Better Crops

WITH PLANT FOOD

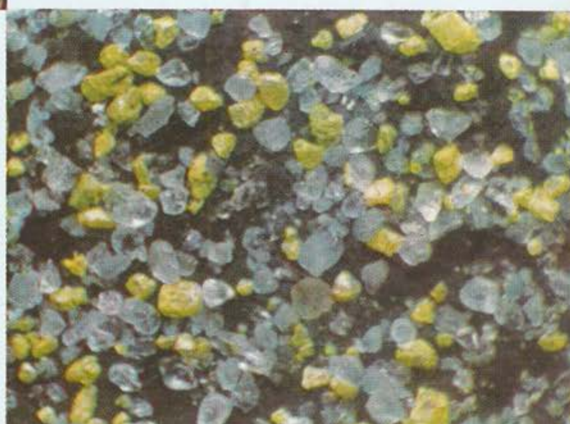
August-September, 1958 **10 Cents**

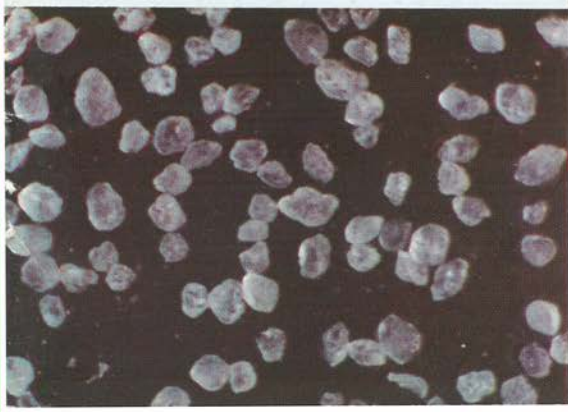
ALLUVIAL SOIL

POTASSIUM MINERALS:
YELLOW
CALCIUM MINERALS:
BLUE

GLACIAL SOIL

. . . WHICH IS HIGH IN
POTASSIUM MINERALS





OZARK SOIL

. . . WHICH IS
LARGELY QUARTZ

ON THE COVER . . .

. . . by staining minerals from the *fine sand fractions* of various soils, we can see why some soils are more durable than others.

The *top picture* shows minerals from the rich alluvium deposited along the Missouri River during the great flood of 1951—material brought in from a cool, arid region where chemical weathering is slow.

When stained, particles that contain sodium and calcium in combination with aluminum become blue, and quartz are not affected. This alluvium contained many kinds of minerals, with moderate quartz.

The *middle picture* shows minerals from soils of the glaciated region north of the Missouri. The potassium feldspars, which stain yellow, contrasted with the calcium feldspars, which stain blue, show why glacial soils are often well supplied with potassium but usually require lime.

Potassium in the glacial soils probably came from granite over which the glacier passed. Granite pebbles and stones occur in the glacial till, while the region's bedrock is limestone.

The *bottom picture* shows minerals from soils of the Ozark Region. None of the particles in the fine sand fraction, extracted from the Ozark soil, was affected by the chemical stains, indicating the particles were quartz. The region is very old geologically, with most nutrient-bearing minerals of the parent material decomposed long ago.

That is why this region responds so well to fertilizers today.

Better Crops WITH PLANT FOOD

The Whole Truth—Not Selected Truth

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Keeping farmers posted is . . .

INFORMATION'S JOB

Jeff McDermid

(ELWOOD R. MCINTYRE)

BELIEVE it or not, hardly over a thousand professionals in communications prepare the regular information materials flowing out by type, radio and TV from colleges, universities, public and private research stations, farm organizations, and the USDA.

Information is more than the "hand maiden" of science and learning. Information specialists are now technical craftsmen for the most part. They partake of science in their own field, often doing research that aids them in doing a better job to serve our fewer but much more comprehending farmers.

Who is the prospective audience to whom the farm information workers address their efforts? "Dirt" farmers come first for attention, *yet they are but a fraction of the total audience.* Agricultural extension information goes to *more rural nonfarm folks, part-time farmers* and *urban gardeners and landscapers* than to fully employed farm operators today. Then, to our dismay and regret, the information forces who know agriculture are also obliged to wage constant warfare against galling prejudice and misconception which puts the farmer in a false light before his fellow citizens.

Two basic things laid the foundation on which this vast machinery of agricultural information now rests.

(1) First, there was a glimmering belief that we must take farm research to folks who could use it—to farmers who needed it.

(2) Then there had to be the strong desire to write—a talent for clarity, logic, brevity, and plain talk.

