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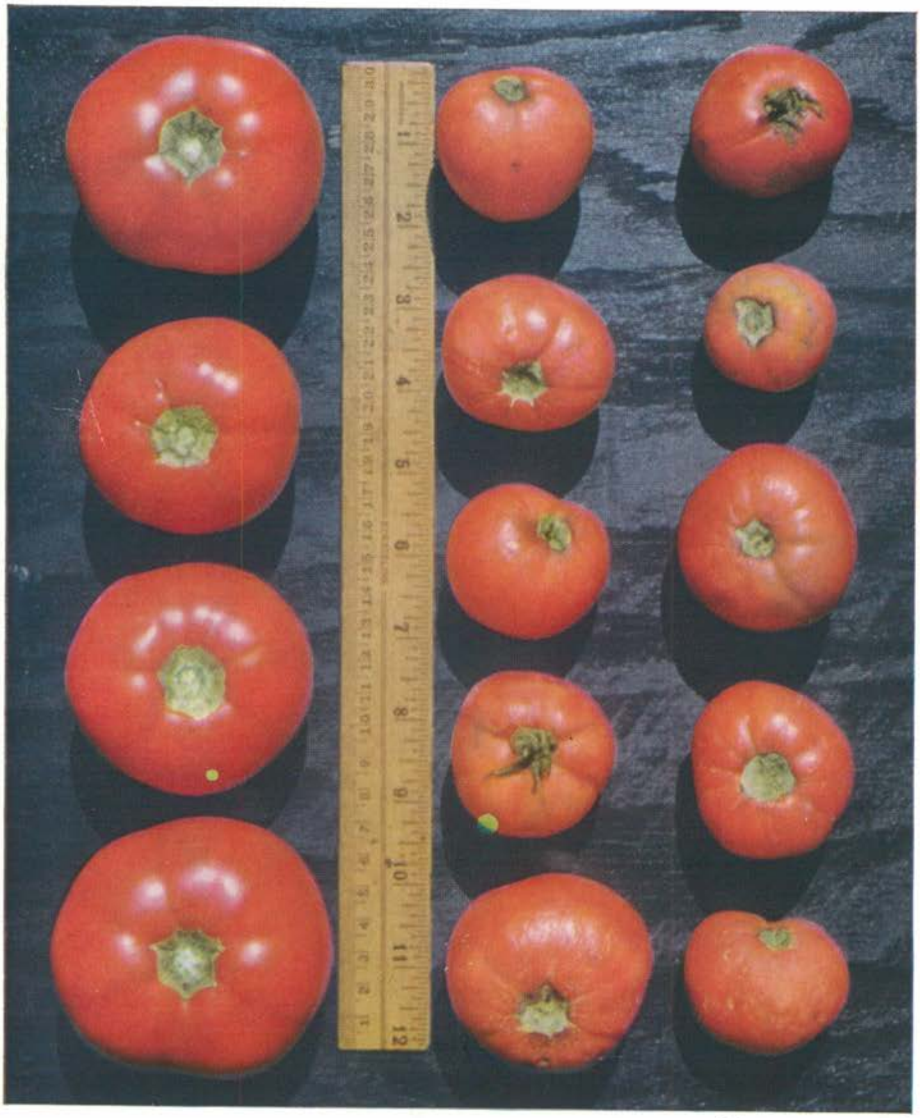

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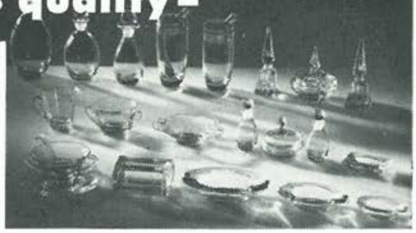

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Better Crops with PLANT FOOD

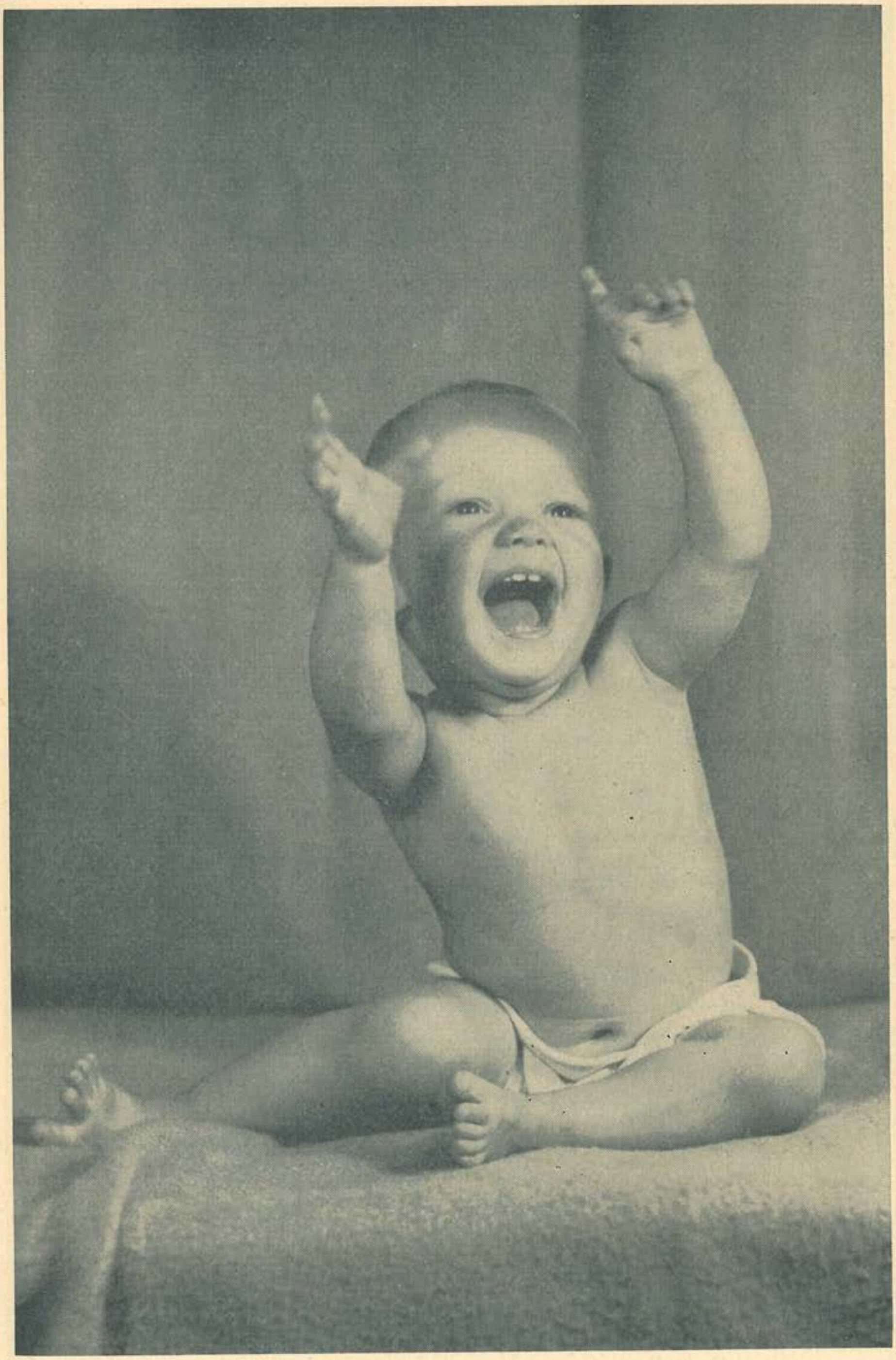
The Whole Truth—Not Selected Truth

R. H. Stinchfield, *Editor*

Editorial Office: 1102 16th Street, N. W., Washington 6, D. C.

VOLUME XXXIX NO. 1

Table of Contents, January 1955



Hi—1955!

Better Crops with PLANT FOOD

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Keeping up with . . .

Rural Reading

Jeff McDermid

BEST direct influence upon farm folks for all sorts of changes and improvements is "word of mouth" over the line fence or at a rural gathering. The next best, as many tests have proved, is the standard farm journal or "farm paper" whose total mass circulation in the open country runs well over twenty million. That's better than four of these periodicals per census farm. Material, social, and spiritual influences spring from numerous sources today, but with the farm paper occupying the key position. Not that the farmer has little access to other reliable information sources in this age of grandiose publicity programs via press, screen and airways. He has plenty, often verging on the "too much."

It simmers down to this: The farm paper is a tradition and a familiar custom of long and generally respected standing. It came out to the farm before any other major educational force. It holds fast to farm attention in most cases like few other mediums. As a trade or occupational medium, it enters into the life of the whole family—unlike most of the standard technical workers' periodicals.

Naturally it can't do it all. There is also a place on the farm for the modern communications services—especially in great emergencies and for instant application, as well as for simon-pure entertainment. The farm paper never hopes to compete in the realm of spot announcements, of course, but it has visions of serving up a little relish with its meat, or pastime pleasantries along with production problems.

Another avenue for rural readership has bobbed up in recent years. It is the "farm department" of the metropolitan newspaper. The last time we counted up, there were about 275 writers listed in the annual newspaper directory as bona fide skippers of these agricultural columns. But thus far there are no appreciable signs that farm folks are relying more upon such media than upon the friendly old farm press. This varies with the locality and the type of man involved and the degree of recognition he gets from his boss.

The presence of these newer information avenues reaching the farmer serves, no doubt, to key up the farm paper staff and oblige it to be alert and cognizant of the kind of competition that could be troublesome. The weakness of the usual newspaper farm department as a factor in the picture lies mainly in two things—that the farm writer too often has other chores to do on split time, and the editorial scribes on the sheet often lack the incentive or the background to comment upon or point up the current agricultural doings and pending programs.

THERE are two functions typical of the field of the farm department newspaper that carry a wallop. One is the fact that they are able—but not always willing—to reach food consumers with the right kind of farm facts. This could help do away with much that is prejudicial to the farmer's interest as a producer. Then the city newspaper gets itself into the political arena more steadily and fluently than does the average farm paper. Most farm papers have been conservative on handling partisan issues or candidate claims, except to accept their paid insertions. They are learning, however, that public questions can't be ignored with ostrich behavior, and they are willing to risk "stop-my-paper" threats by taking sides occasionally on moot questions. Of course, with regard to regular farm economic programs resulting from legislation, the farm papers all indulge more or less. That's because the parity price and commodity loan features have become woven into our whole national fabric—like taxes, highways, and public schools.

All sorts of variable positions are taken by farm paper editors on the issues and administrative dictums involved in soil conservation, rural electricity, production credit, loans to disadvantaged farmers—and even the cooperative extension service.

A FEW farm papers frankly admit there is too large a percentage of the farm dwellers making far too little income, with a relatively few making the most. They know that hosts of farm folks eke out their living from off-farm employment. But only here and there are there any active campaigns set going to raise the levels, and nothing that compares with the campaigns in behalf of research, farm safety, and that big one of long ago—the parcel post. This is merely a passing observation and not a carping criticism. The Good Book says that we shall always have the poor with us—and maybe the education and training of a poorer operator may bring him into the upper brackets. Anyhow, it's education more than legislation that seems to govern the attitudes of our farm press today.

You cannot possibly compare the bulky farm papers of today with the little books that circulated out in the sticks when we were young. Yet there are some honest and homely values which you can use to find out why the basic wealth of the farm paper lies in the good will of its steady readers. Behind that you can't ever forget that almost every state and section can look back with pride to certain vivid characters whose lives were linked with the farm press in the nineteenth century. Much of this accumulated force and influence stems from editors like Herbert Myrick, Herbert Collingwood, E. T. Meredith, Orange Judd, Leonidas K. Polk, Edmund Ruffin, and Uncle Henry

Wallace—and countless more. Some editors of equal respect and influence perform today in the conning towers of our forward farm magazines. So it may truly be said that rural journalism attracts a high order of intelligence and a deep sense of responsibility to the reduced ranks of "embattled" farmers today.

Foreign student observers coming over for a look-in on the strange operations of our farm paper craftsmen have told me that they do not much like all the big advertising spreads, more especially when the ads are mingled in with the reading matter. The foreign fellows prefer to have all the paid stuff tucked into the first and last sections of the book. One of them asked if our farm papers were not mainly "hucksters."

THE best reply to make to that is to state circulation figures and costs. The practical farm paper today must have sufficient revenue and some to spare. Otherwise, the quality of the contents and the ability of its staff to seek and find the best and latest aids to agriculture would dwindle and decline. A magazine that is rich enough to be independent is in a better position to advance some revolutionary and progressive causes and programs than the poor and timid one. And it takes a stout income to maintain modern farm magazines with their skillful artists and layout specialists. Years ago I heard farmers complain that their farm papers were badly printed and hard to read. The old belief that "anything is good enough to sell to farmers" is a silly motto that vanished with the peddler's wagon.

One of the tests of any successful venture lies in the response it receives. Somebody told me awhile back that he thought fewer farmers wrote to their favorite farm paper as compared to times long ago. He claimed that in the early pioneer days the farmers exchanged experiences through the columns of their single family farm journal, writing long missives in great detail.

TO this my answer would be that winter was a shut-in time for many of the pioneers and they probably had more time to settle down with pen in hand than the active farm operator today who has less help and much more on his mind to engage his daily attention. But when it comes to short, peppery, and challenging notes, pithy and provocative, I take my hat off to the present-day subscriber. He seldom has time or mood for telling other farmers how he does this and that, but he is quick to find flaws in logic or attack the writer who draws the wrong conclusions in the farm paper.

But this did not satisfy the inquiring friend aforesaid. He said the old-timer did not have the facilities for communication that modern readers have, so his conclusion was that the real reason for less correspondence from farms today is simply that the average farm paper has lost "that personal touch." He believes that the articles are so impersonal that they don't mean much to a real human being interested in a human contact on ideas. "People do not write a salmon can factory, and that's about what some of our magazines resemble today—mere manufacturing facilities," he declared.

This adverse idea of his set me to wondering. So with your help, let's scan a few pages of the latest current state and national farm papers. We'll hunt for titles and sentiments and language that tell us whether or not there

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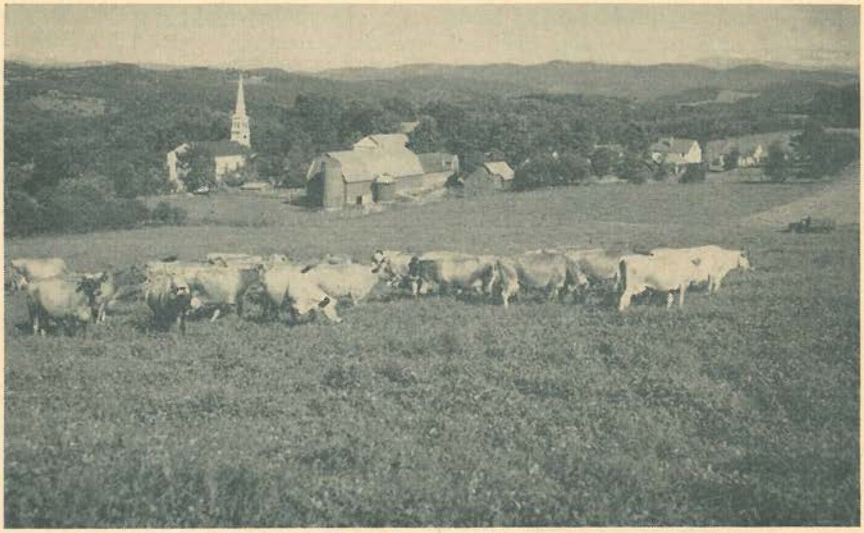

Fig. 1. Dairying on hilly land in Vermont. (Photo by A. Devaney, Inc., N. Y.)

The Net Worth of Soils in the Northeast

By C. L. W. Swanson

Soils Department, Connecticut Agricultural Experiment Station, New Haven, Connecticut

WHEN the Pilgrims landed at Plymouth Rock, they couldn't have stepped onto a more infertile soil. It is fortunate they came for religious freedom rather than farming, or they would have been extremely disappointed and disillusioned. Perhaps one reason they had such tough sledding the first year can be attributed to the sandy Carver soils of that area. These soils are about the exact opposite of the fertile prairies in the Midwest. It is true that the Indians put a fish in every hill of corn, which we now know furnished enough plant nutrients to grow a 50-bushel corn crop.

Northeastern soils may be the poorest naturally but they are among the most responsive soils we have anywhere. If they are managed properly, which includes the use of fertilizers, they are very productive. The way they are made up and how they are managed, in addition to climate, account for much of this.

I'd like to explain a few basic facts about our soils to show what I mean. In other words, I am going to take them apart and attempt to show why they act like they do.

First, we have to understand that soils are more than "skin" deep. Soils are a three dimensional system. They have a top, sides, and bottom. We can express this by what we call a soil profile. If we dig a pit, we observe that the soil to a two- to three-foot depth has three layers which we may call the A, B, C layers or horizons. The composition of these soil layers determines the kind of soils we have. For example, if the soil has about equal amounts of sand, silt, and clay, it has a loam texture.

Environment Makes Different Soils

The environment under which a soil was formed has a great deal to do with the kind of soil it is and its fertility. The soils of the Northeast have developed in a cool, humid climate under forest. Decomposition of the forest litter produced organic acids which subsequently were washed into the soil profile by rains. Soil-forming processes are reflected in the appearance of the soil to a depth of 24 to 30 inches. The major great soil groups occurring in the Northeast are Podzols, Gray-Brown Podzolic, and Brown Podzolic. These great soil group names are used for naming broad regional patterns of soils having similar characteristics. Thus is given a regional picture of the kinds of soils produced by climate and vegetation as reflected in the soils by degrees of leaching, by parent rocks from which they were formed, by kinds of relief on which they were developed, and the stages of maturity of the soils.

Podzols are named for the ash-like, nearly white leached layer that lies just under the thick accumulation of organic debris. This makes a striking profile in its natural state. Well-drained Podzols have formed where forests of spruce, fir, and northern hardwoods predominate in the northern area and at the higher elevations in the southern part. Virgin Podzols are characterized by this one- to four-inch nearly white mineral horizon just beneath the forest litter. This is underlain abruptly by a reddish brown, rusty colored subsoil horizon. The texture of all layers of horizons is about the same throughout the profile.

In the southern part, the leaching process is not quite so strong because the litter from the white pine-oak forest is thinner and less acid. As a result, the well-drained soils do not have a leached light gray or white surface mineral horizon, and the rusty colored subsoil horizon is absent or developed only to a slight degree. These soils are called Brown Podzolic and are closely related to Podzols. They are characteristically yellowish brown in the upper part. Texturally, the Brown Podzolic soils are similar to the Podzols. When these soils are cleared and plowed, the upper horizons are mixed and the soils are hard to tell apart.

