but if such practices are long repeated, the pasture is bound to be hurt. There is no system of soil fertility that can entirely offset the bad effects of improper grazing.

Neither is undergrazing a pasture without its serious faults. It too may make a pasture tired and lazy, for in meaning its net results may approach those of premature grazing and overstocking. An undergrazed pasture always becomes patchy and uneven and covered with lots of wasted feed. An animal in excess pasture is like the rulers of old—monarch of all it surveys, and it will take what best suits its fancy. When feed is present in abundance, the animals can get their fill at each grazing period in a comparatively short time and from limited areas. The constant return of grazing animals to the areas first grazed is a significant observation, for it is on these that the newest and most palatable grass is to be had. Much of the pasture thus grows away from them, causing a lot of wasted feed for at least two reasons; first, because the animals refuse to eat from these mature patches unless forced to, and second, because when once grown to stemminess and seed head, growth is practically done for that season. The plants have lived their normal cycle and there is no incentive for further growth.

Repeated undergrazing is bad for any natural grass pasture. It becomes uneven in growth, and weeds find their way in, because the overgrazed patches are weakened, and in the uneaten areas, the weeds do not suffer from being grazed and tramped down in early growth, and because the turf tends to thin itself out thus making way for them.

Half-grazed pastures with their undisturbed appearance and loosely knit turfs seem to offer special attraction for the female beetle of the white grub. Some of the worst injury from this grass-land pest has been observed on these under-eaten pastures. In contrast on well-managed pastures, where fertilization and grazing practices are caused to do team-work in building and maintaining a thickened turf, observation seems to confirm the opinion that such injury is usually at a minimum. A mowing machine does good service on undergrazed pastures, and should be freely used in assisting stock to keep the grass in vegetative growth. No grass pasture should be permitted to run into seed head, not only because the leaf is much more nutritious than the stem, but also because the young, partially grown leaf is more palatable and nutritious than the same leaf in maturity.

Young Grass Is Rich in Nutrients

Recent investigations made on the chemistry of grass have disclosed some very significant truths that should not only be recognized in grazing practices, but should be made the basis for them. Grass that is kept growing vegetatively because of being sufficiently close grazed has outstanding nutritional values. It is exceedingly high in crude protein values in its dry matter, normally ranging as high as 25 per cent on fertile pastures, and carried well throughout the season. This is because nitrogen is drawn on most heavily in early stages of growth, making the tissues very protoplasmic, and hence protein bearing. The same grasses allowed to reach a hay stage of growth have less than half such amounts. It therefore follows that even though there are much greater amounts of dry matter yielded from most grasses when taken at a hay stage of growth than from pasture stages, it is very probable that the total protein to be had is greatest when they are treated as pasture. This principle makes a strong appeal for keeping the grass well grazed down, so that there always will be the urge to return a new growth with high protein values.

Present simultaneously with high protein values in young, closely grazed grass are limited amounts of crude fiber, for the reason that cell walls of plant tissues are thin in juvenile growth, little lignification or thickening of them not yet having set in. Furthermore the discovery has been announced that a high percentage of crude fiber in young grass is digestible, and that the feeding value of its dry matter compares very favorably with oil-meal cake in all of its constituents. Regardless of variety, the principle of high protein and low crude fiber seems to be a common quality of young grass; and grazing that stimulates repeated, new growth reduces grasses generally to similar feeding levels as far as chemical composition is concerned.

A third significant feeding quality of young grass is to be had in its mineral content. Both phosphorus and calcium have been found to be considerably higher in young grass than in the hay made from them. This is of importance particularly to young growing animals and to dairy cattle, both of which require bone-building and bone-repairing materials. With all of its extraordinary values in mind, it does not seem at all out of place to consider a pasture when properly grazed, the cheapest and nearest source of protein feeding concentrates for the livestock farmer.

If the high feeding value of young grass as expressed in the chemical composition of its dry matter is to be most fully realized through pasturing it off, and if the common ailments credited to premature, too long deferred, over, and under-grazing practices are to be avoided, some scheme must be put into operation that places both grazing animals and pastures under control. In my judgment, based upon both experience and observation, the essence of such a scheme is to be had in the European system of pasture management, where it is suggested that both the herd and the pasture be placed under rational, rotational grazing.

While the system involves several major elements, the one concerned with grazing practices operates like this. The pasture is cut up into smaller divisions, the size of which should be governed by the size of the herd and the quality of the pasture. For a pasture in reasonable productiveness and with a herd of about 30 cattle, the divisions should be from two and one-half to four acres large. The divisional fences need not be expensive, from two, and not more than three wires being necessary.