Those who had that gift sought methods that appeal to and convince farmers that science can do them some good. Browsing in ag libraries, these old-time information men decided that our current style of offering bait to farmers was hardly any real improvement over that ancient, mildewed tome, Jethro Tull's "Horse Hoeing Husbandry." In truth, even the medical almanacs had it all over the station literature for dog-eared interest.

Over 60 years ago the directors of agricultural research sensed the keen need for *better outgoing information.* On August 15, 1891, the Association of American Colleges and Experiment Stations, meeting at Washington, D. C., discussed: "How can the results of research be most successfully presented to farmers?"

Prof. I. P. Roberts of Cornell is reported as stating: *"If we do not reach the farmer and hold his interest, we fail very largely in our efforts.*

"First, we must have something to say, and second, we should understand who this farmer is, his environment and conditions. He cannot make a word picture, so we must do it for him. We must illustrate, using more pictures and less words, more lines of different angles and fewer figures.

"THE FARMER IS A BUSY MAN . . .

"The farmer is a busy man and is used to reading small paragraphs in the newspapers. So our bulletins must be short. The bulletin must be of a kind that he who gets it will read it. The neater it is, the better the paper, the more artistic it is in press work, the better he will like it.

"When you go away from home, you dress up a little. Dress your bulletin up. It also is going away from home. Use the press, too. The press is glad to be used that way. With the help of the press, our first bulletins at Cornell reached 600,000 readers."

One good idea led to another. President Scott of the New Jersey Agricultural College supported the personal, hand-to-hand, eye-to-eye method of getting results both to the farmer and the investigator:

"We propose to use part of the U. S. grant," he said, "to employ men, not merely as platform lecturers, but to go out among small groups of men, to bring them the latest books of practical value and show them what they mean."

Here as a twin movement, the extension system and the information system seem to have been recognized as necessary and vital to the adoption of scientific agriculture.

As early as 1883, R. J. Swan, chairman of the Board of Control of the New York Experiment Station, Geneva, likewise saw the need for information methods:

"The duties of our agricultural experiment station comprise *dissemination* as well as *investigation.* To bring its experiments before the public, not alone through the annual report, but in other ways as well, is a duty that cannot be neglected."

But the language of those days was lofty and the terminal facilities of sentence structure were poor. In other words, the head professors saw the necessity for constant communication with their farm folks but when trying to set up an attractive, understandable approach, their attempts fell shy.

As a possible exercise modern journalism students might edit into readable dimensions, take the two ponderously official statements lifted from certain college deans of the 1880's:

Referring to the need of bringing science to the aid of farmers, he built this sentence: "Adverse influences, operating with accelerated force, have had visible effect in depriving the agriculture of this state of that encouragement which is necessary to healthful growth and development; and they have also been the immediate cause of transferring to other states the material portion of the labor that under more favorable conditions would have remained to preserve and increase the importance of our own commonwealth."

Again, to explain the objective of the college, its director observed: "There is ample room in the study of agriculture for pure science, and there is also abundant reason for the science that applies to practical affairs. This station, however, was organized in the interests of the latter rather than of the former, and so our duty compels us to leave to

. . . USED TO READING SMALL PARAGRAPHS"

others that agreeable and fascinating work of seeking for knowledge for its own sake, so long as the equally good knowledge which relates to practical problems is pressing and is pressed upon us for our acceptance."

One hastens to admit, too, that scores of weighty economic documents and situation reports distributed right now fall equally short of alluring readership. At least, they give the modern information writer a chance to translate them for the good they might do.

Back in the formative days, "natural-born" writers who could make the public see and understand were found here and there at a few of the new agricultural colleges. Many of them were outstanding developers and promoters, as well as clean-cut information men.

Take the sharp, incisive, telling language of Dr. Seaman A. Knapp, for example. Writing the preface to "Report of the Iowa Agricultural College Farm," in January 1883, the founder of Extension said this:

"The object of experiment stations is to substitute fact for theory in farming and thus do away with many of the uncertainties in agriculture. Experiments, to be in any sense authoritative, must have all the conditions carefully determined and be conducted in a most painstaking way."

When the going got rough in affairs at Ames, Knapp's language stayed clear, brief, and simple. Witness his words during the dark days of criticism in 1884:

"What the college needs is a strengthening of hands to carry out its work and not constant assault. No college in the land can stand under such malignant vituperation and such false and outrageous charges as have been hurled for the past two years against the man and things connected with the Iowa Agricultural College."

It's a long backward look to those pioneer times when seen from the vantage point of our trained and organized editors and writers, visual specialists and layout artists. Journalism schools no longer train writers alone, since there are special audiences and varied media to reckon with. Moreover, the new idea is that information workers are true educators and not crass seekers after institutional publicity.