Still farther south and to the west, accumulation of materials in the B or subsoil layer takes place. More clay occurs in this horizon than in the other great soil groups, having a finer texture and more pronounced structure. This layer is also a darker color, commonly being dark yellowish-brown. These soils are called Gray-Brown Podzolic.

The great soil groups depict regional characteristics. Broadly they are related to length of growing season, temperature and rainfall, and consequently to agricultural production practices. Leaching, combined with their inherent infertility, has been strong enough in all of the soils to make it necessary to use fertilizers for economic crop production.

Locally, differences in soil development overshadow these broad regional differences. Local factors extremely important from the standpoint of management and production on the individual farm are degree of drainage, extent of fertilizer residue, and kind of parent material from which the soil was derived.

Comparison with Other Areas

Soils in the Northeastern States differ greatly from those found in some other parts of the United States. If they are compared with those from the Midwest, several striking differences are noted.

For example, the Tama silt loam, a prairie soil developed from loess, occurs principally in Iowa. This soil is developed under a somewhat warmer climate than is general for the Northeast, having less rainfall and being under grass instead of trees. The numerous grass roots bring up plant nutrients from the subsoil. When the plants decay, the plant nutrients are added to the soil surface. The Tama has a deep topsoil (12-18 inches) in comparison to the thin topsoil (2-4 inches) of Podzols and Brown Podzolic soils. Prairie soils have no distinct horizons like the Podzol light gray layer but grade from the A horizon into a lighter colored, more sticky and plastic layer. Below that is a deep, pale yellow, mixed limy till. This is the way the soils appear over a large part of the undulating uplands of the Corn Belt.

The soils in the Northeastern States differ from those in the Midwest not only morphologically but also in their native fertility and responsiveness to fertilizers. In forested areas when the soils are in their natural state, the pH in the profile ranges from as low as 3.5 to as high as 6.0. On the other hand, the prairie soils are only slightly to medium acid (pH 5.6-6.5) and in many of the soils in this area the lower horizons are neutral or calcareous. Except for special crops like tobacco and potatoes, liming must be practiced for maximum production of crops in the Northeastern States. Liming not only corrects the acidity but furnishes calcium as a plant nutrient and immobilizes iron and aluminum compounds which make phosphates unavailable in acid soils. Liming in the Midwest is done mainly to assure stands of legumes, like clover or alfalfa. Lime has the same beneficial effects in the Northeast but to a greater degree.

Contrasts in carbon content are also marked. In forested areas, the top 4-6 inches of soil contain large amounts of partly decomposed plant remains, and are therefore high in organic matter. The Gloucester soil in Connecticut, a Brown Podzolic soil, contains about 51,000 pounds per acre of carbon in this layer.[1] At about a similar depth, the Carrington soil in Iowa, another prairie soil, averages 48,000 pounds.[2] As depth increases, the differences are more marked. At the 12- to 15-inch depth this soil averages 28,600 pounds per acre while the Gloucester at the 7- to 15-inch depth has 11,000 pounds. At the next depth, 15 to 24 inches, the Carrington has more than twice (8,400 lbs. more) as much carbon as the Gloucester soil.

Although the soils in the Northeastern States are naturally infertile, they are highly responsive to fertilization. Because of this, and for other reasons, they are especially suitable for the growing of intensive crops like tobacco, potatoes and vegetables. As much as 200 pounds of nitrogen, 120 pounds of phosphoric acid, and 200 pounds of potash per acre are applied annually to shade-grown tobacco in the Connecticut Valley.

The predominantly sandy texture of the soils means that they warm up early in the spring and that they can be worked soon after rains. Their predominantly loose structure allows for good aeration and rapid oxidation of organic materials which are conducive to making nutrients quickly available to plants. However, this looseness makes it necessary to add supplemental nitrogen to replace that leached from the soil.

The unusual ability of these soils to tie up phosphates applied as fertilizers has resulted in many of them becoming higher in phosphates than they were before cropping, especially where heavily fertilized crops like tobacco, potatoes and vegetables have been grown.

Plant-food Content of Soils

Comparison of the natural fertility status of soils in the Northeast with that of soils in other areas in the United States shows the Northeastern soils to be very low naturally in nitrogen. The sandy nature of the soils and the relatively high precipitation are conducive

[1] Lunt, H. A. The forest soils of Connecticut. Conn. Agr. Exper. Sta. Bul. 523. 1948.

[2] Pearson, R. W. and Simonson, R. W. Organic phosphorus in seven Iowa soil profiles: Distribution and amounts as compared to organic carbon and nitrogen. Soil Sci. Soc. Amer. Proc. 5:162-167. 1940.

Fig. 2. Soil mapping by A. Ritchie, Jr. of the Connecticut Agricultural Experiment Station in a tobacco-producing area in the Connecticut Valley. Broadleaf tobacco in foreground and shade-grown tobacco in background.

to leaching of nitrogen. This is in contrast to the Midwest with high soil nitrogen, high silt and clay soils, and moderate rainfall. Also, leaching under grasses is retarded by their numerous and fine root systems in contrast with that which occurs with the relatively coarser and fewer roots of trees.

Little, if any, phosphorus is removed from soils by leaching action. Removal from the soil is principally by harvesting of crops or by soil erosion. Also, some soils are inherently poor in phosphorus. The Northeastern soils are quite high in native phosphorus in comparison with most areas in the

Fig. 3. Potatoes in bloom in Aroostook County, Maine. (Photo courtesy Maine Agricultural Experiment Station.)

Southeast and Southern United States.

The amount of potash occurring in soils naturally depends largely on the amount contained in the rocks from which the soils are derived. In a general way, this compares with areas having soils produced from rocks weathered rather recently, as in glaciated and mountainous areas or in the drier parts of the United States. Since the Northeast, except for the southern tip was covered by glaciers, the soils are relatively young. Consequently, the soil potash content is generally rather high.

Soil Removal by Erosion

Loss of soil from erosion is not the problem in the Northeast that it is in some other parts of the United States. Generally, here the topsoil consists of the thin A horizon incorporated by plowing with the upper part of the B horizon. So, we really are farming "made" soils, at least "made" soils in comparison with those in the Midwest. Midwestern soils have "built-in" fertility; in the Northeast, the fertility is "built into" the soils. We have two different kinds of management for these different kinds of soil.

The productivity of the Northeastern soils has been greatly improved mainly by large applications of commercial fertilizers and manures used in a generally intensive agriculture. On cultivated soils especially, we should be concerned about the fertility we are losing because of erosion. Little natural fertility is lost from virgin soils by soil removal because these soils never were fertile.

Erosion affects the physical nature of soils in the Northeast more than their chemical status. Removal of the already low amounts of fine materials (silt and clay) means that less fertility-holding material is left. Fertilizers will then leach more quickly, as well as wash down the slope.

Agricultural Worth of Northeastern Soils

One may ask "What are the agricultural potentials of the Northeastern States?" These States occupy 5.6 per cent of the land area of the United States and produce 10 per cent of the farm income (Table I). The West Northcentral States (Minn., Iowa, Mo., N. Dak., S. Dak., Neb., Kans.) occupy 3 times more area but produce only 2½ times more total farm income. The Pacific Coast States (Wash., Ore., Cal.) are twice as large as the Northeastern States but produce the same amount of agricultural income. Yet the Northeastern States have a population density about 8 times greater than either of these areas.

If the agricultural incomes of Iowa and Connecticut are compared, in 1949 the income per acre for land in farms for Connecticut was $95.31 and for Iowa $47.73. For Wisconsin, a more diversified State, the amount was

(*Turn to page* 41)

TABLE I.—LAND USE, FARM INCOME, AND POPULATION DENSITY FOR SELECTED REGIONS IN THE UNITED STATES*

Region	Land area of U.S. 1950	Cropland harvested 1944	Plowable pasture 1944	Forest land 1944	Farm income 1948	Population per square mile 1940
	%	%	%	%	%	
Northeastern......	5.6	5.3	4.0	10.0	9.9	211.4
East Northcentral..	8.2	17.3	19.8	7.6	19.1	108.7
West Northcentral.	17.2	37.6	21.1	7.4	26.3	26.5
Mountain.........	28.8	6.6	4.0	20.0	6.9	4.8
Pacific Coast.......	10.8	4.3	6.8	15.9	10.2	30.4

* Source: U. S. Bureau of the Census. Statistical Abstract of the U. S.: 1950 (71st Ed.) Washington, D. C. 1950.

Summary of Ten Years' Work with Complete Fertilizers on Sugar Cane*

By M. B. Sturgis and D. S. Byrnside, Jr.

Department of Agronomy, Louisiana Agricultural Experiment Station, Baton Rouge, Louisiana

THE observations of Gouaux through many years of varietal test field work and analytical soil studies by Worsham and Sturgis (Soil Sci. Soc. Amer. Proc. 6:342-347, 1941) had by 1941 established the fact that the productive capacities and the available nutrient content of the soils in the sugar cane area were variable and in many cases low. Soil nitrogen was generally low. Forty per cent of the soils tested were so low in easily soluble phosphorus that it was apparent that sugar cane on these soils could be expected to respond to added phosphates. Over fifty per cent of the soils tested were low in exchangeable potassium, and response to potash fertilizers could be expected on the soils testing low in potassium. It was also recognized that other factors, such as high soil acidity associated with low availability of calcium and especially magnesium, the development of a plow pan in the soil, and soil acidity in relation to the choice of nitrogen fertilizers, might affect the response of sugar cane to complete fertilizers.

The results of experiments reported in the Louisiana Agricultural Experiment Station, Crops and Soils Department Annual Reports, 1948-1953, show that responses from sugar cane to dolomitic limestone or to soluble forms of magnesium have not been established.

Generally, as the depth to the plow pan or to the natural clay pan increases there is less response to added fertilizers especially with normal moisture (Soil Sci. Soc. Amer. Proc. 16:148-150, 1952). In dry years this relationship would be reversed since the deeper surface soils would furnish more available moisture which would be a more limiting factor for growth than fertilizer nutrients.

The effects of sources of nitrogen in relation to soil acidity have not been extensively studied, especially with high rates of nitrogen. The studies that have been made (Sugar Journ. 12:16-18, 1950) show that all the materials, ammonia, ammonium nitrate, urea, calcium cyanamid, and sodium nitrate, were equally effective. It might be expected, however, that after the use of high rates of the ammonium type of nitrogen carriers for many years, soil acidity could become a problem.

In beginning the experiments with complete fertilizers on sugar cane, locations were largely limited to stubble cane on the Pleistocene terrace soils. The treatments were placed in randomized blocks and replicated. The plot size chosen at each location was sufficient to yield at least a sling of cane. The fertilizers were applied in the off-bar furrow. The treatments and the average yields of cane and sugar at five locations each on Olivier silt loam, Lintonia silt loam, and Iberia silt loam during the period 1942-1944 are given in Table I. At the low level of nitrogen, 36 pounds per acre, on Olivier silt loam there was a 6.7-ton increase from the nitrogen with less than a ton response from phosphate and potash. In later

* Reprinted from *Sugar Journal* June 1, 1954.

Fig. 1. Cutting sugar cane, Saint Martinville, Louisiana.

experiments, Table IV, on Olivier silt loam at the 60-pound per acre level of nitrogen, the response to phosphate and potash amounted to 4.6 tons of cane and 865 pounds of sugar per acre. At the low level of nitrogen, Lintonia silt loam reacted like the Olivier silt loam. Experiments with stubble cane on Iberia silt loam have consistently shown responses to complete fertilizers. At the 36-pound per acre level of nitrogen, Table I, there was a 3.3-ton response to nitrogen, but when phosphate and potash were added to the mixture, the response to the complete fertilizer was 6.4 tons of cane and 1,187 pounds per acre of sugar.

Experiments with plant cane at the low level of nitrogen at three locations were conducted on Olivier and Iberia soils in 1942 and 1943. The highest yields in all cases were obtained with complete fertilizers. This led to testing the responses of plant cane on the Pleistocene terrace soils at higher levels of nitrogen, phosphate, and potash. Data in Table II show that the average response of plant cane on Olivier silt loam was 5.6 tons per acre increase from 40 pounds of nitrogen. The increase from

TABLE I.—RESPONSE TO FERTILIZERS FROM STUBBLE CANE ON PLEISTOCENE TERRACE SOILS, 1942-1944

Pounds per acre plant nutrients N^1–P_2O_5–K_2O	Average of 5 locations on Olivier silt loam		Average of 5 locations on Lintonia silt loam		Average of 5 locations on Iberia silt loam	
	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar
0–0–0	14.40	2,738	21.15	3,811	15.12	2,957
36–0–0	21.05	3,976	25.07	4,246	18.41	3,510
36–24–0	21.55	4,094	24.85	4,299	19.18	3,755
36–0–36	21.96	4,086	26.55	4,615	19.66	3,660
36–24–36	21.70	4,007	26.75	4,670	21.53	4,144

[1] Nitrogen from nitrate of soda; P_2O_5 from 20% superphosphate; K_2O from 50% muriate of potash.

TABLE II.—RESPONSE TO FERTILIZERS FROM PLANT CANE ON PLEISTOCENE TERRACE SOILS, 1945-1953

Pounds per acre plant nutrients N^1–P_2O_5–K_2O	Average of 3 locations on Olivier silt loam		Average of 3 locations on Iberia silt loam	
	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar
0–0–0	21.83	3,491	21.32	3,678
40–0–0	27.46	4,126	22.15	3,916
40–0–60	28.10	4,355	25.33	4,422
40–40–60	29.68	4,760	26.98	4,746
60–0–0	27.20	4,178	23.69	4,201
60–0–60	28.26	4,522	25.31	4,281
60–40–60	30.37	4,742	25.56	4,239

[1] Nitrogen from ammonium nitrate; P_2O_5 from 20% superphosphate; K_2O from 60% muriate of potash.

40 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O was 1.9 tons of cane and 1,269 pounds of sugar per acre. Plant cane on Iberia silt loam, Table II, showed a more definite response to the complete fertilizer. The response to 40 pounds of nitrogen for three locations averaged less than a ton of cane per acre, while the response to 40 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O gave an average increase of 5.7 tons of cane and 1,068 pounds of sugar per acre.

The response of plant cane on the Recent alluvial soils to complete fertilizer is quite varied. The averages of four locations on Baldwin silt loam, Table III, show a 5.2-ton response to 60 pounds of nitrogen per acre and a 7.7-ton increase from 60 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O. Only one experiment was located on Commerce very fine sandy loam with plant cane. At this location there was no response to nitrogen alone, but 40 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O gave an increase of 14.9 tons of cane and 900 pounds of sugar. The averages from four experiments with plant cane on Mhoon silty clay loam show a response of 4.8 tons of cane to 60 pounds of nitrogen alone. The response to 60 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O gave an increase of 4.9 tons of cane and 900 pounds of sugar.

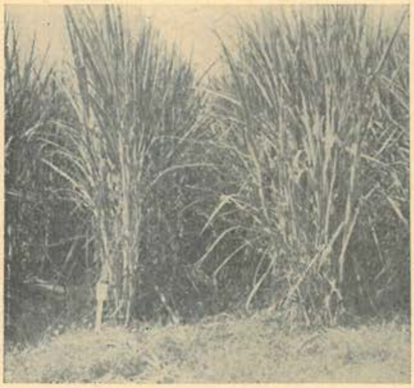

Fig. 2. No fertilizer was applied to the check plot.

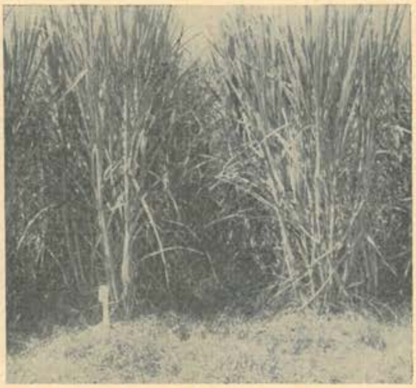

Fig. 3. This plot had fertilizer at the rate of 40 lbs. N, 40 lbs. P_2O_5, and 60 lbs. K_2O per acre.

TABLE III.—RESPONSE TO FERTILIZERS FROM PLANT CANE ON ALLUVIAL SOILS, 1945-1953

Pounds per acre plant nutrients N^1–P_2O_5–K_2O	Average of 4 locations on Baldwin silt loam		One location on Commerce very fine sandy loam		Average of 4 locations on Mhoon silty clay loam	
	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar
0–0–0	25.25	4,563	31.51	5,125	23.91	4,532
40–0–0	29.41	5,258	30.16	4,870	27.72	5,255
40–0–60	29.79	5,014	32.12	5,325	27.41	5,024
40–40–60	30.93	5,587	36.40	6,025	27.27	5,140
60–0–0	30.47	5,275	31.63	5,135	28.66	5,401
60–0–60	31.82	5,523	33.58	5,495	28.06	5,317
60–40–60	32.96	5,780	33.17	5,370	30.32	5,778

[1] Nitrogen from ammonium nitrate; P_2O_5 from 20% superphosphate; K_2O from 60% muriate of potash.

The averages from four experiments with plant cane on Mhoon silty clay loam show a response of 4.8 tons of cane to 60 pounds of nitrogen alone. The response to 60 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O was 6.4 tons of cane and 1,246 pounds of sugar per acre.

The effects of fertilizers at the higher levels of nitrogen on the Pleistocene terrace soils with stubble cane from 1945 to 1951 indicate marked benefits from the complete fertilizers. The averages of results at three locations on Olivier silt loam, Table IV, show that 60 pounds of nitrogen alone increased the yield of cane 4.9 tons per acre. The same amount of nitrogen in combination with 40 pounds of P_2O_5 and 60 pounds of K_2O gave an increase of 9.5 tons of cane and 1,849 pounds of sugar per acre. The averages of results from five experiments with stubble cane on Richland silt loam show 4.5 tons of cane benefit from 60 pounds of nitrogen alone, while 60 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O gave increases of 7.5 tons of cane and 1,185 pounds of sugar per acre. Eight experiments with stubble cane on Iberia silt loam showed marked response to complete fertilizers. The average increase from 60 pounds per acre of nitrogen alone was 4.6 tons of cane. The increase from 60 pounds of nitrogen and 60 pounds of K_2O was 8.1 tons of cane, while the increase from 60 pounds of

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TABLE IV.—RESPONSE TO FERTILIZERS FROM STUBBLE CANE ON PLEISTOCENE TERRACE SOILS, 1945-1951

Pounds per acre plant nutrients N^1–P_2O_5–K_2O	Average of 3 locations on Olivier silt loam		Average of 5 locations on Richland silt loam		Average of 8 locations on Iberia silt loam[2]	
	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar
0–0–0	16.45	3,021	20.57	3,326	19.41	3,355
60–0–0	21.35	4,005	26.09	3,785	24.02	4,132
60–0–60	20.36	3,737	25.82	4,217	27.52	4,792
60–40–60	25.97	4,870	28.05	4,511	28.72	4,937

[1] Nitrogen from ammonium nitrate; P_2O_5 from 20% superphosphate; K_2O from 60% muriate of potash.
[2] At two locations 80-40-60 gave the highest yield.