Both Pasture and Livestock Benefit

When grazing is ready to be started in the spring, the entire herd is turned into the enclosure which at that time is most fit, remaining there until the best of the growth has been taken away. Ordinarily this will consume but a few days, probably a week at the most. They then are rotated to a second paddock and are followed on the first by young stock, dry cattle, or mixed stock, for while the herd has taken the lush of growth, there usually will be left enough grass to support other classes of stock for the period that the herd is on the second pasture. This rotation of both stock and pasture is followed in succession throughout the entire series of enclosures, and when the rounds have been made, it repeats itself, starting again with the first paddock.

Its merits, although quite obvious, are worth relating. First, complete advantage is taken of the high feeding value of young grass, all of it being lifted when in the immature leaf stage. Second, each division of the pasture is given a resting period for mobilizing a new growth. This alone seems to be a decided advantage to the pasture, for it gives the plants an opportunity for renewed root growth as well as top growth. Third, reasonably close grazing constantly stimulates new vegetative growth, both by renewing the grazed-away portions and in the production of new tillers as well. This causes a general thickening of the turf, reflecting itself in increased production and a greater tolerance to the effects of tramping hoofs. Fourth, weeds are better controlled, not only because many of them if present will be eaten and tramped down, but because the improvement that comes to the turf limits them in the increased competitive struggle set up by the grass.

While it is recognized that controlled grazing cannot be a substitute for pasture fertilization, I think it may be safely said that even though practiced alone certain benefits would accrue to the pasture. *But it never can turn an infertile soil into a fertile one.* And it is to be doubted if it ever can be economically practical on any but the best pastures. European investigators and farmers have attained very striking results with it, both in increasing the carrying capacity of the pasture, and also in assisting fertilization to be most effective. Here in America with pastures in their general depleted state, fertilization is the first step to take, but controlled grazing might very well be adopted along with it. It is to these two that recognition ultimately will be given, when grazing lands are raised to the position they are entitled to among the other farm crops.

Pasture Fertilization

(*From page* 26)

ment with phosphate, lime, and potash is likely to be secured on somewhat lighter soils and on soils which have been more exhaustively treated in past years (but only provided the soil in question is sufficiently supplied with moisture for clover to grow well);

III—That the Type 3 response, that is a satisfactory yield only when nitrogen is included in the treatment, is likely to be secured wherever the soil is good enough to grow grass, but for any reason does not have a good stand of clover.

The treatment required to produce the Type 1 response is cheapest, that required to produce the Type 2 response costs slightly more, and the complete fertilizer required to produce the Type 3 response decidedly more because nitrogen, even at present prices, still costs much more than the mineral elements.

Despite its being a more expensive treatment, the complete fertilizer treatment has several distinct advantages. Perhaps the most important of all is that it virtually never fails to produce results provided the soil is at all fit to grow grass and has anything approaching a good sod on it. The same cannot be said for the Type 1 and Type 2 treatments, as failure to secure a really satisfactory response, or at least delay in securing the response, is rather common. Another big advantage possessed by the Type 3 treatment is the fact that really good grazing can be produced about two weeks earlier in the spring with this treatment than with either of the other treatments, and the barn feed saved during those two weeks will go a long way toward paying the cost of the fertilizer.

By way of illustrating the three types of response in comparison with the general average of all responses, I went through the results of the pasture fertilization tests already referred to and selected 10 typical results of each type and averaged them. The averages of the 10 results of each type and the general average of the entire 103 tests are shown in the accompanying table and graph.