Meanwhile, a kinship has developed between information folks close to the wellsprings of new knowledge and the people who manage and write for the agencies that carry the bulk of the information to the farmers themselves and other interested groups.

The Association of American Agricultural College Editors fraternizes and exchanges ideas with such direct-to-the-farm units as the American Agricultural Editors' Association and the Newspaper Farm Editors Association. As leaven to these groups, we find the information staffs in USDA participating widely in all of the meetings and projects dedicated to sounder and more effective tools of "tell 'em."

The time and effort spent by college extension editors and specialists with the state and county agricultural extension staffs provides still another link in the chain of better information programs. Hardly a meeting of county agents and home demonstration agents fails to feature some definite factor relating to communications. Similar aid has gone to the vocational agricultural teachers and state directors.

Maybe we are about where H. H. Goodell, late dean of Massachusetts College at Amherst, thought we were when he said this in 1891:

"Progress is the cry of the age. The charm of antiquity is broken. The historic tales of our childhood have faded into myths before the cold scrutiny of modern learning. Every year, nay every month, sees the birth of some new discovery in the laws of Nature, who, in her old age, seems as prolific of law as a continental congress!"

Which leaves us of the old school almost certain we and what talents we possess were born far too soon—*maybe*. ◄◄◄

LIME IS IMPORTANT TO CORN

CORN NEEDS LIME. Continuous corn plots at the University of Missouri's experimental South Farms show the crop's need for lime. The two pictures above were taken on adjoining plots that received full basic soil treatments except for the lime requirement. Corn on the left didn't get the needed limestone and shows 10 inches less growth than the corn at the right that had an adequate lime treatment.

Will lime help a non-legume crop like corn?

This is a question commonly asked by many Missouri farmers, says Alva Preston, University of Missouri extension soils specialist.

The fact that lime, or calcium, does help the growth of corn is apparent in current experimental work at the University's South Farms near Columbia. In tests at the South Farms, corn on limed soil has made a more rapid growth and has had a better color than corn on unlimited soil.

The plots where the difference shows have been in continuous corn for seven years. Nitrogen, phosphate, and potash fertilizer applications have been made each year according to soil test.

In 1957, part of the plots were limed and the remainder left without lime. The value of the lime is easy to see on this year's crop of corn.

There's nothing new in this response, Preston says. Corn is a non-legume and can tolerate soil acidity. However, its calcium requirement is high and lime is important since it supplies that mineral element.

At the same time, it speeds the breakdown of organic matter and thereby delivers more nitrogen to plants. It also makes phosphate more available and this, along with the increased nitrogen, helps the corn crop along greatly.

THE MINERALS IN OUR SOILS

A MISSOURI SOILS SCIENTIST LOOKS AT MINERALS IN THE SOILS OF HIS REGION

- At how staining techniques give more facts on the minerals present in the soil.
- At how soil minerals help supply soil fertility elements.
- At how Alluvial soils contain much potassium and calcium minerals.
- At how Glacial soils are often supplied with potassium minerals but deficient in calcium minerals.
- At how Ozark soils contain largely quartz minerals.

By C. M. Woodruff **Department of Soils**

Soil is a remarkable substance. Regardless of how much we study it, work with it, delve into the intricacies of its functioning, there is always some facet, some angle, some concept, heretofore unknown, which opens new vistas in the search for more understanding.

Results of early explorations often become submerged in the stream of current interests, only to rise again when insight and understanding deepen as a result of recent advances.

Modern thinking emphasizes the *functional aspects* of soils. We see them in terms of the crops they will produce, of the nutrient elements which may be extracted readily by chemical tests, and of the organic matter which has accumulated in them.

We may view them simply as repositories for fertilizers and water, and as sites for the production of plants. Some we know to be good soils because of the rich agricultural empires they have produced. Others we know to be poor soils because agriculture on them has failed.

We compare good soils with poor ones and by seeing organic matter in the good soils as a rich black color, we ascribe their strength to the organic matter rather than to the underlying qualities of the soil that caused the production of organic matter.

By stripping away the black coatings of organic matter, and of iron and clay, we can expose a mass of small crystals that appear to the naked eye as a whitish powder.

This powder is the heart and life

Figure 1. Under this extreme condition, we see alluvium that was deposited over farmland in 1951 by the flooding Missouri River. Some farmers sought federal aid to plow down the sand and bring the good soil back on top. But those farming the sand today find it produces bumper crops with only nitrogen. Sand from these particular soils contained greatest percentages of stained minerals, as shown in the upper picture on the cover.

blood of the soil. It is the sand and silt fraction of the soil. The minerals present in the powder make the soil good or poor.