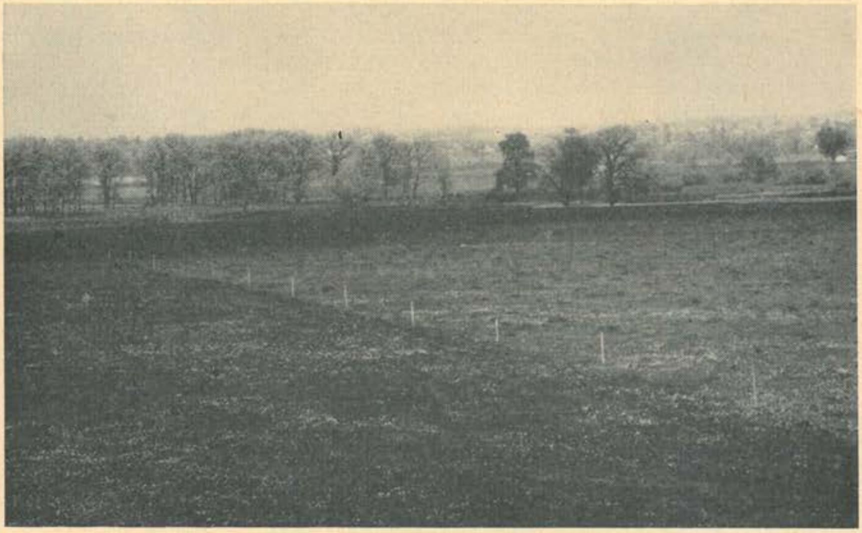

Fig. 1. Here is one of those creek bottom fields that responds so generously to straight nitrogen and will continue to do so for a few years. Eventually the lush growth of grass resulting from nitrogen treatment will pump the mineral content down to a point when response to N only just "peters out." "A stitch in time" on such fields "will often save nine." Where straight nitrogen is applied to pastures, it is a good idea to check the phosphate, potash, and pH levels and then put on what soil tests indicate is needed.

Nitrogen Use Accentuates Need for Minerals

By C. J. Chapman

Soils Department, University of Wisconsin, Madison, Wisconsin

THE great increase in the use of nitrogen fertilizer by farmers in this country has been an almost phenomenal development in the past three or four years. Anhydrous ammonia has swept into the Midwest like a cyclonic storm and its use in Wisconsin is keeping pace with that in other Corn Belt States.

Most of us are familiar with the fact that at the close of the war in August 1945, the capacity for the production of synthetic ammonia in the nine gunpowder plants in this country amounted to some 700,000 tons (fixed nitrogen). Agronomists wondered if even 50% of this capacity would ever be used as fertilizer in the postwar period. A few of us caught a glimpse of what we thought was the great potential in terms of low cost feed, food, and fiber production, and started talking and writing about it. Today, nitrogen is being used on a scale that exceeds the most extravagant speculation of any who predicted this gigantic growth in nitrogen production and use as a fertilizer. Present capactiy for the production of fixed nitrogen in this country now hits close to three million tons.

Ammonium nitrate as a source of

low cost nitrogen has come into wide use on corn and other crops in Wisconsin and other Midwest States. In fact, the demand these past three or four years has greatly exceeded supply. Farmers are now using another source of low cost nitrogen—anhydrous ammonia. This liquefied form of ammonia gas (NH_3) carries 82½% nitrogen. It must be held in rust-resisting steel tanks under pressure of from 150 to 200 lbs. per square inch. The application of this liquid gas calls for special type and rather costly applicators. Injected or "knifed" into the soil, it is fixed chemically and held there until the soil warms up. At temperatures above 60° it nitrifies and becomes available to the growing crops or is used by and built into the tissues of bacteria or fungi and thus held for later use when these bacteria and fungi decompose.

Nitrogen Use Increases Need for Minerals

The great expansion in the use of nitrogen has accentuated the need for minerals in our soil. We must stress as never before the importance of lime, phosphate, and potash to back it up. In fact, there will be an increasing need for certain trace and secondary minerals in order to balance out fertility. Low cost nitrogen fertilizer has extended crop production horizons —but unless we balance out the fertility of our soils with both major and minor elements, we may see a general decline in the productiveness of the soils in this country.

This may be a good time to present some yield data that are of far greater significance now than when the work was conducted. It was 10 years ago that plans were made for an extensive program of fertilizer demonstrations in northern Wisconsin. This program of demonstrations came about as a result of a demand on the part of county agents in these northern counties for help from the College of Agriculture. "What's wrong with northern Wisconsin's agriculture?" This was the question that during the summer of 1944 was put to the adminis-

Fig. 2 This is a picture of one of the many fertilizer demonstrations carried out in northern Wisconsin where nitrogen alone would not do the job. Yields per acre: Ammonium nitrate at 200 lbs., 2,700 lbs.; ammonium nitrate at 200 lbs. plus 0-20-20 at 250 lbs., 5,700 lbs.; no fertilizer, 1,800 lbs.

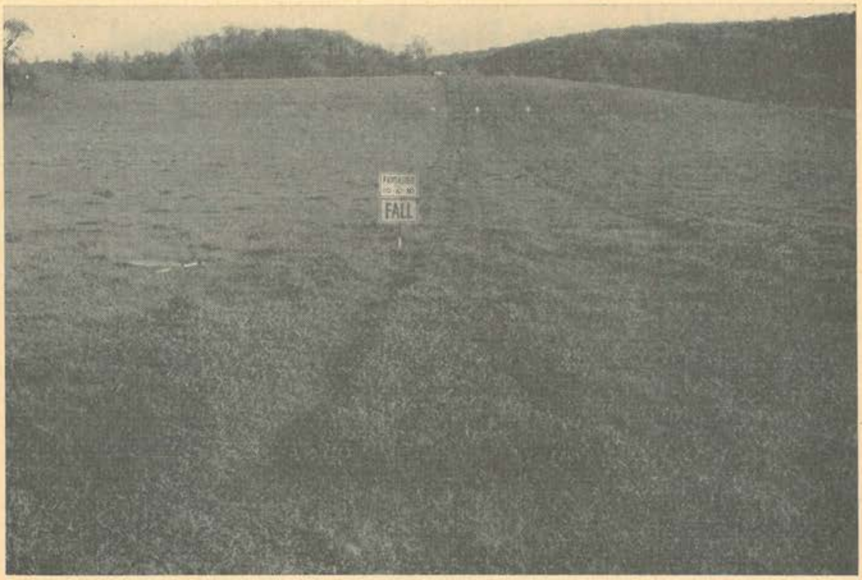

Fig. 3. Soil tests for available phosphorus, available potassium, available nitrogen and acidity on samples taken from this field indicated a fair to low content in all elements. (Available P, 10 lbs.; Available K, 180 lbs.; Available N, 325 lbs.; pH, 5.5). Little wonder that the application of a complete (10-10-10) fertilizer made such a tremendous showing. A comparison was made of fall vs. spring application. The fall treated area got off to an earlier start than where fertilizer was applied in the spring, and yields were somewhat better.

trative heads of the College. The initial step was a two-day conference at Ashland of administrative heads, including departmental chairmen as well as county agents and farm leaders from this northern area, Dr. E. B. Fred (then dean of our College of Agriculture) and Walter Hodgkins (then president of the University Board of Regents).

The livestock people offered the suggestion that there was much to be desired in the way of herd improvement. "Too many scrub cows! Poor quality feed," they said. They suggested a program of artificial insemination for the dairy farmers of this northern area.

The economics people voiced their opinions. "Cut costs of production! Increase the output of quality feed! Betters cows and a greater diversification of farm income," they said.

The crops people summed up the situation in very few words: "Convert the weed-infested hay and pasture meadows of the area into good, high quality, protein-rich forage crops! Grow more grain and practice a system of shorter rotations!"

Professor Emil Truog, then chairman of the Department of Soils, elaborated on the basic fundamentals of soil fertility, lime, and fertilizers, and the importance of mineral-rich soils as a starting place in a program of crop improvement and the eventual development of better herds of dairy cattle. Without question, Professor Truog had hit upon the real and basic reason for low yields and poor quality of hay and grain in that north country.

Topdress Grassland Meadows With Nitrogen

The first year we started out with nitrogen only on those old June grass or timothy quack meadows. The results were very good on some fields but on others just fair, and in some cases all it did was to green up the

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Guides to the Management of Illinois Soils

By M. B. Russell

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"THE wealth of Illinois is in her soil, and her strength lies in its intelligent development." This statement, which appears on the frieze of Davenport Hall on the University of Illinois campus, was made half a century ago by President Draper. It is as true today as it was 50 years ago.

One of the major functions of the University's Agronomy Department has been and continues to be to assist in the intelligent development of the soils of Illinois. It is our firm conviction that sound soil management is the foundation on which an efficient, productive, and progressive agriculture must be built. Not only for this reason, but because of the wide range of soil conditions found in Illinois and because of the steadily growing reservoir of knowledge concerning soil and crop behavior, a review of the basic concepts of soil management is appropriate. We are keenly aware of our opportunities and responsibilities in working with all the technical agricultural personnel in the State in assisting farmers in the selection of soil management practices. Therefore, the Agronomy Department accepts as one of its major functions the collection, summarization, and dissemination of basic information concerning soils and their behavior under use, so that farmers will have at their disposal the necessary facts on which to make intelligent soil management decisions.

Basic Principles

The soil management problems encountered on individual farms involve specific combinations of many factors. This fact, together with the large amount of experimental data on the effects of particular practices under specific conditions, makes it necessary to establish certain guideposts to assist in evaluating practices for individual farms. The following basic precepts should be kept constantly in mind when advising farmers on the selection of soil management practices.

1. The relation of practices to the attainment of the over-all soil management objectives of the farmer should be emphasized. These objectives, irrespective of type of farming enterprise, should be, in our opinion, (a) to supply the amounts and forms of plant nutrients necessary for efficient levels of crop production, (b) to provide a satisfactory state of tilth for normal root development and favorable soil-air, -water, and -temperature conditions, and (c) to minimize the loss of productive capacity arising from erosion.

2. There can be a range of alternative practices that merit serious consideration in answering the above objectives. These can be expected to vary with the soil and economic conditions prevailing on the farm, the abilities and desires of the operator, and the risks he is willing to assume. Therefore, it becomes the responsibility of those who advise farmers on soil management problems to acquaint them with the alternative practices available and to inform them, to the extent possible, of the consequences arising from the choice of any one of the alternatives. The particular set of practices

which most efficiently meets the objectives on one particular farm at one particular time may be quite different from those best suited for that farm at some later time or for a neighboring farm.

3. Specific practices must be considered in relation to other soil management practices and to other aspects of the entire farm enterprise from the standpoint of how they are complementary, competitive, and supplementary with respect to the employment of land, labor, machinery, capital, etc.

4. For soils having multiple nutrient deficiencies, proper amounts of each of the nutrients must be supplied if efficient use is to be obtained from any one of them.

Facts Needed on Individual Farms

Specific information on the following points is necessary to select properly the soil management practices for a particular farm or field.

1. The objective and goals of the farmer—An understanding of these is fundamental to the adoption of practices.

2. Soil type—The physical nature of the profile, particularly its moisture and air relations, is of considerable importance in any consideration of soil management practices.

3. Production limitations imposed by soil resources—The existence of erosion hazards, susceptibility to flooding, lack of adequate drainage, or the existence of insufficient storage capacity for soil moisture often imposes rather severe limitations on the choice of soil management practices and also on the economic returns.

4. Nutrient status—Full use should be made of soil test data, information on previous fertilization and cropping practices, current yield levels, and yield potentials in the development of a set of soil fertilization practices.

Although it is impossible to list all of the combinations of specific practices that should be considered on one or more of the farms of Illinois, certain generalizations that serve as a basis for making decisions concerning soil management can be made. These principles are well established and are supported by many direct and indirect research data; they provide the building blocks from which acceptable, sound soil management systems are constructed.

Soil Reaction

Most but not all Illinois soils are naturally acid. The degree of acidity is a function of the relative amounts of exchangeable hydrogen and exchangeable cations, such as calcium and magnesium, on the colloidal surfaces of the soil. The proportion of exchangeable hydrogen, and hence the acidity of an acid soil, can be reduced by the addition of such basic compounds as $CaCO_3$, $Ca(OH)_2$, CaO, $MgCO_3$, etc. The rate at which the neutralization occurs is determined by the rapidity with which the added material goes into solution in the soil. This is influenced by the chemical nature and fineness of the liming material, the rate of application, and thoroughness of mixing with the soil.

Soil reaction affects crop growth indirectly through its influence on the chemical forms and availability of the nutrient ions as well as the solubility of certain essential and nonessential elements, such as Al, Mn, etc., which are harmful in high concentrations. Soil reaction also influences microbial activity in the soil.

For cropping systems which include legumes, the soil should be maintained at pH 6.0 to 7.0 and should not be lower than pH 5.5 for most of the commonly grown field crops. The priority to be given lime, particularly where limited capital is available, should be based on the expected responsiveness of the crops grown to lime and to other nutrients which might be deficient. For example, soil tests might indicate a pH of 5.5 and severe phosphate or potash deficiencies.

This degree of acidity is relatively more serious for the legume than for the other crops. The severe potash or phosphate deficiency, on the other hand, will seriously limit the yields of all crops. In this case top priority would be assigned to phosphorus or potash for all crops, with lime also applied ahead of the legume. Below pH 5.5 there is little basis for choice, and lime as well as phosphorus and potash, if deficient, should be applied for all common crops. This illustrates that no set sequence of soil treatment can be recommended for all conditions.

If proper proportions of high calcium and dolomitic limestones are added in amounts necessary to correct soil acidity, then the calcium and magnesium nutrient requirements for plants will be met.

Phosphorus

It has long been recognized that many Illinois soils contain insufficient phosphorus for efficient levels of crop production. Those constituents which contribute to phosphate fertility in soils reside in organic forms and in two principal inorganic forms, adsorbed and acid-soluble. The relative proportion of the latter forms is largely determined by the pH of the soil. The phosphorus taken up by plant roots is derived from the adsorbed and acid-soluble inorganic soil forms, both of which can be measured by soil tests. Phosphates added to a soil are ultimately converted into the native soil forms mentioned above. The rate of conversion of inorganic carriers is determined primarily by the solubility of the added phosphorus. This, in turn, is determined by the chemical form of the added phosphorus, the acidity of the soil, and the thoroughness of mixing.

With respect to phosphate fertilizers, the following points merit emphasis:

1. There is no one best carrier for correcting the phosphorus deficiencies of all Illinois soils.

2. Soluble phosphatic fertilizers can be used effectively to meet the crop needs irrespective of the crop or the pH of the soil.

3. Soil acidity affects the solubility of rock phosphate. In very sweet soils (pH 6.5 to 7.0), and especially in alkaline soils (pH above 7.0), rock phosphate dissolves so slowly that it does not supply sufficient available phosphorus for maximum yields. On these soils the phosphate needs of crops should be supplied largely through soluble phosphates.

4. In soils limed according to test which have reached a pH range of 6.0 to 6.5, plant roots can feed on rock phosphate, and it is therefore classed as available, although for many plants its availability is limited. Rock phosphate should be broadcast and mixed with the soil. Its effectiveness on soils in this pH range appears to be increased by duration of soil contact. Even so, supplementary soluble phosphorus would appear to be necessary for maximum yields of some crops, notably wheat.

5. For starter fertilizer, for direct application to wheat, for corn subject to injury by grape colaspis or other root insects, or for crops with restricted root systems, only soluble phosphates are recommended.

Potassium

Although Illinois soils contain a large amount of total potassium, the amount of this element in the exchangeable or "plant-available" form is too low in many soils for efficient levels of crop production. It is established that potassium exists in several forms in Illinois soils and that the amounts found in each of these forms are in dynamic equilibrium with each other. This important concept constitutes the logical basis for potassium fertilization practice.

The rate at which potassium is released from the reserve soil forms in southern Illinois and sandy soils is much lower than that of most northern Illinois soils. For this reason maintenance as well as build-up requirements for potassium in soils of these areas are quite different. On soils testing low in potassium, the required potash should be added in two or more applications per rotation to avoid excessive conversion to the "storehouse" forms. Because of its highly soluble nature, potash applied with or near the seed at planting time may cause injury to seedlings. Since many crops have the capacity for luxury consumption of potassium when large amounts of this nutrient are present, it is not a good practice to apply surplus amounts of potash immediately ahead of a forage crop from which hay is to be removed.

Build-up and Maintenance

One of the basic concepts concerning soil fertility management is that of raising the nutrient level of the soil to that required for efficient crop production and then maintaining it at or near that level by regular fertilization as determined by the nutrient losses from crop removal, leaching, and erosion and by periodic soil tests. This concept applies primarily to such immobile nutrient elements as phosphorus and potassium. In economic terms, the fertility build-up might be considered as a capital investment and the maintenance application as an operating cost.

It is possible, depending on the nutrient in question and its level of availability, to operate on a strictly maintenance basis, on a partial build-up and maintenance basis, or on a complete build-up and maintenance basis. On soils that are highly deficient in potassium, the build-up of potassium should be achieved on a gradual basis which permits maximum yields without excessive conversion of the applied potash into "storehouse" forms. Except for calcareous soils, a phosphorus build-up can be achieved either as a single full application or on a gradual basis. The choice among the several alternative routes will be determined usually by the magnitude of the build-up requirement, by the financial status of the farmer, and by the manner in which the alternative systems fit into the farmer's system of operations.

The concept of build-up and maintenance involves no explicit requirements as to the forms used to meet the fertility needs. It is usually true, however, that the large amounts of nutrients, required for full build-up can be most economically supplied in the form of straight fertilizer materials rather than in mixed fertilizers. The same may also apply for rotational maintenance applications following complete build-up. If the maintenance needs are met wholly or in part through the use of fertilizers on the individual crops, a higher-unit-cost mixed fertilizer of suitable grade may be preferred if it reduces the number of applications that have to be made. Thus starter fertilizers can be used to meet fertility maintenance requirements and at the same time provide a supply of available nutrients for seedling establishment and vigorous early growth.