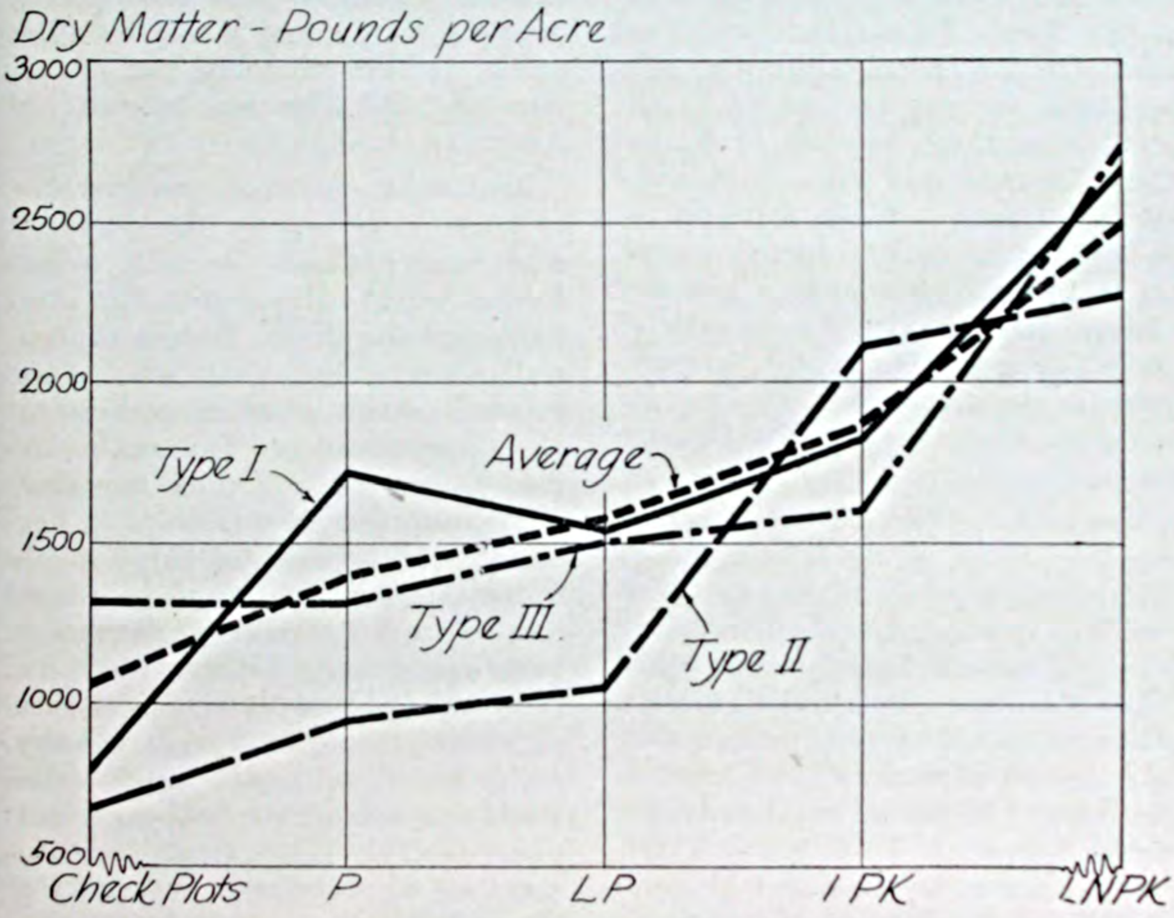
THREE TYPES OF RESPONSE TO PASTURE FERTILIZATION AND GENERAL AVERAGE OF 103 TESTS.

	Pounds Dry Matter per Acre				
	Ck	P	LP	LPK	LNPK
Type 1* 10 tests	789	1718	1543	1826	2686
Type 2** 10 tests	670	940	1056	2119	2268
Type 3*** 10 tests	1320	1323	1499	1603	2718
Average of 103 tests	1051	1392	1548	1850	2501

*1. Fertile, heavy soils responded to phosphorus.

**2. Lighter soil types and heavy soils depleted of fertility responded to lime, phosphorus, and potash.

***3. Soils where lime, phosphorus, and potash did not produce heavy clover growth. Nitrogen in addition to the above minerals was required.



My own conclusion from this study is that any farmer who requires a larger yield from his grazing land would better begin with the Type 3 treatment, that is, complete fertilizer, and lime if needed, even though it does cost more, because of the virtual certainty that he will get the results which he requires; and attempt to reduce his cost by substituting one of the cheaper treatments only after he has determined by test which of them, if either, will give the results which he desires.

As a matter of practical dairy farm operation, I am strongly of the opinion that it will be found profitable to continue the use of complete fertilizer, and lime if necessary, on at least a part of the pasture acreage for the sake of earlier grazing and more luxuriant grazing even though the Type 1 or Type 2 treatment may be fairly satisfactory for the remainder of the pasture area and particularly for less intensive conditions such as young stock, dry stock and beef animals.

The Inquiring Mind

(*From page* 22)

uated from the veterinary department in 1896.

Next he engaged in veterinary practice in Philadelphia, from June, 1896, until January 21, 1897, when he was appointed by civil service examination an Assistant Inspector in the Bureau and assigned to duty at Kansas City, Missouri. Later he was transferred to Texas fever quarantine work and Mexican import inspector, at El Paso, Texas, and afterward worked at San Diego, California. Subsequently, he was transferred to the Meat Inspection Service at Kansas City, Missouri, and then to Milwaukee, Wisconsin. While stationed at Milwaukee he took a special course, for two years, at Marquette University and on June 1, 1899, was transferred to Washington, D. C. for scientific work in the pathological division. He was appointed Chief of the Division on July 1, 1902.

On July 1, 1914, he was appointed Assistant Chief of the Bureau and on December 11, 1917 became its Chief. He is a past-president of both the U. S. Livestock Sanitary Board and The American Veterinary Medical Association and at the present time is a member of the executive board of the latter. He served on the advisory committee of the U. S. Army Veterinary Corps at the time of its organization and is a member of the executive board of the Hygienic Laboratory, U. S. Public Service.