Identifying the Minerals of the Sand and Silt Fractions of the Soil

By comparing the cleaned particles from good and poor soils, we may see very little that indicates the great difference between the behaviors of the two soils as media for the growth of plants. Using the microscope to extend our vision, we can detect clues that are suggestive.

Particles from the *poor soil* may be *rounded and worn,* while particles from the *good soil* may be *sparkling, sharp, and angular*. But further sampling of soils reveals that sharp angular particles may also occur in poor soils.

Grains of sand may appear clear or opaque, white or slightly colored. But grains of silt, under the microscope, are too small to register any significant difference in appearance.

If we were fortunate enough as students to view soil minerals under a microscope, we probably saw very few differences that would excite our

Dr. C. M. Woodruff, native of Missouri, is professor of soils in the Soils Department at University of Missouri. He teaches and researches in the fields of soil chemistry and plant nutrition. He earned his BS, MS, and PhD at Missouri.

imagination or explain the behaviors of good and poor soils.

Chemical analyses and petrographic methods have been used to examine soil particles. The results reveal differences in chemical and mineralogical compositions of good and poor soils. But such techniques are seldom used at the undergraduate level of teaching soils, and the tabular data from chemical analyses may soon be forgotten.

Staining techniques are now available for distinguishing different kinds of minerals through their colors. The techniques are simple and usable at the undergraduate level of teaching. And when we are able to examine the stained minerals of widely divergent soils, the visual impressions will never be forgotten. When we view stained minerals from good and poor soil through a microscope, we can easily understand what contributions sand and silt fractions make to the continued productivity of the soil.

Extreme contrasts in soil durability show up where the mineral rich alluvium, glacial till, and loess from the cold and arid regions lie adjacent to the highly weathered residual soils of a warm humid region.

Such a condition exists in Missouri where the Missouri River (marking the southern boundary of glaciation) separates the recent mixture of till and loess from the more ancient geological materials of the Ozark region.

Unstained and Stained Minerals of the Alluvial Soils Along the Missouri River

The alluvium along the Missouri River—carried in periodically from the cool, arid, mountainous northwest section of the United States—contains traces of free calcium carbonate (shown in Figure 1). Deposits of it are so high in phosphorus and potassium that crops rarely respond to fertilization with these elements.

Unstained sand particles of such soils were found to vary greatly in shape, degree of angularity, color and degree of opacity suggesting a wide variety of different kinds of minerals.

After the feldspars containing potash are stained, they turn yellow or green; those containing sodium and calcium turn blue; and quartz remains unstained.

Relatively few of the particles from the Missouri River alluvium were found to be quartz. Many were *blue* and *yellow*. The abundance of stainable minerals, releasing their nutrients by chemical weathering, provides both the production capacity and durability that has made these soils so valuable as agricultural soils. The preponderance of blue staining minerals explains why these soils contain free lime.

Stained Minerals from Glacial Soils

The glacial till plain extending north from the Missouri River contains stones and boulders of granite. This suggests the mechanical disintegration of this granite accompanying the glaciation should have produced an abundance of fine particles containing potassium but few containing calcium. Results of soil tests and fertilizer experiments usually reveal that these soils are well supplied with potassium but deficient in calcium.

Potassium deficiencies occur when large amounts of hay crops are removed from the land and when high production of corn is achieved through the use of liberal amounts of nitrogen and phosphorus.

Examination of the stained minerals from the glacial soils revealed the minerals were primarily quartz and potash-bearing feldspars. The low amount of blue, calcium-containing minerals and the relative abundance of potash-bearing minerals explain why these soils require large amounts of lime but only small amounts of potash fertilizers.

Stained Minerals from Soils of the Ozark Highland

The residual soils of the Ozark region were derived from weathered sandstone, shale, and cherty limestone. The region is geologically old, and the soils were formed under a relatively warm humid climate.

All but the most resistant minerals have been completely weathered, leaving little but quartz as the constituent of the sand and silt fractions of the soil. An examination of the fine sand particles after staining revealed nothing but clear rounded grains of quartz.

Agriculturally, the soils are poor. The few plant nutrients that had accumulated on the clay and in the organic matter of the virgin soil were removed by the first few crops following the clearing of the land.