Nitrogen

Of the essential plant nutrients that are supplied from the soil, nitrogen is the element that is required in the greatest quantities. This fact, coupled with the knowledge of the mobile nature of the nitrogen forms absorbed by crop plants, makes it essential that continuing attention be given to the nitrogen supply for each crop. All the possible sources of nitrogen should be considered in meeting crop demands for nitrogen. These sources include soil organic matter, crop residues, legumes, manure, and nitrogenous fertilizers.

In evaluating legumes as a source of nitrogen for subsequent crops, adequate attention must be given to the manner in which they are utilized, amounts of nitrogen added, the fixed charges involved in their production, and the hazards arising from stand failures. When needed, nitrogen fertilizers can be effectively used to supplement legume nitrogen.

The proportion of nitrogen secured from the air by nodulated legumes decreases as the supply of available nitrogen in the soil increases. Therefore, legumes will be most effective as suppliers of nitrogen to the cropping system when grown on soils that are low in available nitrogen and at the position in the rotation where the available nitrogen supply is at its lowest level.

In the presence of organic material that is low in nitrogen and under favorable environmental conditions, soil microorganisms compete with the growing crop for nitrogen. Sufficient nitrogen must be supplied to meet the needs of the crop and the microorganisms if satisfactory yields are to be obtained. The amount of nitrogen required for the microorganisms will depend upon the kind and amount of residue returned to the soil.

Organic Matter

Organic matter is an important soil constituent. It serves as a reservoir of nutrients, particularly nitrogen, and it alters the physical properties of the soil. The effects of organic matter on soil aggregation and tilth are determined primarily by the unstable intermediate compounds formed during decomposition. It is important that a steady supply of actively decomposing organic matter be present in the soil if it is to be kept well aggregated. All sources of organic matter should be utilized as effectively as possible. Legumes, nonlegumes, manure, cover crops, and crop residues are all good sources of organic matter. Except for manure the quantities of these materials available for incorporation into the soil will be highest on soils in a high state of fertility.

Organic matter, either incorporated in the soil or used as a mulch, aids in water infiltration. Except on very sandy soils it probably does not significantly increase the water-supplying power of the soil.

Soil Tilth

To function normally, plant roots require water and oxygen as well as nutrients. The amounts and rates of supply of both air and water are strongly affected by the physical condition of the soil. Highly compact soils, or soil horizons, may seriously impede the movement of air and water through the soil and may prevent full exploitation of the soil volume by roots. When rooting volume is restricted, plants are less efficient in their utilization of the total available water and nutrient supplies of the soil.

Soils in a good state of tilth are well aggregated, have a low bulk density, and exhibit a considerable amount of resistance to compaction. Such soils have moderate to high infiltration rates, good internal drainage, and enough large pores to permit adequate aeration. Management systems that favor the creation of good tilth are those which regularly supply large amounts of readily decomposable organic matter to the soil, those which maintain a vegetative cover on the soil for a maximum portion of the time, and those in which tillage operations, particularly during times of high soil moisture, are minimized.

The effects of soil tilth on crop yields on soils of high fertility are not sufficiently well established to permit, at this time, a quantitative evaluation of tilth as a factor in crop production. In many instances yield effects which in the the past have been attributed to poor physical conditions have in recent years been found to be associated with insufficient nutrient levels, particularly nitrogen. This is especially true on the medium-textured soils. However, on very fine-textured soils the effect of tilth upon yield is more clear-cut.

Erosion Control

One of the principal objectives of any sound system of soil management is to minimize the loss of productive capacity arising from erosion. The relative position of erosion control as a major consideration affecting the selection of management practices varies widely and is determined by the slope and soil profile characteristics. Since, under Illinois conditions, erosion occurs primarily as a result of movement of water over the surface of the soil, it follows that practices that reduce or eliminate such water flow will constitute effective erosion control. Therefore, all practices that increase the infiltration of water into the soil are important in controlling soil and water losses. Maintenance of good tilth and vegetative cover and use of contour tillage, strip cropping, grass waterways, and where necessary, water control structures, such as terraces, should be considered in the management of soils having an erosion hazard. The maintenance of a high state of fertility is conducive to effective erosion control through its effect on the amounts of crop residues returned to the soil and its effect on the vigor and density of the vegetative cover on the land.

Rotations

The use of a planned system of crop sequences is useful in the development of a sound soil management system for a particular farm. A crop rotation, however, is but a means to one or more objectives; it is a means to an end—not the end itself. Rotations are useful in distributing risks; in decreasing crop diseases, weeds, and pests; and in distributing labor and machinery demands on the farm. Rotations or cropping systems are intimately associated with soil fertility needs and with the maintenance of tilth and the control of erosion.

In the past the rotations that have been most productive and profitable and that have maintained satisfactory soil tilth have been those in which legumes and sod crops have been grown frequently. On sloping land the range of choice of cropping systems is restricted because of the erosion hazard. On level, nonerosive land the choice may be conditioned primarily by the effects of the cropping system on the air and water relationships of the soil. The latter are intimately associated with soil tilth and with the amount and activity of soil organic matter. Also, one of the functions of legumes in a cropping system is to supply nitrogen for subsequent nonlegume crops. Therefore, it is easy to understand why the increased use of commercial nitrogen has given rise to many new ideas that apparently contradict our previous concepts of the contribution of cropping systems to sound soil management.

Under present price conditions there are many situations where synthetic nitrogen can substitute for legume nitrogen in crop production. If crop yields are increased, the amounts of organic residues available for incorporation into the soil are normally increased. If sufficient nitrogen is supplied to satisfy both the crop and microbial demands, then a high level of nitrogen availability and organic matter activity is achieved. For many situations the functions of legume rotations can be achieved by nonlegume cropping systems and synthetic nitrogen except for the possible physical effects of the legume roots. It is possible that many of the other shortcomings of the more intensive rotations can be reduced or eliminated by intercropping or other modifications of crop production practices.

Rotations and legumes are not being repudiated. Rather, new techniques and materials that offer alternative routes to the same objectives have become available. Farmers now have a wider choice of cropping system and greater flexibility and reduced risk within the cropping system because for the first time, in a practical sense, the farmer has control of the nitrogen management of his farm. With proper fertilization, on permeable, nonerosive soils, even continuous corn production becomes a possibility.

There are many nearly level soils in Illinois where it is very doubtful that efficient levels of production can be maintained without the periodic use of cropping systems that include sod crops. Under most soil conditions—and particularly on the flat, slowly permeable, very fine-textured soils—

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The Soil Profile's Contribution to Plant Growth

By Jackson B. Hester

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LITTLE enough has been explained about the requirements of various plants, to say nothing about the contribution of the various soil horizons in the production of plants. To illustrate this premise, such crops as broccoli, cabbage, cauliflower, celery, lettuce, and spinach have a relatively shallow root system but require about as much nitrogen as potash for production, namely, between 50 and 150 pounds of the respective nutrients per acre. On the other hand, such crops as tomatoes, potatoes, and carrots utilize considerably more potash than nitrogen.

It is well recognized that approximately 450 to 500 pounds of water are required to produce one pound of dry plant material. This figure is almost constant irrespective of the type of plant grown. The difference in the various crops for the humid and arid areas is associated with the extent of the root system and the evaporation from the plant. Because of this fact, too little attention has been focused upon the properties of the different layers of the soil in supplying the essential elements for crop growth.

A well-developed profile that exists in the eastern and southern parts of the United States is composed of an A_p (plowed) horizon, A_2 (leached) horizon, B_1 (accumulative) horizon, followed by a greater density down to the 3- to 5-foot level. Below this the parent material is found extending to various depths. While the above figures describe a well-drained yellowish brown sandy loam, other soil series exist with varying degrees of depth.

Figure 1 shows a yellowish brown sandy loam that has a characteristic soil profile to the 42-inch depth versus a grayish brown loam with a characteristic profile to approximately the 24-inch depth.

Each of these soil horizons contributes to the ultimate production of the plant. Every plant must have adequate water for optimum growth. Therefore, one of the first discussions of the two soils is their power to supply water to the plant. The yellow brown soil, in the plowed horizon, has the power to supply 880,000 pounds of water per acre. The yellowish brown leached horizon (9-23″) has the power to hold 1,100,000 pounds of water. The subsurface layer likewise has the power of holding 2,700,000 pounds of water.

At this point it may be of interest to call attention to the fact that 100 bushels of corn per acre will utilize between 4 and 5 million pounds of water or between 12 and 19 inches of rainfall. A 15-ton crop of tomatoes requires 2½ to 4 million pounds of water. It must also be remembered that the amount of water that falls upon the ground does not mean that all of that water will be available to growing plants. Such factors as surface runoff, sub-drainage, and evaporation from the soil without actually going into the plant are the predominating conditions that consume part of the rainfall. Because of the difference in soils, these factors greatly influence crop production.

The yellowish brown soil would be

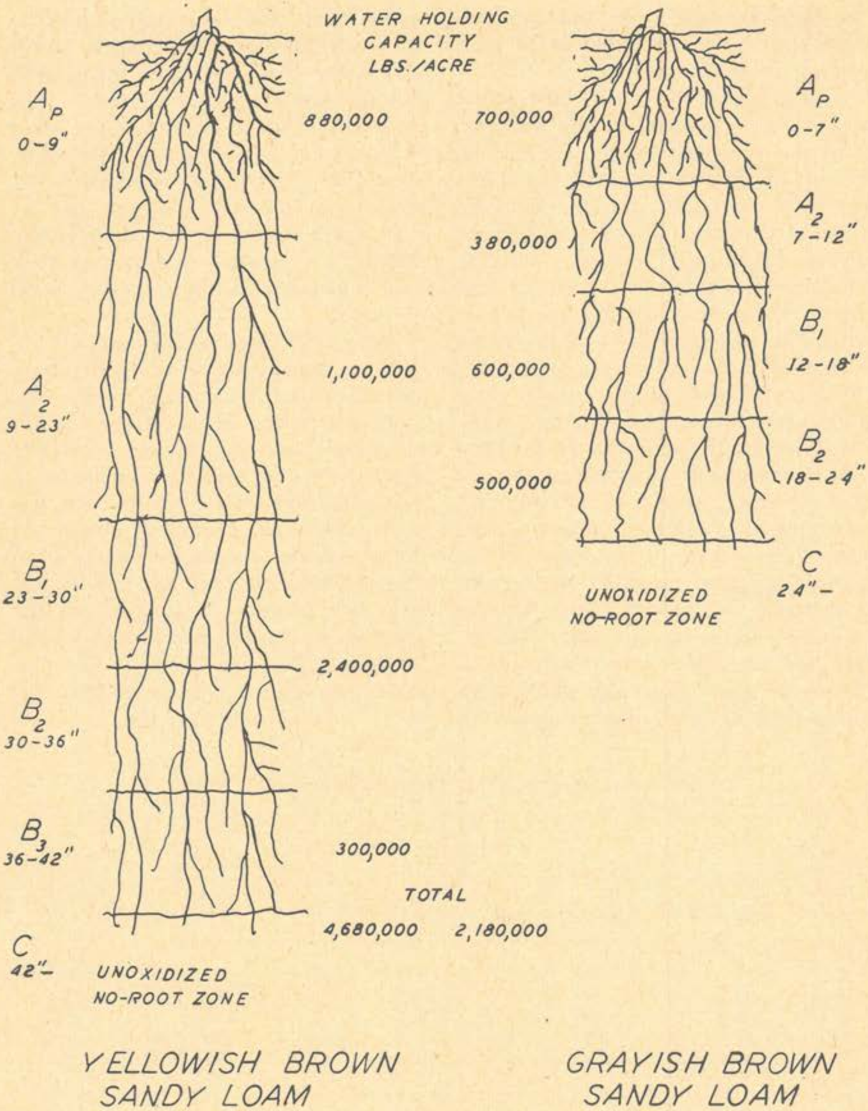


Fig. 1

capable of supplying more than 4,-000,000 pounds of water at complete saturation whereas the other soil could supply slightly over 2,000,000 pounds. Complete saturation only occurs for a short time in either of these soils and is more likely in the gray soil with shallow depth, high water table, and heavy clay base.

Water flows through the soil to the streams and underground reservoirs. It is generally reported that each 100-foot depth of Coastal Plain soil contains approximately 17 feet of water which has all moved into the soil from the surface by slow seepage or fissures. Since, however, the plant is confined to the aerated layer of the soil, that is, the layer in which free oxidation occurs, this is the part that is of most interest in plant production.

The grayish brown soil will require irrigation far earlier, in dry weather, than the yellowish brown soil because of the depth and potential possibility of root penetration into the oxidized areas of the soil. In other words, the grayish brown soil, because of its shallow nature, would be capable of supplying much less water than the yellowish brown and related soils under stress.

In addition to supplying water, the different horizons supply various plant nutrients. The organic matter is primarily concentrated in the A_p horizon. The organic matter content of the soil is the primary source of soil nitrogen. The organic matter influences the plowed surface in various ways. It improves aeration, furnishes energy for microbiological activity, and supplies secondary and trace elements. The surface soil to plow depth also contains almost all of the available phosphorus and a part of the available magnesium and potash. The A_2 or leached horizon is practically devoid of plant nutrients other than iron and manganese, but supplies considerable water. The accumulative or B horizon is the most fundamental part of the soil from many standpoints. It has a tremendous water-holding capacity and also has accumulated much of the magnesium, potash, and secondary elements such as manganese and iron over the period of years.

Most crops have a high potash absorbing capacity and it is highly essential that potash be available to the ultimate root depth. Seldom is the amount of potash used by the plant actually applied in the form of fertilizer to that particular crop. For instance, the utilization of 20 pounds of potash per ton of tomatoes produced would mean that a 20-ton crop would actually utilize 400 pounds of potash or that amount of potash in two tons of 5-10-10 fertilizer. Fortunately all of this potash is not removed from the field but

(*Turn to page* 39)

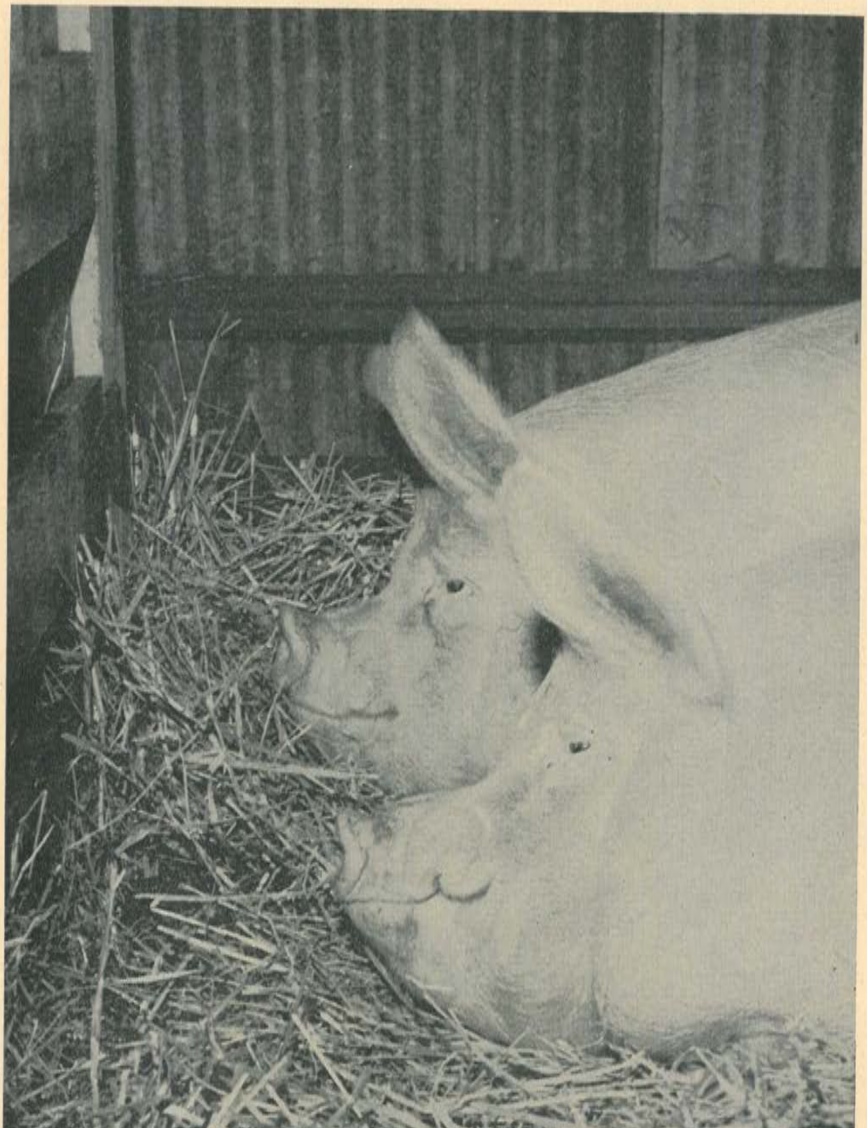
SOIL ANALYSES OF YELLOWISH BROWN SANDY LOAM

Horizon	Pounds per Acre								% Organic Matter
	pH	CaO	MgO	Al	N as NO_3	P_2O_5	K_2O	Mn	
A_p	5.45	250	25	0.6	4.4	60+	36	0.5	1.1
A_2	5.95	100	45	0.3	5.4	60+	25	0.4	0.4
B_1	6.35	425	90	0.3	0.7	2	140	0.4	0.35
B_2	6.25	425	100	1.2	1.8	3	110	0.4	0.5
C	6.00	200	110	0.8	3.0	3	98	0.4	0.2

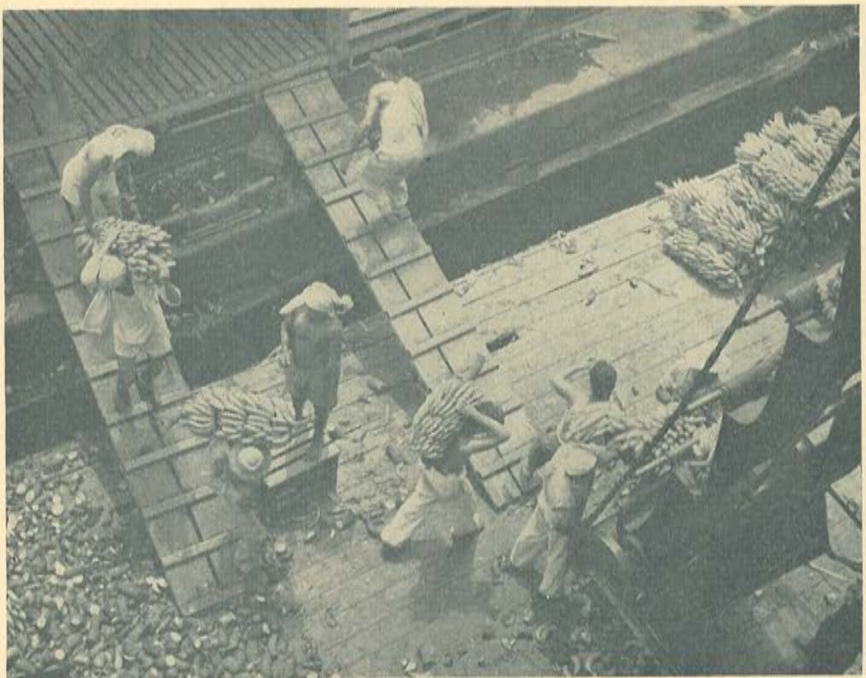
SOIL ANALYSES OF GRAYISH BROWN SANDY LOAM