Dr. Mohler is a prolific, pleasing, and practical writer on veterinary subjects and has the unanimous thanks of the profession for his excellent translations of European text-books, including Ostertag's Hand Book of Meat Inspection, Edelman's Meat Hygiene, Hutyra and Marek's Pathology and Therapeutics of Domestic Animals, and Ernsts Milk Hygiene. He has also written many of the useful veterinary bulletins of the Department of Agriculture. No wonder, then, that he is regarded with respect by his co-workers in the livestock industry. They keenly appreciate his ability and capability as a leader, his easy accessibility, which makes him pleasant and sympathetic to work with, and his whole-hearted interest in the health and sanitation of the Nation's ten-billion-dollar livestock business. Like his predecessors, he is devoting his life and giving his all in service for the promotion and protection of the livestock interests of America.

And what patience, perseverance, optimism, and bravery these eminent men have displayed in their monumental work! It has been the invariable practice of the Bureau of Animal Industry to slaughter affected and exposed animals when an outbreak of pleuropneumonia or foot-and-mouth disease occurred, and while that drastic measure has been absolutely necessary, and always successful in the desired way, it has had to be carried out, in many instances, in the face of bitter opposition. Yet the Chiefs, and their staffs of competent and faithful assistants throughout the country, perfectly have accomplished their work and often have withstood misunderstanding and abuse, without wavering or swerving in their duty to the public.

Among the major achievements of the Bureau of Animal Industry is the inspection of meat service which functions perfectly in every center where slaughtering of animals is done for interstate shipment of meat. When you notice on cuts of meat in a butcher shop the small purple stamp, it guarantees that the meat bearing it came from an animal that passed a thorough inspection by a trained government expert. Only meat that comes from healthy animals can pass the rigid inspection of the Bureau.

It includes examination of the animal before slaughter and after death. If the inspector detects an animal that is sick or abnormal in any way, it is tagged either "U. S. Condemned," or "U. S. Suspect," depending on how serious the ailment is. The post-mortem examination includes every part of the carcass, especially the internal organs, and all unfit meat is discarded. All condemned carcasses and meat go to the rendering tanks, while the approved carcasses and meat are stamped "U. S. Inspected and Passed."

Surely that is a wonderfully valuable service to our people, and nowhere else in the world is the work done better or more thoroughly than in the United States.

Other achievements of the Bureau and the vast and various activities at present supervised by Dr. Mohler cannot fully be outlined here, but some of the major ones briefly may be mentioned, as follows:

The discovery of the nature of Texas fever, its transmission by ticks, and a practical method of ridding the southern states of those parasites.

The discovery of a filterable virus as the cause of hog cholera, and development of a protective serum which, used in conjunction with virus, produces lasting immunity, and the employment of this serum throughout the country, which has reduced annual losses from the disease some 60 per cent.

Speedy eradication of every outbreak of foot-and-mouth disease, and the present progressive campaign against tuberculosis which, steadily and surely, is suppressing the disease.

A method of diagnosing dourine in horses, and the successful eradication of the disease.

Success in keeping rinderpest and other contagious diseases out of the country.

Identification of a new species of human hookworm, in the South, and its destruction by administration of carbon tetrachlorid, which also has been found effective for ridding sheep of liver flukes.

The development of a method of preventing losses of swine from roundworm infestation, and of destroying the vitality of trichinae by refrigeration, thus rendering infested pork harmless.

The development of several processes which have improved the uniformity and keeping qualities of sweet pasteurized cream butter, extensive contributions to the knowledge of the bacteriology of market milk, and factors influencing condensed milk and evaporated milk, and relating to the ripening and abnormal fermentation of Swiss cheese, and the making of cheese of the Roquefort type.

The investigation of anthrax, blackleg, contagious abortion, glanders, hemorrhagic septicemia, tuberculosis, and many other diseases of animals and poultry, leading to a more intimate knowledge of their causes and effects and the employment of successful methods for their control.

The development of suitable dips for the freeing of animals of ticks, lice, and other external parasites, testing the strength of dip solutions in vats, and methods of controlling and remedying scab.

Valuable cooperative work in cow-testing, stock-breeding, horse improvement, animal genetics, development of new breeds, and studies of feeds and feeding problems.

Supervision of the manufacture of hog cholera serum and virus and of the preparation and testing of biologics, and, in coöperation with the

Bureau of Chemistry, preventing the sale of worthless proprietary preparations offered as cures and preventives for hog cholera and other diseases of livestock.

The publication of instructive literature relating to animal diseases and the breeding, management, and feeding of livestock.

The work undertaken truly is stupendous, and we hope the notes given here will impress our readers with a better conception of the importance of the subject, and appreciation of the character and splendid services of the men who accomplish it for the benefit of our people and the livestock industry.