Eventually many fields were abandoned. *In this region spectacular results are achieved from the use of fertilizers today.*

Soil Minerals as Generators of Soil Fertility

The *clay* of a soil is like an *automobile battery*, since both serve as *charge accumulators*. The nutrient-bearing minerals of the soil are like the car's generator. *Both deliver charges that are stored in accumulators.*

Nutrient-bearing minerals in the sand and silt fraction of the soil deliver nutrients slowly throughout the year to the clay fraction of the soil where they are stored ready for use when the plant root appears. As generators of soil fertility, the quantities of nutrient-bearing minerals in a soil must be great enough to deliver a full charge for a crop, *or a supplemental charge through fertilization is necessary.*

The highly weathered soils without nutrient-bearing minerals are like automobiles with faulty generators. *They operate only upon the charges supplied through fertilization.*

Although early studies and explanations of the soil emphasized its geological genesis as a fertility determinant, today's methods of soil science often pay little attention to geological origin when evaluating the fertility state of the soil.

The mineralogical methods, however, do reveal *why* some soils remain productive with little if any fertilization and others require repeated applications of large amounts of fertilizers in order to maintain production.

We may conclude that soils which do not contain an abundant supply of nutrient-bearing minerals in the sand and silt fractions will always require large amounts of fertilizers in order to maintain suitable levels of production. ◄◄◄

A PAYING INVESTMENT

More fertilizer, up to Agricultural Experiment Station recommendations, will pay on all crops, says the Louisiana Agricultural Extension Service.

Experiment Station results show that corn growers can get back up to \$8 for each \$1 invested in fertilizer on alluvial soils and \$3.50 for each \$1 on other soils. Rice growers get back \$6 for each \$1 invested in fertilizer and cane growers from \$3.75 to \$10, depending on soil type and fertilizer needs. Cotton growers can get back as much as \$19 for each \$1 on alluvial soils and \$5 for each \$1 on other soils.

Where can anybody get a better return on money than that? Even the lowest of those figures represents a return of 350 per cent in one crop year. If Wall Street could find an investment like that, nobody would buy stocks.

According to some estimates, if all growers used the recommended amount of fertilizer on their crops, about twice as much fertilizer would be applied in Louisiana each year as now is used. At a return of 3½ to 19 to 1, that would mean a big jump in farm income.

POUNDS OF MARKETABLE WATERMELONS PER ACRE				
POUNDS P_2O_5 PER ACRE	POUNDS K_2O PER ACRE			
	0	100	200	AVERAGE
0	7,878	11,635	13,726	11,080
40	12,332	17,635	20,937	16,968
80	13,787	18,786	22,967	18,513
Average	11,332	16,019	19,210	15,520
L.S.D.	P_2O_5	K_2O		
5%	2,255	2,255		
1%	2,977	2,977		

Figure 1—Effect of phosphorus and potash on the yield of Charleston Gray Watermelons, Prairie View, Texas. Note how the first 100 pounds of potash per acre caused a sharp rise in yield—and how the second 100 pounds of potash caused another significant increase in marketable melons.

HIGH POTASH RATES BOOST WATERMELON YIELDS

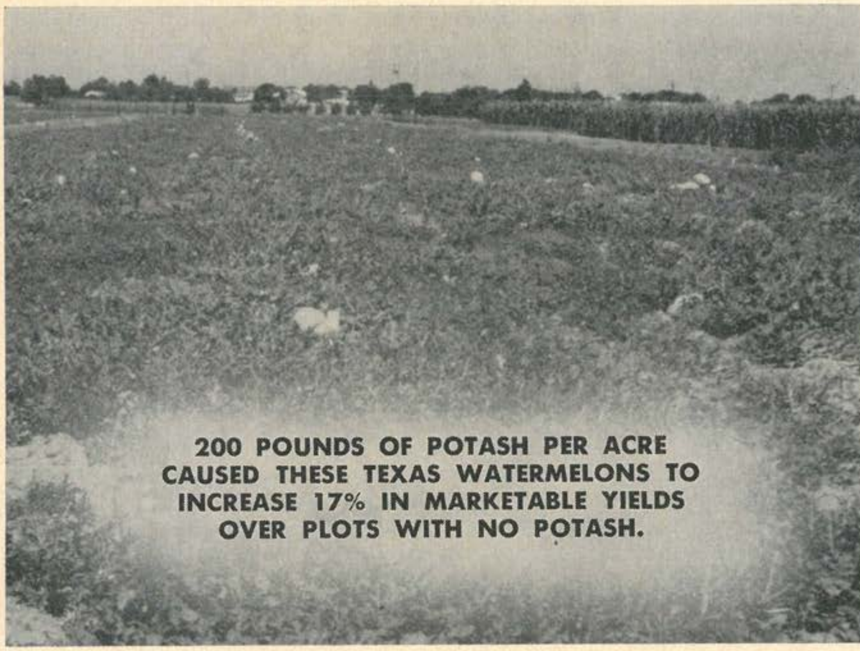
Recent studies by the Texas Agricultural Experiment Station showed corn and sweet potatoes responding to high rates of potash on the Hockley fine sandy loam soil at Prairie View, Texas.