Horizon	Pounds per Acre								% Organic Matter
	pH	CaO	MgO	Al	N as NO_3	P_2O_5	K_2O	Mn	
A_p	4.5	210	13	22.4	4.7	0.75	78	0.5	2.75
A_2	4.3	82	8	17.4	0.5	Trace	48	0.4	1.7
B	4.2	58	94	16.4	0.9	Trace	31	0.4	0.4
C	4.5	58	118	15.6	1.8	0.6	69	0.4	0.3

PICTORIAL

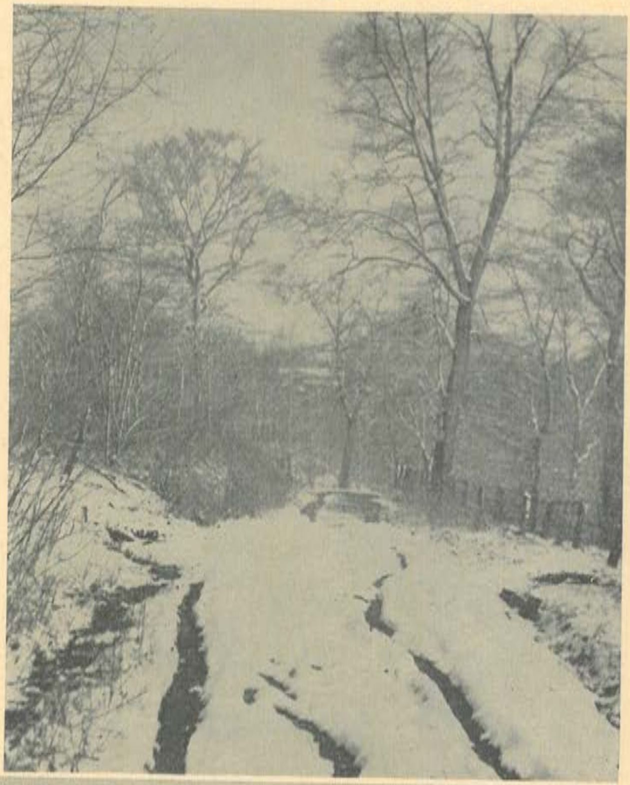


Let it be cold outside—

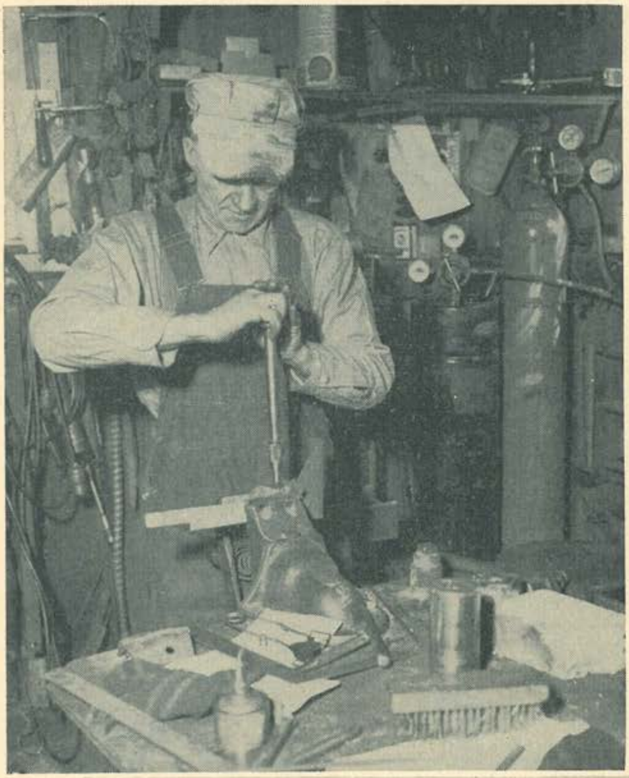


Bananas and coffee for Northern climes.

Photos courtesy W. R. Grace and Co.

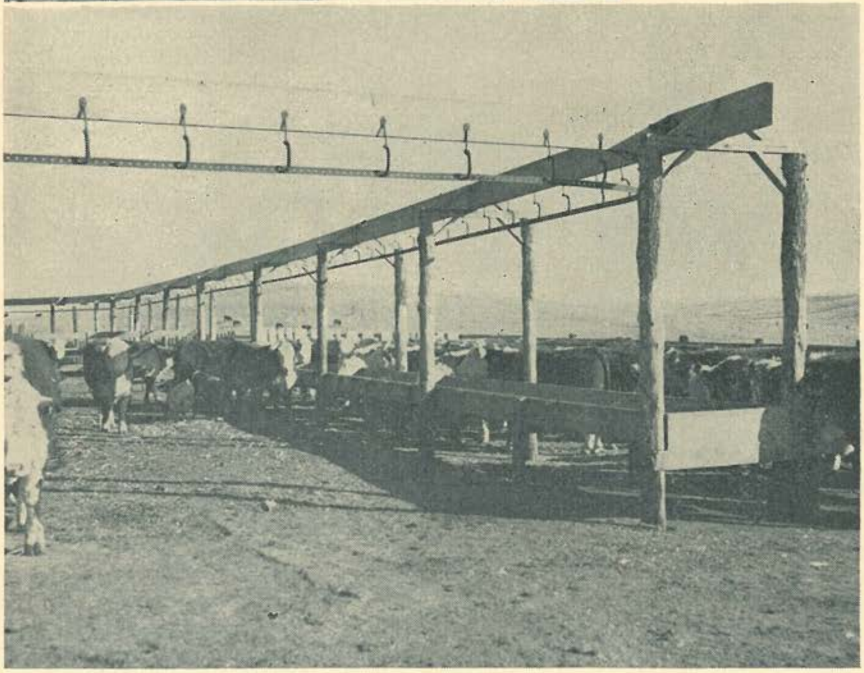


A cup of hot coffee would make this weather seem better.



Left: A well-equipped farm shop minimizes time and expense in machinery preparation and repair.

Below: This overhead track does away with much of the feed handling in this feeder lot.



The Editors Talk

Our Cover Picture

One final result of severe potash starvation on tomatoes is illustrated on the cover page. At the left are shown four normal tomatoes with fair size, brilliant red color, and bright stem ends. The 10 tomatoes on the right illustrate three typical conditions of fruits from potash-starved plants late in the picking season: 1 — Small fruits; 2 — poor and uneven color; and 3 — darkened stem ends, indicating poor attachment with the plant.

Such conditions indicate some breakdown within the plant which hinders the normal fruit growth and ripening processes. Some early fruits may ripen normally. Many late-season fruits actually fall off the potash-starved vines. Stems often die and break off, leaving a short section of stem attached.

This photograph illustrates only one of several observations regarding tomato nutrition problems made during recent fertilization trials in the Midwest. The tomatoes came from an experiment on brownish gray silt loam soil near Terre Haute, Indiana.

Tomato yields are determined largely by the total number of quality fruits harvested per acre. Size of fruit may be affected by fertilizer treatments only under certain conditions, such as severe potash hunger. In these trials, where complete fertilizers were applied, on most low-potash soils both numbers and size of fruits were increased. However, when only nitrogen and phosphates were added without potash, then (1) the numbers of fruits were increased, but (2) the average weight per fruit harvested on several farms was reduced by the NP treatment as compared to the untreated or NPK plots. A greater number of fruits were set than could be matured by the potash-starved plants, resulting in conditions illustrated by the color photograph. When phosphorus was very deficient, there was comparatively little benefit from nitrogen and potash on yields or numbers of fruits, and no definite trends regarding fruit size. The tomatoes were late in maturity, the same as on unfertilized plots.

Tomatoes are very sensitive to any nutrient deficiency. Growing tomatoes involve a series of changing nutrient problems over a four-month period. Two-thirds of the total nutrients may be taken up after the second month. However, plenty of quickly available nutrients, and phosphates especially, are necessary to give young plants an early start. Soluble phosphates in starter solutions, to supplement regular fertilizer treatments, are proving quite beneficial. Too much nitrogen early may cause first clusters of fruits to drop without a set. More nitrogen and potash are required during the last half of the growing season. Early symptoms of potash starvation include short, compact, dark green plants, which may remain in an erect position longer than plants with adequate potash. Lower leaves of potash-starved tomatoes may show yellow blotches followed by browning. Continued defoliation and dropped fruits, as illustrated, may be a late symptom of potash deficiency. Of course, defoliation also may result from diseases.

A goal of 15 tons of No. 1 tomatoes means harvesting from 90,000 to 120,000 quality fruits per acre, averaging from one-third to one-fourth pound per fruit. There is a trend toward setting more plants per acre, i.e., up to 5,000 tomato plants instead of only 3,500 to 4,000. More plants, if well fed, give more early clusters set, larger early and total yields from the greater number of fruits to pick. So with 5,000 plants per acre, it would require 18 to 24 fruits per plant to give that 15 tons. With only 3,500 plants, each plant must produce from 25 to 35 tomatoes. If 1,500 additional plants per acre are grown to help boost tomato yields, perhaps more fertilizers may be used profitably to support this increased productive capacity.

Retirements and Appointments

The American Potash Institute is announcing two changes in its staff which will be of interest to many of the readers of this magazine. On January 1, Dr. G. N. Hoffer retired as Manager for the Midwest territory. Dr. Werner L. Nelson has been named his successor. Concurrently, E. K. Hampson retired from the Canadian managership. Dr. Roy P. Pennington assumes active management of this office on February 1. Both Dr. Hoffer and Mr. Hampson had held their positions since the formation of the Institute in 1935 and are widely known in agricultural circles.

Dr. Hoffer has done much research work in plant physiology, corn breeding, and diagnostic techniques for identifying plant-food deficiencies. He pioneered in the field for determining the nutrient needs of crops. His observations and studies on corn root diseases and development led him to be one of the first to recognize the deterioration in the structure of Midwest soils due to depletion of organic matter and use of heavy machinery.

Always very interested in official affairs, Mr. Hampson has served on many Provincial committees dealing with Canadian agriculture. He is a past president of the Agricultural Institute of Canada, a member of the Chemical Institute of Canada, the American Society of Agronomy, Soil Science Society of America, and the American Association for the Advancement of Science.

Dr. Nelson returns to the Midwest after several years of research and teaching work in the South. Along with investigations of the fertilizer and lime requirements of soils, he has studied fertilizer placement, rotation effects, and plant and row spacing. In 1949 he became Director of the Soil Testing Division of the North Carolina Department of Agriculture and from 1951 until his resignation last October to work with Dr. Hoffer was in charge of Soil Fertility Research at the North Carolina Experiment Station. Dr. Nelson is program chairman of Division IV "Soil fertility, fertilizer, and plant nutrition" of the Soil Science Society of America. He has been a member of a number of national committees including chairman of the Committee on Fertilizers and chairman of the National Soil Test Work Group. He was chairman of Section 9 at the International Soil Science Society Meetings in Dublin, Ireland, in 1952.

Dr. Pennington was born in Toronto and did his undergraduate work in chemistry at the Ontario Agricultural College. His graduate work on clay mineralogy at the University of Wisconsin culminated in a Ph.D. degree in 1949. During 1945-1946 he was laboratory assistant at the Ontario Agricultural College, and from 1946-1949 research assistant at the University of Wisconsin. At Penn State his work has been in soil fertility and plant nutrition with the emphasis on grassland agriculture. Among his memberships, Dr. Pennington lists the American Society of Agronomy, Soil Science Society of America, International Soil Science Society, Sigma Xi, and the Joint Committee on Grassland Farming.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb. Aug.-July	Tobacco Cents per lb.	Potatoes Cents per bu. July-June	Sweet Potatoes Cents per bu. July-June	Corn Cents per bu. Oct.-Sept.	Wheat Cents per bu. July-June	Hay [1] Dollars per ton July-June	Cottonseed Dollars per ton July-June	Truck Crops ....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1928...........	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929...........	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930...........	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931...........	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932...........	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933...........	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934...........	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935...........	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936...........	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937...........	8.4	20.4	52.9	78.0	51.8	96.2	8.74	19.51	....
1938...........	8.6	19.6	55.7	69.8	48.6	56.2	6.78	21.79	....
1939...........	9.1	15.4	69.7	73.4	56.8	69.1	7.94	21.17	....
1940...........	9.9	16.0	54.1	85.4	61.8	68.2	7.59	21.73	....
1941...........	17.0	26.4	80.8	92.2	75.1	94.4	9.70	47.65	....
1942...........	19.0	36.9	117.0	118.0	91.7	110.0	10.80	45.61	....
1943...........	19.9	40.5	131.0	206.0	112.0	136.0	14.80	52.10	....
1944...........	20.7	42.0	150.0	190.0	109.0	141.0	16.50	52.70	....
1945...........	22.5	36.6	143.0	204.0	127.0	150.0	15.10	51.10	....
1946...........	32.6	38.2	124.0	218.0	156.0	191.0	16.70	72.00	....
1947...........	31.9	38.0	162.0	217.0	216.0	229.0	17.60	85.90	....
1948...........	30.4	48.2	155.0	222.0	129.0	200.0	18.45	67.20	....
1949...........	28.6	45.9	128.0	214.0	124.0	188.0	16.50	43.40	....
1950...........	40.1	51.7	91.7	173.0	153.0	200.0	16.70	86.50	....
1951...........	37.9	51.1	163.0	304.0	166.0	211.0	19.50	69.30	....
1952...........	34.6	49.9	198.0	338.0	153.0	209.0	19.95	69.60	....
1953...........	32.3	52.2	79.7	251.0	148.0	204.0	17.45	52.60	
1954									
January......	30.05	48.3	69.1	253.0	142.0	203.0	19.05	52.00	....
February.....	30.42	31.9	65.3	258.0	143.0	206.0	18.95	51.40	....
March.......	31.05	27.3	53.2	252.0	144.0	209.0	18.35	50.50	....
April........	31.57	....	70.2	268.0	145.0	206.0	18.05	50.80	....
May........	32.17	58.0	134.0	263.0	147.0	200.0	17.05	51.40	....
June........	32.31	53.0	151.0	270.0	149.0	191.0	15.65	51.40	....
July........	32.18	52.7	149.0	302.0	150.0	200.0	15.15	54.00	....
August......	34.00	48.2	141.0	259.0	153.0	203.0	16.45	61.30	....
September...	34.55	53.0	116.0	236.0	153.0	207.0	17.25	61.60	....
October......	34.67	53.6	93.2	212.0	145.0	208.0	17.55	60.20	....
November...	33.17	52.0	109.0	222.0	137.0	212.0	18.15	59.40	....
December....	32.67	50.0	105.0	259.0	139.0	212.0	18.55	59.60	....
Index Numbers (Aug. 1909—July 1914 = 100)									
1928...........	145	200	76	134	131	113	95	152	147
1929...........	135	183	189	133	124	117	92	137	137
1930...........	77	128	131	123	93	76	93	98	128
1931...........	46	82	66	83	50	44	73	40	107
1932...........	52	105	55	62	50	43	52	46	100
1933...........	82	130	118	79	81	84	68	57	90
1934...........	100	213	64	91	127	96	111	146	94
1935...........	90	184	85	80	102	94	63	135	116
1936...........	100	236	164	106	163	116	94	148	108
1937...........	68	204	76	89	81	109	74	87	114
1938...........	69	196	80	79	76	64	57	97	96
1939...........	73	154	100	84	88	78	67	94	98
1940...........	80	160	78	97	96	77	64	96	122
1941...........	137	264	116	105	117	107	82	211	138
1942...........	153	369	168	134	143	124	91	202	178
1943...........	160	405	188	235	174	154	125	231	270
1944...........	167	420	214	216	170	160	139	234	236
1945...........	181	366	205	232	198	170	127	227	240
1946...........	263	382	178	248	212	209	141	319	217
1947...........	257	380	232	248	336	259	148	381	262
1948...........	245	482	222	253	201	226	155	298	253
1949...........	231	459	184	244	193	213	139	192	232
1950...........	323	517	132	197	238	226	141	384	211
1951...........	306	512	233	346	259	239	164	307	269
1952...........	279	499	284	385	238	236	168	309	274
1953...........	260	522	114	286	231	231	147	233	240
1954									
January......	242	483	99	288	221	230	160	231	271
February....	245	319	94	294	223	233	160	228	233
March.......	250	273	76	287	224	236	155	224	246
April........	255	...	101	305	226	233	152	225	225
May........	259	580	192	300	229	226	144	228	279
June........	261	530	217	308	232	216	132	228	200
July........	260	527	214	344	234	226	128	239	243
August......	274	482	202	295	238	230	139	272	223
September...	279	530	166	269	238	234	145	273	170
October......	280	536	134	241	226	235	148	267	191
November...	268	520	156	253	213	240	153	263	237
December....	263	500	151	295	217	240	156	264	216

Wholesale Prices of Phosphates and Potash **

	Superphosphate, Baltimore, per unit	Florida land pebble, 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports [2]	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports [2]	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports [2]	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports [2]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.367
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945	.650	2.20	6.23	.522	.777	25.35	.195
1946	.671	2.41	6.50	.508	.769	24.70	.190
1947	.746	3.05	6.60	.432	.706	18.93	.195
1948	.764	4.27	6.60	.397	.681	14.14	.195
1949	.770	3.88	6.22	.397	.703	14.14	.195
1950	.763	3.83	5.47	.371	.716	14.33	.195
1951	.813	3.98	5.47	.401	.780	15.25	.200
1952	.849	3.98	5.47	.401	.793	15.25	.200
1953	.878	....	....	....	.793	15.25	.200
1954							
January	.895	....	....	.430	.827	16.00	.210
February	.895	....	....	.430	.827	16.00	.210
March	.895	....	....	.430	.827	16.00	.210
April	.895	....	....	.430	.827	16.00	.210
May	.895	....	....	.430	.827	16.00	.210
June	.895	....	....	.359	.710	13.45	.174
July	.895	....	....	.388	.765	14.75	.184
August	.895	....	....	.388	.765	14.75	.184
September	.895	....	....	.388	.765	14.75	.184
October	.895	....	....	.388	.765	14.75	.184
November	.895	....	....	.388	.765	14.75	.184
December	.895	....	....	.405	.825	16.00	.193