Potash and Sand

(*From page* 15)

ash or 11 tons of average manure to meet the potash needs of this alfalfa crop. Muriate of potash is the principal potash fertilizer used in Wisconsin. The potash requirements of some other sandy soil crops are as follows:

2,500 lbs. clover hay removes from the soil	40.8	lbs. potash per A.
2,000 lbs. soybean hay " " "	46.6	" "
2,000 lbs. vetch hay " " "	52.4	" "
16,000 lbs. corn silage " " "	70.4	" "
150 bushels potatoes (9,000 lbs.) " "	47.7	" "
15 bushels rye grain (840 lbs.) " "	4.8	" "
1,250 lbs. rye straw " "	10.0	" "
30 bushels oat grain (960 lbs.) " "	5.4	" "
1,000 lbs. oat straw " "	15.0	" "

These assumed average yields per acre as calculated by Mr. Albert are based on experience, records, and judgment as an attainable production goal on sands. For sandy loams these should be 20 to 30 per cent higher.

The soil, however, can always be depended upon to contribute some potash as it becomes available, especially to alfalfa which can reach subsoil supplies, but the amount cannot be known. Farm tests have shown in a number of instances that a 200 to 300-pound application of muriate of potash is suitable and sufficient for unmanured alfalfa for two years. For this reason, Mr. Albert feels that it is probably safe to depend on the soil for a quarter to a half of the potash required by this crop.

"A 3-year rotation of corn-grain-legumes would require about 125 pounds of actual potash, that is, 250 pounds of muriate of potash per acre every three years," he explains. "To these shallow rooted crops the soil will not supply as much, but let us say, 50 pounds, leaving about 200 pounds to be supplied by 10 tons of manure. Accordingly, if and when the farm is producing enough manure to cover the fields every three years at 10 tons per acre, if this manure is produced from feeding legume hay, and if there are but small losses in handling the manure, then potash fertilization would be unnecessary in this rotation. However, this would be true on very few farms, and so 100 to 150 pounds of muriate of potash per acre should be used every three years until these conditions can be met. Many farm tests in widely different types of sandy soils check with these statements.

"In short rotations the potash application, supplemented when necessary with phosphates, should be made on grain for the legume seeding. Potash is not subject to much leaching from the soil. Nevertheless, it should be used largely for and on alfalfa fields, where the deeper roots will catch any possible leachings. Alfalfa will make a better return than other legumes, because of deep rooting and long life. The potash passes with the hay through the animals but since they do not require any, it is all voided in the manure (from 50 to 80 per cent in the liquid) and thus can be saved and distributed to the commonly manured non-legumes and biennial legumes in a shorter rotation. It is clear that it will not take very long to establish an ever-increasing, revolving fund of available potash through the use of potash fertilizers and livestock farming."

Agronomists Meet

(*From page* 10)

is now being carried on by the Division of Fertility, Bureau of Chemistry and Soils, and the cooperating state experiment stations, in which the fertilizer requirements of certain soil types in all parts of the United States are being studied in an exhaustive way."

The soil survey association approved proposed changes in the soil survey reports of the U. S. Department of Agriculture. These changes, it was stated, will result in a practical working handbook by which farmers in every state can determine the location, judge the value, and learn the best uses of all different soils on the farms of every county which has been mapped.

Future reports, it is planned, will emphasize groupings of certain related soils in every county and will connect in a way more easily understood the soil features with the agricultural opportunities in the areas surveyed.

"The new method of writing soil surveys not only gives a picture of every individual soil type in a county; it also shows the best adaptation of certain crops to whole groups of soils, and should prove serviceable in organizing a more profitable agriculture, both for local communities and for states," said W. E. Hearn, inspector of District No. 2 for the Bureau of Chemistry and Soils, in presenting the new scheme.

The plan was worked out under the direction of Dr. Curtis F. Marbut, chief of the soil survey of the Department of Agriculture, whose services to soil science were recognized recently by the award of the Cullum Geographical Medal of the American Geographical Society, and who was introduced at the annual banquet of the association as "the premier soil scientist of America, if not of the world."

The United States leads the world in the extent and practical usefulness of its soil survey, it was stated by Dr. Charles F. Shaw, in charge of soil survey at the University of California.

Discussions of organic forest soils, soil structure, soil acidity, soil colloids, and the technique of soil mapping and of writing soil survey reports occupied the soil survey association meeting. Many of the members took part in the meeting of the Society of Agronomy which followed

The following officers were chosen by the soil survey association: president, G. N. Rhunke, Ontario Agricultural College; vice-president, W. B. Cobb, North Carolina Agricultural College; secretary-treasurer, A. M. O'Neal, U. S. Bureau of Chemistry and Soils.

Mr. O. D. Middlebrooks and his sons, Melvin (left) and Arnold (center).

Watermelons!

(*From page* 23)

iced watermelons are served to the many thousand visitors, as well as the passengers on all through trains. All railroads entering Hope cooperate by running special excursion trains. This past year 49,000 people were in attendance. Besides honoring the outstanding growers, the outstanding event of the day is the crowning of the Queen of the Festival.