Dr. D. R. Paterson, a New York native, is Associate Horticulturist with the Texas Agricultural Experiment Station. He works with plant nutrition of vegetable crops over the state. He earned his B.S. from Cornell, his M.S. from University of California, his Ph.D. from Michigan State.

Although the Black Diamond watermelon variety did not respond to 20 and 40 pounds per acre of nitrogen, the variety gave a *highly significant increase in yield* when supplied with 20 pounds per acre of phosphoric acid and 20 pounds per acre of potash in a four year study at this same location.

The watermelon growing areas adjacent to Prairie View in Waller County, Texas, ship approximately 105 carlot rail shipments of watermelons each year.

The experiment reported here was designed to test the reaction of Charleston Gray watermelons to relatively high rates of potash under the



200 POUNDS OF POTASH PER ACRE CAUSED THESE TEXAS WATERMELONS TO INCREASE 17% IN MARKETABLE YIELDS OVER PLOTS WITH NO POTASH.

By D. R. Paterson
Texas Agricultural Experiment Station

and

Oliver E. Smith
Prairie View A & M College

high light intensity and high temperature of South-central Texas.

Experimental Procedure

The experimental design used in 1956 and 1957 was a 3 x 3 x 3 nitrogen (N), phosphoric acid (P_2O_5), potash (K_2O) complete factorial experiment inside a 9 x 9 quasi-latin square, with the N-P-K interaction confounded with the rows and columns of the square.

The fertilizer treatments included all possible combinations of 0, 20 and 40 pounds of nitrogen from ammonium nitrate; 0, 40 and 80 pounds of phosphoric acid from 20 percent superphosphate; and 0, 100 and 200 pounds of potash from potassium chloride.

All of the phosphoric acid and potash and half of the nitrogen were placed in the water furrow and a bed

Professor Oliver E. Smith, Texas native, has taught agronomy and done research in agronomy and horticulture at Prairie View A & M College for 9 years. He earned his BS there, his MS at the University of Nebraska.

Table 1. Effect of P_2O_5 on the date of harvest of Charleston Gray watermelons, Prairie View, 1956.

Harvest date	Pounds of marketable watermelons per acre			
	Pounds per acre P_2O_5			
	0	40	80	Average
7/6/56	1137	5693	5952	4261
7/17/56	5293	4766	4418	4826
7/25/56	6299	1811	2409	3506
Total	12729	12270	12779	12593
L. S. D.	Date		Date of harvest x P_2O_5	
5%	1018		1764	
1%	n.s.		2329	

of soil listed on top of it. The rest of the nitrogen was applied as a side-dressing when the watermelon plants started vine growth.

Each plot consisted of one row 48 feet long with 12 feet between rows. Seed were planted in hills 12 feet apart in the row on April 6, 1956 and on April 7, 1957.

The melons were harvested and yield data recorded on July 6, 17 and 25, 1956, and on July 19, 26 and August 2, 1957, from the three center hills in each five-hill plot.

Soil tests indicated that the Hockley fine sandy loam soil at Prairie View was low-medium in nitrogen and *very low in phosphoric acid and potash* (Table 3).

As shown in Table 1, significantly fewer melons were harvested on July 25 than on July 6 or 17. Although there was no significant increase in the marketable yield due to either nitrogen or phosphoric acid, there was a highly significant interaction between the dates of harvest and the rate of phosphoric acid application.

There was a highly significant increase in the yield of marketable melons harvested on July 6 from an application of 40 pounds per acre of phosphoric acid. Conversely, there was a highly significant decrease over the control plots in the yield of marketable melons harvested on July 25 from the 40 and 80 pound per acre applications of phosphoric acid.

The use of 100 pounds per acre of potash in 1956 caused a yield in-

Table 2. Effect of P_2O_5 on the date of harvest of Charleston Gray watermelons, Prairie View, 1957.

Harvest date	Pounds of marketable watermelons per acre			
	Pounds per acre P_2O_5			
	0	40	80	Average
7/19/57	848	3737	4322	2969
7/26/57	3768	8959	9777	7501
8/2/57	6464	4272	4414	5050
Total	11080	16968	18513	15520
L. S. D.	Date	P_2O_5	Date of harvest x P_2O_5	
5%	1301	2255	2255	
1%	1718	2977	2977	

Table 3. Results of soil tests on Hockley fine sandy loam soil at Prairie View.