Index Numbers (1910-14 = 100)

	Superphosphate	Florida land pebble	Tennessee phosphate rock	Muriate of potash	Sulphate of potash	Sulphate of potash magnesia	Manure salts
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945	121	61	128	73	82	105	83
1946	125	67	133	71	81	102	82
1947	139	84	135	70	74	78	83
1948	143	118	135	67	72	58	83
1949	144	108	128	67	74	58	83
1950	142	106	112	68	75	59	83
1951	152	110	112	72	82	63	83
1952	158	110	112	72	83	63	83
1953	164	...	...	73	83	63	83
1954							
January	167	...	...	76	87	66	85
February	167	...	...	76	87	66	85
March	167	...	...	76	87	66	85
April	167	...	...	76	87	66	85
May	167	...	...	76	87	66	85
June	167	...	...	66	75	56	79
July	167	...	...	70	80	61	81
August	167	...	...	70	80	61	81
September	167	...	...	70	80	61	81
October	167	...	...	70	80	61	81
November	167	...	...	70	80	61	81
December	167	...	...	72	87	61	83

Wholesale Prices of Ammoniates **

	Nitrate of soda bulk per unit N	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia, Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945	1.75	1.42	7.81	5.77	4.86	6.71
1946	1.97	1.44	11.04	7.38	6.60	9.33
1947	2.50	1.60	12.72	10.66	12.63	10.46
1948	2.86	2.03	12.94	10.59	10.84	9.85
1949	3.15	2.29	10.11	13.18	10.73	10.62
1950	3.00	1.95	11.01	11.70	10.21	9.36
1951	3.16	1.97	13.20	10.92	10.18	10.09
1952	3.34	2.09	13.95	11.27	9.72	9.16
1953	3.26	2.27	11.04	11.19	7.39	7.09
1954						
January	3.09	2.22	11.28	11.24	9.26	9.71
February	3.09	2.22	11.20	11.45	9.34	10.02
March	3.09	2.22	11.35	11.70	9.59	10.20
April	3.09	2.22	11.63	12.15	10.32	10.55
May	3.09	2.22	11.40	12.15	11.47	10.74
June	3.09	2.18	10.76	12.15	10.09	9.87
July	3.09	2.18	11.12	11.28	10.02	9.87
August	3.09	2.18	12.37	11.19	9.83	11.19
September	3.09	2.18	11.51	10.85	9.78	10.09
October	3.01	2.18	11.55	11.26	9.64	9.94
November	2.98	2.18	11.85	11.78	8.80	9.23
December	2.98	2.18	11.98	12.41	8.50	8.35

Index Numbers (1910-14 = 100)

	Nitrate of soda	Sulphate of ammonia	Cottonseed meal	Fish scrap	Tankage	High grade ground blood
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	112	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945	65	50	223	163	144	191
1946	74	51	315	209	196	265
1947	93	56	363	302	374	297
1948	107	71	370	300	322	280
1949	117	80	289	373	318	302
1950	112	68	315	331	303	266
1951	118	69	377	310	302	287
1952	125	74	399	319	288	260
1953	122	80	315	317	219	201
1954						
January	115	78	322	318	275	276
February	115	78	320	324	277	285
March	115	78	324	331	285	290
April	115	78	332	344	306	300
May	115	78	326	344	340	305
June	115	76	307	344	299	280
July	115	76	318	320	297	280
August	115	76	353	317	292	317
September	115	76	329	307	290	287
October	112	76	330	319	286	282
November	111	76	339	334	261	262
December	111	76	342	352	252	237

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and all Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1928	148	152	141	121	87	177	108	97
1929	148	150	139	114	79	146	114	97
1930	125	140	126	105	72	131	101	99
1931	87	119	107	83	62	83	90	99
1932	65	102	95	71	46	48	85	99
1933	70	104	96	70	45	71	81	95
1934	90	118	109	72	47	90	91	72
1935	109	123	117	70	45	97	92	63
1936	114	123	118	73	47	107	89	69
1937	122	130	126	81	50	129	95	75
1938	97	122	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	124	130	127	86	56	130	102	77
1942	159	149	144	93	57	161	112	77
1943	193	165	151	94	57	160	117	77
1944	197	174	152	96	57	174	120	76
1945	207	180	154	97	57	175	121	76
1946	236	197	177	107	62	240	125	75
1947	276	231	222	130	74	362	139	72
1948	287	250	241	134	89	314	143	70
1949	250	240	226	137	99	319	144	70
1950	258	246	232	132	89	314	142	72
1951	302	271	258	139	93	331	152	76
1952	288	273	251	144	98	333	158	76
1953	258	262	247	139	100	269	164	77
1954								
January	259	263	250	142	96	300	167	80
February	258	264	248	142	96	301	167	80
March	256	264	250	143	96	307	167	80
April	257	265	250	145	96	323	167	80
May	258	267	250	147	96	338	167	80
June	248	265	248	141	95	311	167	69
July	247	263	248	142	95	310	167	74
August	251	264	248	143	95	319	167	74
September	246	263	248	142	95	308	167	74
October	242	262	248	141	94	308	167	74
November	244	262	248	140	93	301	167	74
December	239	261	245	140	93	300	167	77

* U. S. D. A. figures, revised January 1950. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] Beginning July 1949, baled hay prices reduced by $4.75 a ton to be comparable to loose hay prices previously quoted.

[2] Potash salts quoted F.O.B. mines; manure salts since June 1941; other carriers since June 1947. Beginning June 1954, muriate of potash quoted on both mine and port basis.

**** Where range of prices for fertilizer material is quoted, average figure is used. The weighted average of prices actually paid for potash is lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period.**

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, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Potato Fertilizer Experiments in California," Agr. Exp. Sta., Univ. of Calif., Davis, Calif., Bul. 744, Oct. 1954, O. A. Lorenz, J. C. Bishop, B. J. Hoyle, M. P. Zobel, L. D. Doneen, P. A. Minges, and A. Ulrich.

"The Effect of Certain Commercial Fertilizer Combinations on Yield, Grade, and Storage Quality of Sweet Spanish Onions," Agr. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., Tech. Bul. 52, April 1954, A. C. Ferguson and H. Fauber.

"Fertilizing Through Irrigation Water," Agr. Ext. Serv., Mich. State College, East Lansing, Mich., Ext. Bul. 324, June 1954, J. R. Davis and R. L. Cook.

"Fertilization and Irrigation Practices for Corn Production on Newly Irrigated Land in the Republican Valley," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Bul. 424, Feb. 1954, H. F. Rhoades, O. W. Howe, J. A. Bondurant, and F. B. Hamilton.

"Inspection and Analysis of Commercial Fertilizers in South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 418, Oct. 1954, B. D. Cloaninger.

"Analyses of Commercial Fertilizers Sold During 1953-54," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Bul. 785, Sept. 1954, J. F. Fudge and T. L. Ogier.

"Commercial Fertilizers—1954-55," State Dept. of Agr., Madison, Wis., No. 328, Nov.-Dec. 1954, W. B. Griem.

"Wyoming Fertilizer Recommendations," Agr. Ext. Serv., Univ. of Wyo., Laramie, Wyo., Ext. Cir. 128, June 1953.

Soils

"Soils Studies, Reclamation of Saline—Alkali Land in the San Luis Valley," Agr. Exp. Sta., Fort Collins, Colo., Gen. Series 584.

"Soil, Water, and Crop Management Research, Upper Colorado River Basin," Agr. Exp. Sta., Fort Collins, Colo., Gen. Series 586.

"Limestone, How To Use It, When To Use It, Where To Use It," Agr. Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 721, May 1954, C. M. Linsley.

"Conserve Our Soil, Forest, and Wildlife," Agr. Ext. Serv., Univ. of Mass., Amherst, Mass., Lflt. 59, April 1953.

"Comparison of Pasture and Grain Farming on Claypan Soil," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Res. Bul. 505, Aug. 1952, D. M. Whitt.

"Relationship of Shortleaf Pine Growth to Soil Properties," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Res. Bul. 541, Feb. 1954, R. W. Dingle and P. Y. Burns.

"Estimated Water Requirements of Crops in Irrigated Areas of Montana," Agr. Exp. Sta., Mont. State College, Bozeman, Mont., Bul. 494, Dec. 1953, O. W. Monson, W. D. Criddle, and S. Davis.

"Soil Survey, Sacramento Area, California," USDA, Wash., D. C., Series 1941, No. 11, Aug. 1954.

"Soil Survey, Buncombe County, North Carolina," USDA, Wash., D. C., Series 1942, No. 6, July 1954.

Crops

"Small Grain Varieties for Alabama, A Report of 1954 Variety Tests," Agr. Exp. Sta., Ala. Polytechnic Institute, Auburn, Ala., Aug. 1954.

"Fresh Vegetables—Grow Your Own!" Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., Alameda Co. Cir. 20, L. C. Benson.

"Dominion Experimental Station, Charlottetown, P. E. I., Progress Report 1948-1952," Exp. Farms Serv., Dept. of Agr., Ottawa, Ont., Can., 1954.

"Better Quality Mountain Meadow Hay Through Early Harvesting and Fertilization," Agr. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., Tech. Bul. 54, May 1954, D. E. Miller and M. Amemiya.

"1952 Progress Reports on Western Slope Research," Agr. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., Gen. Series 528.

"Mountain Meadow Improvement, Annual Visitor's Day," Agr. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., Gen. Series 551.

"1953 Progress Reports on Western Slope Research," Agr. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., Gen. Series 562.

"Mountain Meadows Improvement, Research Leads the Way to Greater Efficiency," Agr. Exp. Sta., Colo. A. & M. College, Fort Col-

lins, Colo., Gen. Series 576.

"1953 Progress Reports on San Juan Basin Research," Agr. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., Gen. Series 581.

"Results of Research on Field and Popcorn in the Everglades Area—1954," Everglades Exp. Sta., Belle Glade, Fla., Everglades Sta. Mimeo. Rpt. 55-4, Sept. 1954, V. E. Green, Jr.

"Growing Birdsfoot Trefoil in Illinois," Agr. Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 725, June 1954, J. J. Pierre and J. A. Jackobs.

"Growing Red Clover in Illinois," Agr. Ext. Serv, Univ. of Ill., Urbana, Ill., Cir. 727, July 1954, O. H. Sears.

"Kansas Wheat Quality Survey 1954," State Dept. of Agr., Topeka, Kans., July 1954.

"1954 Experiment Station Results, Fall Seeded Wheat, Barley, and Oats," Agr. Exp. Sta., Kans. State College of Agr., Manhattan, Kans., Cir. 314, Aug. 1954, A. L. Clapp.

"1953 Annual Report of the Director of Agricultural Extension Service for the Year Ended December 31, 1954," Agr. Ext. Serv., Univ. of Ky., Lexington, Ky., 1954.

"Tobacco Diseases," Agr. Ext. Serv., Univ. of Ky., Lexington, Ky., Cir. 522, April 1954, W. D. Valleau, E. M. Johnson, and S. Diachun.

"Annual Progress Report, Rice Experiment Station, Crowley, Louisiana, 1953," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., 1954.

"Hibiscus for the Yard," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. 489, May 1954, R. H. Hanchey and W. D. Kimbrough.

"Gladiolus," Agr. Ext. Serv., Univ. of Mass., Amherst, Mass., Lflt. 265, April 1954, R. E. Pride.

"Factors Influencing Height Growth of Planted Yellow-Poplar in Southwestern Michigan," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Tech. Bul. 242, June 1954, R. D. Shipman and V. J. Rudolph.

"Effect of Sods, Mulches and Fertilizers in a Cherry Orchard on Production, Soluble Solids and on Leaf and Soil Analyses," Agr. Exp. Sta., Mich. State College, East Lansing, Mich., Tech. Bul. 243, June 1954, A. L. Kenworthy.

"Your Flax Crop," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Ext. Fldr. 128, Oct. 1954.

"Research for Better Farm Living," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 619, March 1954.

"50 Years of Research at the North Platte Experiment Station," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Cir. 93, June 1954, W. W. Burr and J. C. Adams.

"Nebraska Spring Small Grain Variety Tests 1954," Agr. Exp. Sta., Univ. of Nebr., Lincoln, Nebr., Outstate Testing Cir. 39, Sept. 1954, A. F. Dreier and P. L. Ehlers.

"Forest Tree Planting Guide for New Jersey," Agr. Ext. Serv., Rutgers Univ., New Brunswick, N. J., Lflt. 121, June 1954, A. N. Lentz, E. B. Moore, N. T. Kessler, and L. C. Smack.

"Band Seed for Better Forage Stands," Agr. Ext. Serv., Rutgers Univ., New Brunswick, N. J., Ext. Bul. 271, Aug. 1954, J. E. Baylor.

"New Blackberry Varieties," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Bul. 764, March 1954, G. L. Slate.

"The Home Fruit Planting," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Ext. Bul. 913, July 1954, M. B. Hoffman.

"Home Lawns," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Ext. Bul. 922, Aug. 1954, J. F. Cornman.

"Alfalfa Production," Agr. Ext. Serv., N. C. State College, Raleigh, N. C., Ext. Cir. 307, July 1954, S. H. Dobson, W. W. Woodhouse, D. S. Chamblee, and C. H. Hanson.

"Spring Production of China Asters," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. B-439, Nov. 1954, R. N. Payne and W. R. Kays.

"5th Annual Field Day, Kiamichi Field Station at Idabel, Oklahoma," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mimeo. Cir. M-247, July 1953.

"Thirty-Third Annual Report of the South Dakota Department of Agriculture, For the Fiscal Year Ending June 30, 1953," State Dept. of Agr., Pierre, S. D.

"Seeding and Planting Guide for Garden Crops," Agr. Ext. Serv., Univ. of Tenn., Knoxville, Tenn., Lflt. 134, Dec. 1954, B. D. Drain.

"Alamo Oats," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Bul. 778, June 1954, I. M. Atkins and G. W. Rivers.

"Cool-Season Grasses in the Wichita Valley," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1716, Oct. 1954, L. E. Brooks and E. C. Holt.

"Cabbage Variety Trials in the Lower Rio Grande Valley, 1953-54," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1718, Oct. 1954, P. W. Leeper.

"Irish Potato Variety and Strain Tests in the Lower Rio Grande Valley, Fall 1953-Spring 1954," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1719, Oct. 1954, P. W. Leeper.

"Cotton Variety Tests in the Lower Rio Grande Valley, 1954," Agr. Exp. Sta., Tex. A. & M. College, College Station, Tex., Prog. Rpt. 1727, Nov. 1954, J. L. Hubbard and W. R. Cowley.

"Home Gardens," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Bul. 422, June 1954, J. C. Dodge, D. Brannon, and M. R. Harris.

"Green Manure and Cover Crops for Irrigated Land," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Bul. 489, July 1954, K. J. Morrison, F. G. Viets, Jr., and C. E. Nelson.

"Bush Bean Variety Studies in Western Washington," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Bul. 551, July 1954, J. F. Moore and M. W. Carstens.

"Growing Blueberries in the Puget Sound

Region of Washington," Agr. Exp. Sta., State College of Wash., Pullman, Wash., Cir. 245, April 1954, C. D. Schwartze and A. S. Myhre.

"What's New in Farm Science," Agr. Exp. Sta., Univ. of Wis., Madison, Wis., Bul. 511, June 1954, R. Powers and R. J. Muckenhirn.

"Agricultural Extension in Wisconsin, Report for 1953," Agr. Ext. Serv., Univ. of Wis., Madison, Wis., Cir. 476, May 1954.

"Sweet Clover in Wisconsin," Agr. Ext. Serv., Univ. of Wis., Madison, Wis., Cir. 477, May 1954, H. L. Ahlgren, F. V. Burcalow, and W. K. Smith.

"Snap Beans for Marketing, Canning, and Freezing," USDA, Wash., D. C., Farmers' Bul. 1915, Sept. 1954, W. J. Zaumeyer.

"Potato Production in the Northeastern and North Central States," USDA, Wash., D. C., Farmers' Bul. 1958, G. V. C. Houghland, R. V. Akeley, T. P. Dykstra, and W. A. Shands.

Economics

"Orange County Avocado Management Study, 1953," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., W. Sullivan.

"Orange County Valencia Management Study, 1953," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., G. Ferguson, A. Shultis, and R. Rock.

"Lemon Management Study," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., J. E. Pehrson.

"Fourth Annual Report of Santa Clara County Walnut Management Study for 1953," Agr. Ext. Serv., Univ. of Calif., Berkeley, Calif., May 1954, A. Shultis and G. D. Worswick.

"1953 Statistics of Hawaiian Agriculture," Agr. Ext. Serv., Univ. of Hawaii, Honolulu, Hawaii, Agr. Econ. Rpt. 22, June 1954, R. Elliott, S. M. Doue, and S. Takei.

"Application of Econometric Procedures to the Demands for Agricultural Products," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Res. Bul. 410, July 1954, J. A. Nordin, G. G. Judge, and O. Wahby.

"Ohio Farm Leases," Agr. Exp. Sta., Wooster, Ohio, Res. Bul. 749, Oct. 1954, J. I. Falconer and H. R. Moore

"Marketing Methods and Facilities for South Carolina Truck Crops," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Bul. 413, March 1954, C. L. Crenshaw and C. D. Evans.

"A Graphic Summary of Agricultural Change in South Carolina," Agr. Exp. Sta., Clemson Agr. College, Clemson, S. C., Cir. 93, Jan. 1954, C. W. Pitchford.

"Cost of Production Data and Related Materials," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Mimeo. 1625, M. F. Bunnell and A. W. Peterson.

"A Comparison of Farm Investments, Receipts, Expenses and Income Between 1952 and 1953, 74 Identical Washington Farms," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Ext. Mimeo. 1638, A. W. Peterson.

"How About Soybeans for the Columbia Basin?" Agr. Exp. Sta., State College of Wash., Pullman, Wash., Sta. Cir. 250, April 1954, C. E. Nelson, A. H. Harrington, and J. C. Gifford.

"Father and Son Arrangements on the Farm," Agr. Ext. Serv., W. Va. Univ., Morgantown, W. Va., Cir. 367, Sept. 1953, R. S. Smith and S. W. Warren.

"Use of Credit in Farming," Agr. Ext. Serv., W. Va. Univ., Morgantown, W. Va., Cir. 368, F. H. Branch.