The champion watermelon growers of the world with the weights of the melons for the past six years are as follows:

		Pounds
1925—Hugh Laseter	Hope, Ark.	—136
1926—Edgar Laseter	" "	—143¼
1927—Arthur Powell	" "	—144
1928—H. S. Dudley	" "	—144¾
1929—Edgar Laseter	" "	—152½
1930—O. D. Middlebrooks and Sons	" "	—164¾

O. D. Middlebrooks and Sons, the 1930 champions, have no production secret, as they expressed themselves at a recent banquet honoring them, outstanding 4-H club members, champion garden growers, and the county's Master Farmer. Mr. Middlebrooks said "The secret of growing large, heavy, meaty melons of good shipping quality is to use plenty of potash."

O. D. Middlebrooks and Sons not only hold the world's record for the largest melon, but also the record by producing the greatest number of melons weighing over 100 pounds from one acre. To continue with the story, Mr. Middlebrooks says:

"I planted one acre of the Triumph variety in 24-feet rows and in hills 24 feet apart in the row. The land was winter-broke and about three months before planting, 75 pounds of manure were applied to each hill. At the same time 500 pounds of cottonseed meal per acre were placed in the drill row.

"The melons were planted the first of May, and as they began to vine, a side-dressing of 800 pounds per acre of 4-8-6 was applied in one application. A second side-dressing of a 14-0-10 (N-P-K) mixture was applied at the rate of a ton to the acre. This was applied in several applications as our soil is a fine sandy loam and an effort was made to keep the plants in a vigorous growing condition.

"On the acre we grew 76 plants allowing only one melon to remain on the vine. We used 10 per cent potash in the side-dresser of the last mixture, as we find that it takes a high potash content to keep the plants in a vigorous growing condition and to make the melons meaty and heavy.

"From this acre we grew 40 melons that averaged a little over 100 pounds each. As they reached this size we sold them for $5 each. Eight were allowed to grow for size. Five of these weighed a little over 120 pounds each and sold for $50. One weighed 145 pounds at pulling time and brought us $20. One weighed 161 pounds, bringing us $125, and the big melon, of which the boys (Melvin, age 10, and Arnold, age 15) and I are proud, weighed 164¾ pounds. We are saving this for seed. Twenty-eight other melons were saved for seed. These averaged from 80 to 117 pounds each, or an average of 93 pounds per melon. This made a total of 7,674¾ pounds from the acre, or an average weight for the 76 melons of nearly 101 pounds each."

The Hope Chamber of Commerce has received requests for information on watermelon growing and orders for seed from many parts of the globe, one of the more recent ones being from far-away China.

Mr. Middlebrooks is selling seed from the 1930 champion melon for 10 cents each and other planting seed for $1 an ounce. Not counting the seed sold from this acre, he sold 48 melons for $395.00.

Chimes and Tinsel

(*From page* 4)

simple thing that will have part of their lives woven into it! What long lists of relatives and friends do we conjure up as we hasten to the drug store for our supply of post-cards! Christmas pin money must be earned and saved.

Growers of turkeys, geese, holly, and cranberries must begin their preparations months before the snow flies so that we shall all be properly merry on December 25. Designers of games and funny toys work hard to make them resistant to Dad's clumsy antics so they may last awhile for the small boy when Dad grows weary of his play. New Sunday school programs and asbestos whiskers must be prepared for the great December religious revival.

Did you ever pause to consider if men alone would ever stop long to celebrate Christmas? I guess they do on the Polar expeditions, but that's right up near Santa's headquarters and it doesn't count. I mean celebrating Christmas with the hearty and home-like spirit that animates us when the women-folks run the show—as they usually do. Men have invented several mighty interesting holidays, such as July Fourth and Labor Day, Columbus Day and the "gineral election." Noise, work, discovery, votes, oratory, and fulsome promises—all these have been man's sole contribution to the calendar of care-free time off.

Come to think of it, that's a lot like the picture of us Men that Friend

Woman draws when the mood strikes her. She lays it on hard and tells us what we are strong on and where we are mighty slow and weak. If you go back and look at the list, you will see that masculine holiday ideals are a good deal like her estimate. Then she hangs up the wreath, lights the candles, bastes the turkey, tucks the kids in bed, and points to the almanac. It's her holiday now—the pageant of Sacrifice and Love. And after all, I doubt if it is much tougher on a thrifty Scotchman than some of the other dates in the calendar we celebrate, especially elections.

SO when a bunch of fellows are marooned somewhere and really do try to celebrate Christmas with a mock spirit of bravado, then we revert again to the origin of it and put Woman and Mother right on the top shelf, the icon of the festival. And I guess that little bit of idol worshiping won't be held against us when we watch for the stop and go signals up where Peter is the traffic cop! No, in fact I think it will be our driver's license.

Consider a moment where Christmas in the traditional way originated. It did not start in the Orient where Christianity itself began. It grew in splendor and variety amid the temperate zones, and flourished, as we imitate it, in "middle Europe." Those who made merry around the yule log were citizens of established communities, people who seldom traveled and who knew each other well. The night watchmen on the village walls knew the ownership of every twinkling light cast across the medieval gloom. When they shouted "All's well" on Christmas Eve they knew that all *was* well and with whom the joy remained. It was a close community of souls pausing for a season to rejoice at simple, interwoven lives.