Year	pH	% O. M.	ppm		
			P_2O_5	K_2O	CaO
1956	5.7	1.81	5	65	285
1957	5.7	1.67	10	76	200

crease of approximately 10 percent over the control plots, while the use of *200 pounds per acre gave a yield increase of about 17 percent.*

The use of phosphoric acid in 1957 again resulted in highly significant increases in the early yield of marketable watermelons. As shown in Table 2, the use of 40 pounds per acre resulted in highly significant increases in the yield of marketable melons from the July 19 and 26 harvests. There was a highly significant increase in total yield from the 40-pound application of phosphoric acid.

The use of 100 pounds of potash per acre caused a highly significant increase in the yield of marketable melons. Additional highly significant increases in yield were obtained by adding a second 100 pounds potash per acre (Figure 1).

As in 1956, the addition of nitrogen in 1957 did not have a significant effect on the yield of melons.

Summary

Applying 200 pounds potash per acre at Prairie View in 1956 caused a 17 per cent increase in the yield of marketable Charleston Gray watermelons over the yield from control plots where no potash was used. There was a highly significant increase in the yield in 1957 from 100 pounds per acre of potash, and again as the potash rate was increased from 100 to 200 pounds.

Applying 40 pounds phosphoric acid per acre caused a highly significant increase in the yield of marketable watermelons in 1957, and in the yield of early watermelons in both 1956 and 1957.

There was no significant increase in the yield of marketable watermelons from additions of either nitrogen or phosphoric acid in 1956, or from nitrogen in 1957. ◄◄◄

NEW RATIO RECOMMENDED

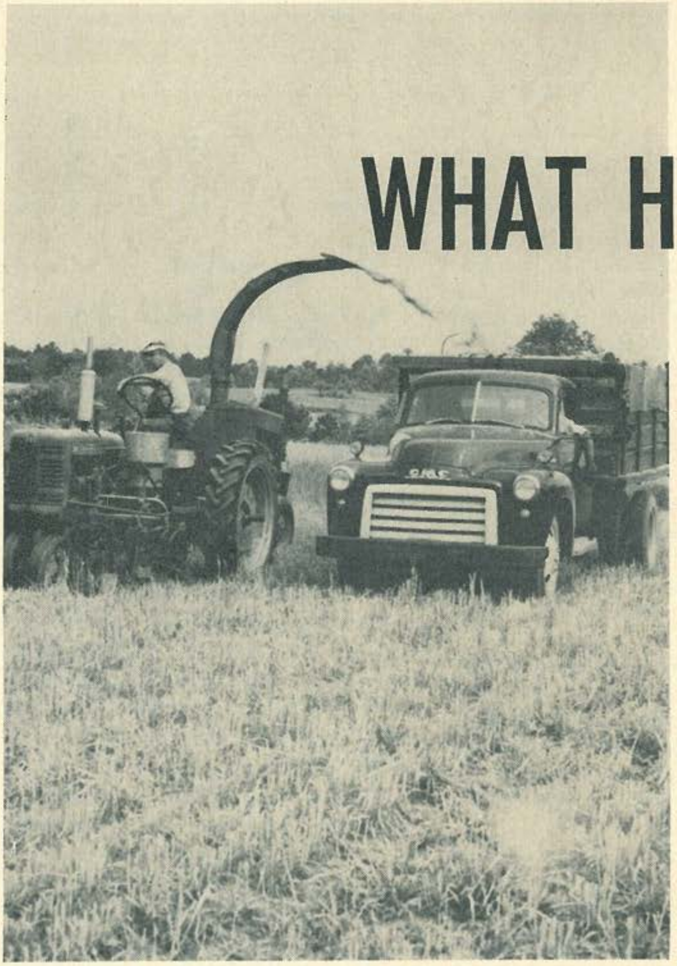
Coastal Plain pickle growers of Arkansas, may get a better crop with an under-row application of *1-2-2 fertilizer ratio* than with a 1-2-1, which has been recommended, says Dr. G. A. Bradley, assistant horticulturist with the University of Arkansas Agricultural Experiment Station.

He bases the new recommendation on fertilizer trials conducted on Ruston fine sandy loam in 1956 and 1957 at Hope.

When soil tests indicate low potassium content, he advises a producer to apply additional potassium under the row.

As a general recommendation, Dr. Bradley suggests an under-row application of 30, 60, and 60 pounds of nitrogen, phosphorus, and potash, respectively, followed by nitrogen sidedressings of 30 pounds an acre when vines begin to run and 30 pounds two weeks later.

WHAT HAPPENS



By
M. E.
McCullough

Cutting forage at the proper stage of maturity is the first step toward good silage.