"Getting Started in Farming," USDA, Wash., D. C., Farmers' Bul. 1961, July 1954, M. R. Cooper.

"Report of Agricultural Trade Missions to the Secretray of Agriculture on Foreign Trade of the United States in Agricultural Products," USDA, Wash., D. C., June 1954.

"The Farmer's Share of the Consumer's Food Dollar," USDA, Wash., D. C., Lflt. 123, Oct. 1954, K. E. Ogren.

"Application of Probability Area Sampling to Farm Surveys," USDA, Wash., D. C., Agr. Handbook 67, May 1954, E. E. Houseman and T. J. Reed.

The Soil Profile's Contribution . . .

(*From page* 26)

is returned to the soil in the form of foliage. A rather high rate of fertilization would be 200 pounds of potash per acre. This means that yields in the 20- to 30-ton category actually re-utilizes potash from former crops. The crop also utilizes potash from disintegrated soil materials and from that supplied by the accumulative (B_1 and B_2) horizon. The phosphates applied and utilized are governed almost entirely by the organic matter, soil reaction (pH), and bacterial activity in the plowed layer. The same factors influence the availability of nitrogen. On the other hand, the magnesium and calcium supply to the plant is similar to the potash supply in its location in the soil profile.

It is perfectly obvious from the profile and data that the two soils differ tremendously in practically every respect, namely, difference in depth, water absorbing and supplying capacity, acidity (pH), plant nutrients, drainage, and other characteristics. The yellowish brown sandy loam was influenced by previous soil treatment, whereas the grayish brown sandy loam had been influenced to a lesser extent.

Summary

An effort has been made to point out that each layer of soil makes a contribution to the efficient production of a crop. The plowed layer supplied predominantly the nitrogen and phosphorus, potash and water. The layer immediately below supplies potash, water, magnesium, and calcium. The depth of the soil determines the extent of this supplying capacity of the soil. A true evaluation of the soil must be based upon the whole soil and not just the surface layer.

Guides to the Management of Illinois Soils

(*From page* 23)

the fertilization and cultural practices used in conjunction with a cropping system are equally as important as the system itself in determining its effects on productivity, organic matter, tilth, and erosion control.

In summary we can say that good soil management is the key to an efficient, productive farm business. Because the soil management problems of an individual field or farm may be unique to that particular field or farm, it is essential that farmers understand their management objectives and the alternative practices that are available for meeting those objectives. The care that the farmer uses in considering the various alternatives and the skill with which he combines them into a soil management program for his particular farm will in large measure determine his production efficiency.

Summary of Ten Years' Work . . .

(*From page* 14)

nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O was 9.3 tons of cane and 1,581 pounds of sugar. The response to potash was very marked. At two locations with stubble cane on Iberia silt loam, 80 pounds of nitrogen with 40 pounds of P_2O_5 and 60 pounds of K_2O gave the highest yields.

The response of stubble cane on Recent alluvial soils to complete fertilizers, while not so marked as to nitrogen alone, is consistent, with approximately 2 tons of increase being derived from phosphate and potash and 7 tons of increase coming from 60 pounds of nitrogen alone. Six locations on Baldwin silt loam, Table V, returned an average increase of 5.1 tons of cane from 60 pounds of nitrogen alone and an increase of 7.7 tons of cane and 1,230 pounds of sugar per acre from 60 pounds of nitrogen with 60 pounds of K_2O. The averages of five experiments with stubble cane on Commerce very fine sandy loam show 8.5 tons of benefit from 60 pounds of nitrogen alone and increases of 10.2 tons of cane and 1,926 pounds of sugar from 60 pounds of nitrogen, 40 pounds of P_2O_5, and 60 pounds of K_2O. Five locations on Mhoon silty clay loam planted to stubble cane gave an average increase of 8.1 tons of cane for 60 pounds of nitrogen alone. The average increase from the complete application carrying 60 pounds of nitrogen, 40 pounds of P_2O_5, and 60 pounds of K_2O was 10.8 tons of cane and 2,100 pounds of sugar per acre.

TABLE V.—RESPONSE TO FERTILIZERS FROM STUBBLE CANE ON ALLUVIAL SOILS, 1945-1951

Pounds per acre plant nutrients N^1–P_2O_5–K_2O	Average of 6 locations on Baldwin silt loam[2]		Average of 5 locations on Commerce very fine sandy loam[3]		Average of 5 locations on Mhoon silty clay loam[4]	
	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar	Tons/A cane	Lbs./A sugar
0–0–0	19.30	3,206	15.41	2,646	14.73	2,596
60–0–0	24.39	4,028	23.92	4,134	22.84	4,086
60–0–60	26.96	4,436	25.06	4,398	23.94	4,377
60–40–60	26.78	4,352	25.60	4,572	25.52	4,696

[1] Nitrogen from ammonium nitrate; P_2O_5 from 20% superphosphate; K_2O from 60% muriate of potash.
[2] At one location 80-40-60 gave the highest yield.
[3] At three locations 80-40-60 gave the highest yield.
[4] At one location 80-0-60 gave the highest yield and at another 80-40-60 gave the highest yield.

The Net Worth of Soils in the Northeast

(*From page* 10)

$32.93; for South Carolina, it was $17.96 (1950 census).

The native infertility of the soils of the Northeast, plus the intensive nature of its agriculture, is reflected in the fertilizer consumption for the area. Although only 5 per cent of the cropland and 4 per cent of the plowable pasture (Table I) in the United States are in these States, 12 per cent of the total amount of fertilizers used in this country were applied to these soils (Table II). This represented 9 per cent of the N, 12.5 per cent of the P_2O_5, and 14 per cent of the K_2O used in the United States.

TABLE II.—ESTIMATED CONSUMPTION OF N, P_2O_5, AND K_2O FOR FISCAL YEAR 1949-50 FOR SELECTED REGIONS IN THE UNITED STATES*

Region	N		P_2O_5		K_2O			
	Total tons	U.S. total	Total tons	U.S. total	Total tons	U.S. total	Grand total	U.S. total
		%		%		%		%
Northeastern	88,400	8.9	245,900	12.5	155,700	14.1	490,000	12.1
W. Northcentral	71,500	7.2	227,600	11.6	64,200	5.8	363,300	9.0
Continental U.S.	987,900	....	1,960,900	....	1,106,500	....	4,055,300	....

* Source: Production and Marketing Administration, USDA. The Fertilizer Situation for 1951-1952. Washington, D. C. 1952.

The West Northcentral region, by contrast, had 38 per cent of the cropland and 21 per cent of the plowable pasture but applied to its soils only 9 per cent of the fertilizers used in the United States. Of this, 7 per cent was N, 12 per cent P_2O_5, and 6 per cent K_2O of the total amounts of these respective fertilizers.

Another interesting fact on the productive capacity of Northeastern soils is brought out by the 1950 census data. When the states are ranked in order of average gross income per acre from farming, the first five and the tenth are in the Northeast. The top states are New Jersey leading with $161 per acre, then Delaware, Connecticut, Massachusetts, and Rhode Island fifth with $84. California and Iowa are next, being tied with $58 per acre. Pennsylvania ranks tenth at $51.

Potential of Northeastern Soils

Since the productive capacity of Northeastern soils is so high, one wonders if instead of spending from $50 to $2,000 per acre[3] on preparing land for irrigation, as is being done in the Far West, it might not be wiser to spend from $25 to $200 for clearing and improving land in the Northeast. Once the land is cleared, there are no further costs for items like irrigation water, for rainfall is usually adequate. Supplemental irrigation, of course, increases yields in some years. With our population increasing at the rate of 4 persons[4] every minute, and with the Northeast in the most densely populated area in the United States, some thought might be given to this possibility as one means of increasing our food supply. Nearness to market is another reason for using our Northeastern soils to their maximum capacity.

It is estimated that from 10 to 20 per cent more of the land in the Northeast could be put into agricultural production. In fact, during the early years of our country, more land was producing crops than now. The acreage which could be cleared and improved would vary with the kind of soils present in the area in question. Modern power equipment now makes it possible to clear fields of stones and boulders never before possible. Many areas can now be drained and put into production as the result of improved land drainage techniques and improved knowledge of the management of the soils after they have been drained. Trees have always been cut and they present no problem.

Soil Mapping Information Needed

Just any kind of land should not be put into production. Some soils are too stony or rocky, some are too sandy and droughty, some would be impractical to drain because of the tightness and impervious nature of their subsoils, some would be too steep and should be kept in trees for controlling erosion. Even in excluding all these soils having inhibiting factors for economical crop production, many soils which are comparable to those now producing crops are now in trees or idle land. Modern soil survey techniques bring out desirable relationships of soils for crop production. Also, information from soil surveys show what soils are adapted to the production of given kinds of crops.

Clearing and draining of land for use in increasing the production of crops cannot be construed as soil conservation measures. They are, in a sense, an exploitation of our soil resources. But this exploitation can be a well-managed one so that every soil will be used to its utmost in producing crops and at the same time be improved in its fertility and productivity. Erosion will be at a minimum. Fertilizers, pesticides, crop rotation, and other management practices will be employed for improved yields. The productivity of our soils will be increased and their fertility maintained or increased.

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[3] Bureau of Reclamation, U. S. Dept. Interior. Reclamation Project Data. 1951.

[4] Production and Marketing Administration, USDA. The 5th Plate. Washington, D. C. 1951.

Nitrogen Use Accentuates Need for Minerals

(*From page* 17)

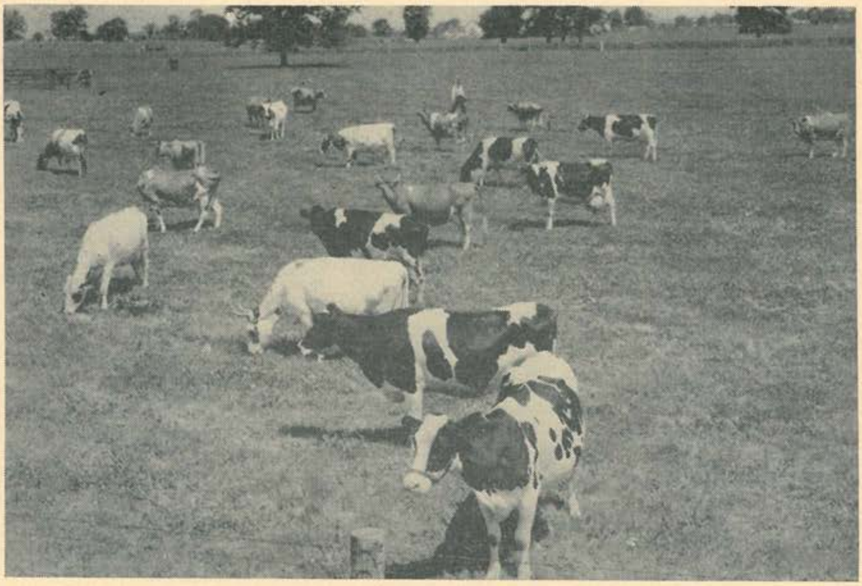

Fig. 4. Pastures treated with balanced fertilizers such as 10-10-10 or 12-12-12 produce an abundance of protein, vitamin-mineral rich feed that makes milk at low cost.

grass. There wasn't much of any increase in total yield.

The second year, 1946, on one half of each acre plot, we backed this nitrogen up with an application of 0-20-20. The results were outstanding, in fact, spectacular. But which was it?—the phosphate or the potash that was responsible for the greatest increase in yield on those plots that received the 0-20-20 in addition to the nitrogen?

Some of my associates, who had consistently opposed the application of superphosphate as a topdressing on pastures, insisted that it was the potash in the 0-20-20 that was chiefly responsible for the phenomenal increases in yields of grass. So in 1947 we split our acre plots into three strips—one strip with nitrogen only, one with nitrogen plus superphosphate, and the other received the complete treatment of nitrogen plus 0-20-20.

The results of our 1947 work proved without question that phosphate was important and would produce substantial increases in yield, but where potash was added, yields of grass or hay were hiked to even higher levels. Table I gives the results of all the 1947 demonstrations. Table II gives the average yield for the nitrogen only plots. Table III gives the average of all plots where nitrogen only was compared with plots where minerals (P and K) were added.

This piece of extension work in northern Wisconsin in the years 1945, 1946, and 1947 is highly significant now in the light of the recent tremendous development in the use of nitrogen fertilizers.

TABLE I.—RESPONSE OF GRASS PASTURES OR HAY MEADOWS TO TREATMENT WITH NITROGEN IS LIMITED WHEN PHOSPHATE OR POTASH IS LACKING

Name and address of farmer & soil type	Crop	Treatment & rate per acre	Yield per acre	Increases per acre	Cost of fertilizer [1]	Value of increase [2]	Profit over cost of fertilizer
Bayfield County			*lbs.*	*lbs.*			
Joe Brandis Mason, Route 3 Superior loam	Timothy & quack 10% clover	Ammonium nitrate at 200#	2,250	375	$6.00	$3.75	$−2.25
		Ammonium nitrate at 200# + 0-20-0 at 250#	3,900	2,025	7.88	20.25	12.37
		Ammonium nitrate at 200# + 0-20-20 at 250#	5,625	3,750	12.67	37.50	24.83
		No fertilizer	1,875				
Louis Larson Grandview Superior loam	Timothy & quack (pasture)	Ammonium nitrate at 200#	2,100	975	6.00	9.75	3.75
		Ammonium nitrate at 200# + 0-20-0 at 250#	3,900	2,775	7.88	27.75	19.87
		Ammonium nitrate at 200# + 0-20-20 at 250#	4,500	3,375	12.67	33.75	21.08
		No fertilizer	1,125				
Walter Wold & Sons Cable Kennan loam (High fertility level)	Timothy & 15% clover	Ammonium nitrate at 200#	6,225	2,475	6.00	24.75	18.75
		Ammonium nitrate at 200# + 0-20-0 at 250#	4,120	Yield data	inconsistent		
		Ammonium nitrate at 200# + 0-20-20 at 250#	6,300	2,545	12.67	25.45	12.78
		No fertilizer	3,750				
Arnold Jacobson Washburn Superior sandy loam	Timothy & June grass 10% clover	Ammonium nitrate at 200#	1,500	150	6.00	1.50	−4.50
		Ammonium nitrate at 200# + 0-20-0 at 250#	2,250	900	7.88	9.00	1.12

		Ammonium nitrate at 200# + 0–20–20 at 250#	3,000	1,650	12.67	16.50	3.83
		No fertilizer	1,350				
Ashland County Joe Schneider Ashland, Route 1 Superior clay loam	Timothy & 10% clover	Ammonium nitrate at 200#	4,950	2,100	6.00	21.00	15.00
		Ammonium nitrate at 200# + 0–20–0 at 250#	4,125	1,275	7.88	12.75	4.87
		Ammonium nitrate at 200# + 6–20–20 at 250#	6,000	3,150	12.67		18.83
		No fertilizer	2,850				
Nester Heine Marengo Superior clay loam (Plot #1)	Timothy & 25% alfalfa	Ammonium nitrate at 200#	3,750	2,100	6.00	21.00	15.00
		Ammonium nitrate at 200# + 0–20–20 at 250#	4,200	2,550	12.67	25.50	12.83
		0–20–20 at 250#	3,075	1,425	6.67	14.25	7.58
		No fertilizer	1,650				
Nester Heine Marengo Superior clay loam (Plot #2)	Timothy & 10% clover	Ammonium nitrate at 200#	5,550	3,300	6.00	33.00	27.00
		Ammonium nitrate at 200# + 0–20–0 at 250#	5,775	3,525	7.88	35.25	27.37
		Ammonium nitrate at 200# + 0–20–20 at 250#	7,125	4,875	12.67	48.75	36.07
		No fertilizer	2,250				
Mrs. Theresa Bucheger Butternut Kennan loam (High fertility)	Timothy & 10% clover	Ammonium nitrate at 200#	7,200	3,600	6.00	36.00	30.00
		Ammonium nitrate at 200# + 0–20–0 at 250#	6,750	3,150	7.88	31.50	23.62

Table I.—Response of Grass Pastures or Hay Meadows to Treatment with Nitrogen Is Limited When Phosphate or Potash Is Lacking—*Continued*

Name and address of farmer & soil type	Crop	Treatment & rate per acre	Yield per acre	Increases per acre	Cost of fertilizer [1]	Value of increase [2]	Profit over cost of fertilizer
			lbs.	*lbs.*			
		No fertilizer	3,600				
Christ Vogt, Jr. Butternut Kennan loam	Timothy & 10% clover	Ammonium nitrate at 200#	4,500	1,500	6.00	15.00	9.00
		Ammonium nitrate at 200# + 0–20–0 at 250#	6,300	3,300	7.88	33.00	25.12
		Ammonium nitrate at 200# + 0–20–20 at 250#	7,500	4,500	12.67	45.00	32.33
		No fertilizer					
Harold Mertis Glidden Kennan loam	Timothy & 10% clover	Ammonium nitrate at 200# + 0–20–0 at 400#	4,800	2,550	(Nitrogen 6.00	only charged) 25.50	19.50
		Ammonium nitrate at 200# + 0–20–20 at 400#	7,050	(Nitrogen 4,800	plus ½ potas 19.34	h charged) 48.00	28.66
		0–20–0 at 400# only	2,250				
John Frankie Highbridge Kennan loam	Timothy & 10% clover	Ammonium nitrate at 200#	1,350	225	6.00	2.25	−3.75
		Ammonium nitrate at 200# + 0–20–0 at 250#	2,625	1,500	7.88	15.00	7.12
		Ammonium nitrate at 200# + 0–20–20 at 250#	3,600	2,475	12.67	24.75	12.08
		No fertilizer	1,125				

Iron County Anton Gibowski Saxon	Timothy & clover	Ammonium nitrate at 200#	3,900	2,550	6.00	25.50	19.50
		Ammonium nitrate at 200# + 0–20–0 at 250#	4,500	3,150	7.88	31.50	23.62
		Ammonium nitrate at 200# + 0–20–20 at 250#	5,625	4,275	12.67	42.75	30.08
		No fertilizer	1,350				
Niile Maenpaa Hurley Kennan loam (Old sod)	Timothy & June grass	Ammonium nitrate at 200#	1,275	525	6.00	5.25	−.75
		Ammonium nitrate at 200# + 0–20–0 at 250#	2,250	1,500	7.88	15.00	7.12
		Ammonium nitrate at 200# + 0–20–20 at 250#	2,625	1,875	12.67	18.75	6.08
		No fertilizer	750				
K. H. McKellar Hurley, Route #1	Timothy & June grass	Ammonium nitrate at 200#	1,725	975	6.00	9.75	3.75
		Ammonium nitrate at 200# + 0–20–0 at 250#	1,875	1,125	7.88	11.25	3.37
		Ammonium nitrate at 200# + 0–20–20 at 250#	2,475	1,725	12.67	17.25	4.58
		No fertilizer	750				
Ed Maki Hurley, Route 1 Kennan loam	Timothy & June grass	Ammonium nitrate at 200#	2,625	850	6.00	8.50	2.50
		Ammonium nitrate at 200# + 0–20–0 at 250#	3,750	1,875	7.88	18.75	10.87
		Ammonium nitrate at 200# + 0–20–20 at 250#	5,475	3,600	12.67	36.00	23.33