But now we hardly know who may be celebrating Christmas in the next house, and we use post-cards and airplane mail to tell the world that "All is well." To be sure, we have a certain kind of inward glow and comradeship toward strangers as we hurry home with heavy parcels. But save for the neighbors in the open countryside in America, our Christmas tends to be a private family affair. Yet it also has its compensations.

Transportation enables us to defy the frigid distances and return again to the firesides we loved so well in other Christmas times. Broader education *ought* to put us away ahead of the huddled home-makers of yore so that our *presence* will mean more than our *presents*. If it doesn't, then we have missed the real meaning of the holiday, and have been educated in vain.

Come to think of it, the vital test of an education comes right at this time. It won't make much difference how many degrees you have attained on the scholastic thermometer if you are an icicle to human relationships. If you are a Bachelor of Science and nothing else you deserve to remain single and singular all your life. The response man makes to sacrifice and simplicity is the only real measure of education.

COMING at the close of the year, Christmas is a handy place to check the speedometer and look back over the old trails. I propose to take you with me as I look back at other "hollydays" and perhaps share kindred experiences and impressions.

Our boyhood Christmases were much the same. We both have a haze of precious memories to share with each other, even though the ground on which we tread in spirit has been traveled over thousands of times by writers and singers of marvelous power. I doubt if there is anything we can add to the tradition of youth at Christmas. We can testify to its simplicity and warmth of feeling, but each mind in this communion of memory holds fast to some distinct and intimately personal thing which we can never make anyone else understand completely, not even our wives.

Digging into an old treasure trunk of Mother's lately, I found some frayed fragments of a Christmas decoration that she had fixed up for us the winter we moved into our new frame house. Mother wanted to make the occasion of our house-warming a joyous one with the meagre means at hand. I recall that she cut out the letters spelling the magic meaning of the season and sewed some arbor-vitae twigs on them. Beside the remains of those happy hours I found a rather smudgy copy of Alice in Wonderland and a torn volume of Scottish Chiefs. You *must* remember how we sat up by kerosene lamp-light that winter reading the delightful tales of the Rabbit, the Duchess and the Hatter, varied by a fling at the braw romances of Wallace and Bruce.

BUT I closed the trunk and faced the privilege of a paterfamilias to make another generation enjoy a happy holiday. The old Christmas was like a tale that is told or a precedent that is outlawed. It is good to sit down by an evening fireside after all the eager family are a-bed, to muse and meander among those old incidents, but they cannot be expected to enthrall the woman I married, who belonged to another family, or our children who have begun lives and attachments of their own.

It is thus apparent that each family lives in a niche of its own by its own generation. The modern custom seems to be to refrain from rehashing too much family lore to the children. Even in proud old New England and the chivalric South I hear they do not instill quite so much grandfather and grandmother stories into the new generation as the custom was once. The only thing I am afraid of is that as each generation goes along there may be less and less reason for historical family pride. And if you can't work off a little of that old stuff at Christmas, there isn't much chance to get by with it when folks are less trusting and sentimental.

After boyhood our trails part. So the next time I recall a Christmas distinctly found me out on the Dakota prairies living in a claim shack with the winds and clouds for company. Luckily we struck a favorable open winter season so that the dog Maje and I could hit our strides across the undulations of buffalo grass in search of game and exercise. At night we drew the cotton sash curtains together, poked the fire in the cast iron stove, brought out the box of dominoes and checkers, and endured another long evening on the road to the redemption date. With a lull in the weary wails of the wind, we heard no choral angels singing, but we got a sensation of the wolf at the door when the coyotes began to yip and yowl. The first time I heard them I remarked that it sounded just like the sleigh-ride party voices when the old Fifth ward class went skylarking back in Minnesconsin.

That Dakota experience of waiting and hoping, subsisting on mail-order groceries and thrice-told tales, yielded us a Christmas present after all, and that was in acquiring patience. Maybe prisons give one the same supply of patience, but not with such clean surroundings and pleasant companions. So now when I get all het up and want to rush things too fast for what is good, I imagine myself sitting on that cot in the tar-paper palace amid the horned larks and the gumbo, waiting for Uncle Sam to cough up a title. Calm patience is a Christmas gift that more of us might use with benefit to ourselves and sundry others.

IT'S quite a jump from Utopia to Bohemia, but the next Christmas found me resident in an eastern city attending an art school. The fashion I acquired in the west of being rather careless of my raiment and short on shaving did not seem to bar me from the inner circle of my newly found friends. So we pioneers and painters were related after all.

Christmas Eve and Christmas Day of that year I spent doing my daily dish-wiping dozen in a second-rate restaurant, where like the person in the poem, I was "working for my board and keep." Except for some homesickness, the outstanding point in my recollection of that holiday was the fact that I dried dishes for a frowzy old lady resembling Dicken's "Sary Gamp," who had generously refreshed herself in some possible premonition of the arid Christmases soon to come. She emptied five-pound cartons of scouring powder into the big wash tub at one dose, and had me sneezing between snivels of loneliness. The last she or I could remember she was crying on my shoulder and sloshing dish water down my neck. I presume that it was not the best Christmas she had enjoyed, either, so why should I complain about it?

AGAIN we return west with youth and Horace Greeley for another winter, this time on an Indian agency where your scrivener worked for a crafty trader who did all the scalping that was permitted on the reservation. It was my duty to learn a number of valuable things about our redskin customers, and to chatter and mumble their Oglalla gutturals. Not to turn the back on blanketed squaws when I had set a bead box on the counter; not to give more than five pounds of gritty sugar for a pair of home-made moccasins; and not to sell too much lemon extract for beverage purposes were some of my instructions.

Christmas was passed in a silent circle of braves, who required me to take my turn at the peace pipe while they chuckled over their share in the downfall of Custer on the Bighorn. Being an employee of the shrewd trader, I did not have the heart to ask them if they believed in Santa Claus.

After my marriage, the most pleasant Christmas came when we fixed up a little tree for the first baby. Flat living, in the fourth, steam-"hinted" story, was new to both of us; but a flat purse was our common heritage. Picking up a bauble here and a gimcrack there in several ten-cent emporiums, wife and I arranged a brave array of those things that former experiences had caused us to associate with the great event. That quiet evening with the starlight peeping at us through the dormer windows and glancing through the needles and tinsel brought me a little closer to Bethlehem than my Sunday school teacher had ever succeeded in doing. Strange to think of it, that infant is now expecting a fur coat for Christmas and her dolls are almost as lonely as those of Little Boy Blue.

Then a little while after came my saddest Christmas. It comes in turn to all mankind to see the old parental homes broken and the old nests strewn to the winds. When Father became too feeble to keep things going and Mother was ill, we met for the last meal in the shelter of those walls that had echoed to so many happy Christmas voices. Bending in reverence over the battered china plates, with his fingers resting on the checkered table cloth, the Head of the Family pronounced his final family grace. To me it was a stabbing period, a blending of the shepherd's comfort song and the last chapter of Ecclesiastes—"Remember now thy Creator in the days of Thy Youth, ere the evil days draw nigh in which Thou shalt say I have no pleasure in them."

BUT now all is peace with them and I trust it is with You and Yours. If this is indeed a season of Good Will, then let us make it so, and in practicing a bit of that sacred spirit mayhap we shall fix a habit in our hearts that will outlast the Yuletide and go with us 'round the calendar.

JUST GROWL

Visitor: "And how old are you, Bobbie?"

Bobbie: "I'm just at the awkward age."

Visitor: "Really? And what do you call the awkward age?"

Bobbie (bitterly): "I'm too old to cry an' too young to swear."

"To what do you attribute your great age?" asked the city visitor of Grandpa Eben Hoskins.

"I can't say yit," answered Grandpa, cautiously. "They's several o' them testimonial fellers a-dickerin' with me."

"Can you give any well-known date in Roman history?"

"I can, teacher," said one pupil. "Anthony's with Cleopatra."

Policeman: "How did you come to get that jar of honey?"

Tramp: "Well, I admit I don't keep no bees; but what's to stop a fellow squeezing it out of the flowers himself?"—*Tit-Bits (London)*.

Runaway horses are headed off by policemen, but there's no known way to stop a woman who starts out ahead of the usher down a dark theater aisle.

—*Life*.

WASTE OF EFFORT

Teacher: "If you subtract 14 from 116, what's the difference?"

Johnny: "Yeah; I think it's a lot of foolishness, too."

PRIMPING

A professor was once accosted by a dirty little bootblack: "Shine your shoes, sir?"

The professor was disgusted by the dirt on the lad's face. "I don't want a shine, my lad," he said, "but if you'll go and wash your face I'll give you sixpence."

"Righto, guv'nor," replied the boy, as he made his way to a neighboring fountain. Soon he returned looking much cleaner.

"Well, my boy," said the professor, "you have earned your sixpence; here it is."

"I don't want your sixpence, guv'nor," replied the boy, "you 'ang on to it and get your 'air cut."

—*Tatler*.

Golfer (bursting in on friend wife): "What do you suppose my score was today, dear?"

Wife: "Double."

Golfer: "Double? What do you mean?"

Wife: "Double what you're going to tell me!"

Faint heart never got away from fair lady.

EXPENSIVE FOLLY

Mrs. Goldberg and Mrs. Silverstein were gossiping over the back fence.

"I heard it today dot Abie Kazinsky vos keeping a budget."

"Vot—und his vife too?"