Table I.—Response of Grass Pastures or Hay Meadows to Treatment with Nitrogen Is Limited When Phosphate or Potash Is Lacking—*Continued*

Name and address of farmer & soil type	Crop	Treatment & rate per acre	Yield per acre	Increases per acre	Cost of fertilizer [1]	Value of increase [2]	Profit over cost of fertilizer
		No fertilizer	*lbs.* 1,875	*lbs.*			
Mulford Callam Hurley, Route 1 Kennan loam	Timothy & 10% clover (2nd year hay)	Ammonium nitrate at 200#	2,025	75	6.00	.75	−5.25
		Ammonium nitrate at 200# + 0–20–0 at 250#	5,100	3,150	7.88	31.50	23.62
		Ammonium nitratê at 200# + 0–20–20 at 250#	6,000	4,050	12.67	40.50	27.63
		No fertilizer	1,950				
	Timothy & June grass (Old sod)	Ammonium nitrate at 200#	2,475				
		Ammonium nitrate at 200# + 0–20–20 at 250#	5,100	(Increase 2,625	for 0–20–20 o 6.67	ver nitrate) 26.25	19.55
Sawyer County Victor Olker Hayward Sandy loam	Timothy & 10% clover	Ammonium nitrate at 200#	3,375	1,000	6.00	10.00	4.00
		Ammonium nitrate at 200# + 0–20–10 at 225#	4,000	1,625	8.39	16.25	7.86
		No fertilizer	2,375				
	Pasture timothy & June grass	Ammonium nitrate at 200#	2,750	1,250	6.00	12.50	6.50
		Ammonium nitrate at 200# + 0–20–0 at 250#	4,000	2,500	7.88	25.00	17.12

		Ammonium nitrate at 200# + 0–20–20 at 250#	4,750	3,250	12.67	32.50	19.83
		No fertilizer	1,500				
Carroll Holland Hayward, Route 1 Kennan loam	Timothy & 10% clover	Ammonium nitrate at 200#	4,250	500	6.00	5.00	−1.00
		Ammonium nitrate at 200# + 0–20–0 at 250#	5,250	1,500	7.88	15.00	7.12
		Ammonium nitrate at 200# + 0–20–20 at 250#	6,000	2,250	12.67	22.50	9.83
		No fertilizer	3,750				
B. O. Wells Hayward Kennan silt loam	Timothy & June grass	Ammonium nitrate at 200#	4,000	2,250	6.00	22.50	16.50
		Ammonium nitrate at 200# + 0–20–0 at 250#	4,500	2,750	7.88	27.50	19.62
		Ammonium nitrate at 200# + 0–20–20 at 250#	5,000	3,250	12.67	32.50	19.83
		No fertilizer	1,750				
Transient Camp (Old Indian School Farm) Sandy loam	Timothy & June grass	Ammonium nitrate at 200#	2,000	1,250	6.00	12.50	6.50
		Ammonium nitrate at 200# + 0–20–0 at 250#	2,625	1,875	7.88	18.75	10.87
		Ammonium nitrate at 200# + 0–20–20 at 250#	3,250	2,500	12.67	25.00	12.33
		No fertilizer	750				

(1) The entire cost of ammonium nitrate and one half the cost of 0-20-0 and 0-20-20 charged here. Ammonium nitrate figured at $60.00 per ton.
(2) Hay figured at $20.00 per ton.
(3) Pasture plots (a portion fenced out and harvested as hay).

TABLE II.—AVERAGE YIELDS OF ALL HAY OR PASTURE PLOTS (1945, 1946, 1947) IN BAYFIELD, ASHLAND, IRON, VILAS, PRICE, AND SAWYER COUNTIES WHERE AMMONIUM NITRATE ONLY AT 200# PER ACRE WAS COMPARED WITH NO TREATMENT. (A PORTION OF PASTURE PLOTS FENCED OUT AND HARVESTED AS HAY).

Treatment and rate per acre	Hay yield per acre	Increase per acre	Value of increase [1]	Cost of fertilizer [2]	Profit over cost of fertilizer
Ammonium nitrate at 200# (average of all plots)	3,961	1,819	$18.19	$6.00	$12.19
No fertilizer (average of all plots)	2,142				

(1) The entire cost of ammonium nitrate and one half the cost of 0-20-0 and 0-20-20 charged here. Ammonium nitrate figured at $60.00 per ton.
(2) Hay figured at $20.00 per ton.

10-10-10 or 12-12-12 the Answer?

It is not surprising that with this background, the writer has been one of the leading advocates of balanced fertility in his program of pasture improvement. While I have talked and written much about 10-10-10 for pastures, I have recognized the fact that the mineral needs of soils vary and farmers must be guided in their use of fertilizer by regional needs, soil tests, and experiment station work.

But one thing I am sure of and that is the fact that this great increase in the use of straight nitrogen—whether it be ammonium nitrate, urea, or anhydrous ammonia—will pump minerals out of our soils at an accelerated rate. I shall continue to talk about the great potentials for low cost feed, food, and fiber production through the use of nitrogen fertilizer—but along with it, the use of adequate supplies of minerals—both major and minor.

TABLE III.—AVERAGE YIELDS OF ALL HAY OR PASTURE PLOTS (1946 AND 1947) IN BAYFIELD, ASHLAND, IRON, VILAS, AND SAWYER COUNTIES WHERE AMMONIUM NITRATE ONLY WAS COMPARED WITH AMMONIUM NITRATE IN COMBINATION WITH 0-20-0 OR 0-20-20 AND NO TREATMENT. (YIELDS OF THE 0-20-0 AND 0-20-20 PLOTS WITH NITRATE WERE AVERAGED TOGETHER).

Treatment and rate per acre	Hay yield per acre	Increase per acre	Value of increase [1]	Cost of fertilizer [2]	Profit over cost of fertilizer
Ammonium nitrate at 200# per acre (average of all plots)	3,289	1,429	$14.29	$6.00	$ 8.29
Ammonium nitrate at 200# plus 0–20–0 or 0–20–20 at 250#	4,749	2,889	28.89	9.90	18.99
No fertilizer..................	1,860				

(1) The entire cost of ammonium nitrate and one half the cost of 0-20-0 and 0-20-20 charged here. Ammonium nitrate figured at $60.00 per ton.
(2) Hay figured at $20.00 per ton.
(3) Pasture plots (a portion fenced out and harvested as hay).

Rural Reading

(*From page* 5)

is justification for the belief that farm journalism now is unlikely to have a warm, human, and understanding appeal.

Farm papers retain the religious and reverent theme. Three of the Christmastime papers I have before me featured the second chapter of Luke, with suitable pictorial embellishment. The national paper used the Christmas tree and original farm family scenes. That's hardly what we would call impersonal.

Take the editorial pages next. "Ike Is for Peace" declares: "This is the time for farmers to get behind President Eisenhower and his campaign for world peace. The war hounds in Congress are after him. Fortunately, the war party has only a minority in Congress —but their voices are loud. Not many farmers realize how close we came to World War III in the last few months." Can you name an issue closer to the family circle and the fate of loved ones than this?

HERE is one that also hits us close to the vest. "Can We Enjoy a Boom Without a Bust?" It states: "Does America always have to have a big business boom followed by a big bust? Chances are that there will always be ups and downs, but it does seem that prompt, intelligent action can help smooth out the peaks and valleys. Maybe America will learn to be less selfish and greedy in a boom, so it won't be so humbled and hungry when the tide turns."

In a third paper appears a tribute to a departed dairy breed leader, a reverent review of the things he accomplished to convert the dual-purpose Brown Swiss cattle to the true dairy type and conformation. Such a piece has double value in a personal way. It encourages young folks to plan their lives with definite progressive programs in mind. It points up the fact that devoted individuals can still render yeoman service, even in this era of mass and power and super-duper objectives.

In the middle of the book, space is given to a branch experiment station philosopher. He dips into the holiday message: "By becoming Men of Good Will can we achieve peace in our own family? Will a family representing Men of Good Will be an influence for peace in our own community? Does it mean that we must wait until God or the diplomats get around to it before we can have Peace on Earth? Or does it have a personal message to us? We can tell the rest of the family how to act. But when we have a grouch or trouble or disappointments, who feels it first? Do we snap at the kids because we are unhappy? Do we growl at the good wife because our pet plans went wrong? Do we chew out the hired man because the price of pigs went down just as we were ready to sell? If I can truly become a Man of Good Will perhaps I can find the promised Peace on Earth."

Coming over into the production sections, one of the papers publishes a handy comparison for several years showing "returns over feed costs" from 100 hens as compared to that from 10,000 pounds of pork—40 hogs at 250 pounds each. The average turns out to be $212 for 100 hens and $590 over feed cost for 40 hogs. But then it touches on the personal situation on a farm that may make the raising of chickens preferable — recognizing the factor of human aptitude, liking for the job, and acquired skill in doing it.

BACK in the household zone of one state paper there is a fine, upstanding report about the affairs of the Helping Hand Club—a 26-year-old volunteer enterprise engaged in by readers to aid needy youngsters who cannot get help elsewhere. The Club in its career of personal giving and helping has cared for 263 children and provided cash amounting to $73,000 to cover hospital costs.

Then there are carloads of letters from readers in these current issues within reach. From the farm home come vital ideas for making Christmas mean more than it does in kindness, forgiveness, and charity. One Dakota woman sent in a photo of their rural mail box decorated with a bright sprig of pine and a big red bow of ribbon. The goodies and the tasties embodied in the columns of tempting recipes sent in by happy housewives surely lend a personal flavor to the occasion.

WELL displayed and written, there appears a story about the West Virginia State 4-H camp or rural center, open and used for 365 days a year among the eternal hills. Its 500 acres comprise the first state 4-H camp in the nation. The site at Jackson's Mill was the original boyhood home of General Thomas Jonathan Jackson—Stonewall to history. Certainly this article has a lot of personal interest owing to the mighty host of eager club members and leaders who always admire the best in achievement.

Readers of one of the journals find sensible discussion about corn acreage allotments—a point in which every farmer in the Midwest must be vitally interested. Their slant on it appears to be that farmers think corn allotments interfere with rotations and also mean a reduction in available feed for livestock. Personal ideas by several active farm operators and feeders are given—straight from the "horse's mouth" to make practical reading.

In another magazine a reader gives a slam-bang comment about something he overheard a city slicker say. This knowing gent was overheard stating loudly, "We must get rid of all that corn in those tin cans. We are spending millions to keep more corn than we'll ever need." The reader asks whose corn is it and how much is there of it? This year's corn holdover of 900 million bushels would keep us going about 14 weeks, and the expected reserve of 700 million bushels in 1955 would last us about 11 weeks. A half-bad corn year like that of 1947, he says, would wipe out all our reserves and leave us with a corn deficit. Too much corn in "them tin cans?" Maybe hardly enough.

Of late the leading farm magazines have spent hours every day studying ways to make their sheets more readable and attractive. They have consulted some of the noted specialists who lay out the designs on the trestle board for the largest national slick paper outfits.

Headlines, subheads, letter styles, sizes and arrangements, photo cropping and displaying, page design and the proper use of color print overlay—as well as a whole grist of new ideas that are just becoming popular—these are the tools they work with to help the farmer get more out of the tools he works with.

BUT the best sign is that of healthy rivalry and a realization that the past is just prologue to the future. To come with open minds to any task is sensible. To live on old laurels is nonsense. Hence the better farm papers are not relying on what somebody else wrote or planned to write 30 and 40 years ago. They are obliged to keep step with the fastest moving of all industries—mechanized agriculture. They live in the present and keep a wise eye to the future as well. Reinforced with new blood and bright young folks ready to get out a paper that the home folks will be proud to read, the general situation is encouraging and alive with promise.

But the real fate of the farm paper rests with the farmer and his family. They move up or down alongside of him. With the recent break in the clouds of pessimism over business conditions, and the almost unanimous plea for peace in our time, we can safely feel that the farmer and his trade papers are in for a Happy New Year.

FREE LOAN OF EDUCATIONAL FILMS

The American Potash Institute will be pleased to loan to educational organizations, agricultural advisory groups, responsible farm associations, and members of the fertilizer trade the motion pictures listed below. This service is free except for shipping charges.

FILMS (ALL 16 MM. AND IN COLOR)

The Plant Speaks Thru Deficiency Symptoms (Sound, running time 25 min. on 800-ft. reel.)

The Plant Speaks, Soil Tests Tell Us Why (Sound, running time 10 min. on 400-ft. reel.)

The Plant Speaks Thru Tissue Tests (Sound, running time 14 min. on 400-ft. reel.)

The Plant Speaks Thru Leaf Analysis (Sound, running time 18 min. on 800-ft. reel.)

Save That Soil (Sound, running time 28 min. on 1200-ft. reel.)

Borax From Desert to Farm (Sound, running time 25 min. on 1200-ft. reel.)

Potash Production in America (Sound, running time 25 min. on 800-ft. reel.)

In the Clover (Sound, running time 25 min. on 800-ft. reel.)

In Canada: The Plant Speaks Thru Deficiency Symptoms
The Plant Speaks, Soil Tests Tell Us Why
The Plant Speaks Thru Tissue Tests
The Plant Speaks Thru Leaf Analysis
Borax From Desert to Farm
Potash Production in America

DISTRIBUTORS

Northeast: Educational Film Library, Syracuse University, Syracuse 10, N. Y.

Southeast: Vocational Film Library, Department of Agricultural Education, North Carolina State College, Raleigh, North Carolina.

Lower Mississippi Valley and Southwest: Bureau of Film Service, Department of Educational Extension, Oklahoma A & M College, Stillwater, Oklahoma.

Midwest: Visual Aid Service, University Extension, University of Illinois, Champaign, Illinois.

West: Department of Visual Education, University of California, Berkeley 4, California.

Department of Visual Education, University of California Extension, 405 Hilgard Ave., Los Angeles 24, California.

Department of Visual Instruction, Oregon State College, Corvallis, Oregon.

Bureau of Visual Teaching, State College of Washington, Pullman, Washington.

Canada: National Film Board, Ottawa, Ontario.

For the Province of Ontario: Distribution Services, Ontario Agricultural College, Guelph, Ontario.

IMPORTANT

Requests should be made well in advance and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of loan.

Request bookings from your nearest distributor.

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Reprints

28-12-45 Better Corn (Midwest) (Circular)
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What is the Matter with Your Soil?
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
A-1-44 What's in That Fertilizer Bag?
QQ-12-44 Leaf Analysis—A Guide to Better Crops
P-3-45 Balanced Fertility in the Orchard
Z-5-45 Alfalfa—The Aristocrat
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
ZZ-11-45 First Things First in Soil Fertility
T-4-46 Potash Losses on the Dairy Farm
Y-5-46 Learn Hunger Signs of Crops
I-2-47 Fertilizers and Human Health
T-4-47 Fertilizer Practices for Profitable Tobacco
TT-11-47 How Different Plant Nutrients Influence Plant Growth
VV-11-47 Are You Pasture Conscious?
R-4-48 Needs of the Corn Crop
X-6-48 Applying Fertilizers in Solution
AA-6-48 The Chemical Composition of Agricultural Potash Salts
GG-10-48 Starved Plants Show Their Hunger
SS-12-49 Fertilizing Vegetable Crops
BB-8-50 Trends in Soil Management of Peach Orchards
I-2-51 Soil Treatment Improves Soybeans
X-8-51 Orchard Fertilization Ground and Foliage
BB-10-51 Healthy Plants Must Be Well Nourished
II-12-51 Pasture Improvement With 10-10-10 Fertilizer
KK-12-51 Potassium in Animal Nutrition
A-1-52 Research Points the Way to Higher Levels of Peanut Production
H-3-52 The Relative Merits of Inorganic & Organic Sources of Plant Nutrients
O-4-52 Tomato Production for the Canning Industry
Y-10-52 The Nutrition of Muck Crops
CC-12-52 The Leaf Analysis Approach to Crop Nutrition
I-2-53 Sericea Is a Good Drought Crop
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THE AMERICAN POTASH INSTITUTE
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The young sailor had only a 24 hour pass, and he was anxious to make good with his new-found girl friend, but the continual ringing of her telephone was interrupting his planned procedure.

After she had left him on the sofa to answer the ringing for the umpteenth time, he could hold still no longer. "Look here," he said, "is this the information bureau?"

"Don't be funny!" she scolded. "You just hold everything 'till I get back."

"But how can I?" he argued, "if you're going to run off to the telephone with it every two minutes!"

* * *

An inebriate, coming home late, hit on a brilliant idea. He tied together all the pots and pans he could find in the kitchen and went upstairs dragging them and muttering confidently, "She'll never hear me in all this racket."

* * *

"Do any of your boy friends try to go too far when they take you out driving?"

"Yes, they drive too far; it wastes time."

* * *

Two small children, dressed as adults, visited the home of a neighboring housewife. After a short visit, the little girl announced that "Mr. Jones and I must be leaving."

"Must you go so soon?" the hostess asked.

"Yes, I'm afraid so," the little girl replied. "Mr. Jones has wet his pants."

The fancy questionnaire a household appliance company used to survey farm housewives brought equally fancy replies. To the question, "What make of garbage disposal unit do you use?" one woman wrote: "Four hogs."

* * *

Young man to draft board: "But you can't turn me down now. I proposed to three girls, told my boss what I think of him, and sold my car!"

* * *

"Junior, can you spell 'avoid?' "

"Soitanly, I can. Vat is de void you vant I should spell?"

* * *

A diplomat told the late Jan Masaryk that although America has wonderful food he never could get to eat any of it because at dinner parties the ladies keep asking so many questions. Masaryk, a veteran at such dinners, replied that he found a solution: "I ask the lady at my right: 'Are you married?' and when she says 'Yes,' I ask if she has children. Then she says, 'Yes. Two,' and I say, 'Why?' and she stops talking to me . . .

"Then I turn to the lady at my left. She too is married, and when I ask if she has children, she says, 'No,' and I ask: 'Why?' and she stops talking to me. Then I ask the lady across from me, 'Are you married?' and she says, 'No' and I ask: 'Have you any children?'—and in that way I'm able to finish my dinner undisturbedly."

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