In 1956 and 1957 at the Georgia Experiment Station, six silos were filled with alternating loads of oat forage from the same field. Three of the resulting silages were *well-preserved,* and three were *poor silage*.

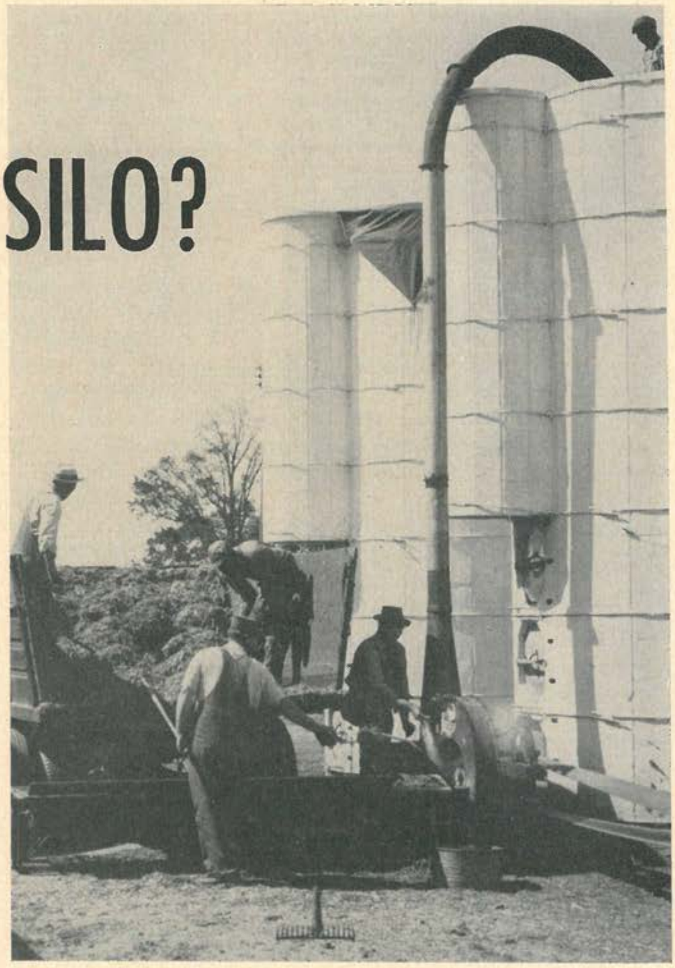
This variation is frequently encountered, giving silage a bad name with many farmers. While a farmer doesn't have to understand the many technical details of silage fermentation, he should understand the more important factors in silage making in order to choose the right method for ensiling a given crop.

Purpose of Silage Fermentation. The purpose of silage making is to preserve the forage nutrients by lowering the pH to a level that will prevent spoilage. This is done by storing the forage in an airtight container and providing the bacteria with an adequate supply of carbohydrates for acid production. *The most efficient process is a fermentation dominated by bacteria which produce lactic acid.*

WHAT ACIDS FORM IN SILAGE FERMENTATION? **WHAT FACTORS**

IN THE SILO?

Georgia Experiment Station



Proper rate of filling and use of proper preservative insures good silage preservation.

Normal Lactic-Acid Fermentation. When an airtight silo is properly filled with a forage having adequate carbohydrates, the usual chain of events is like this:

The plant cells continue to respire for several hours while sufficient heat is generated to increase the temperature to the desired range of 80°-100° F. Acetic acid then forms, while the oxygen supply is exhausted. This provides ideal conditions for the lactic acid-producing bacteria which take over the fermentation and rapidly lower the pH to 4.2 or below. When this degree of acidity is reached, the fermentation ceases and the silage remains stable so long as the anerobic conditions exist. The entire process is normally completed in 20 days or less.

Acids Formed in Silage Fermentation

Acetic acid. This acid is usually found in all silages. And its concentration is usually inversely proportional

Mr. M. E. McCullough, head of dairy nutrition research at Georgia Experiment Station, has authored over 40 studies, appeared on 4 national panels in the field, and conducted *research firsts* on forage intake, forage quality on dairy cows, oat silage, and calf growth on pasture.

to the lactic acid concentration—that is, high acetic, low lactic.

The acid is formed in part by plant enzymes and later by bacterial action. Although the acid possesses feeding value, some workers feel that its presence in large quantities lowers silage intake and digestibility.

Propionic acid. This acid is sometimes found in small quantities, although its origin and significance is not clear.

Butyric acid. Butyric acid is generally associated with *poor silage making techniques.* This acid is formed when the temperature fails to reach 80° or above. The available carbohydrates are insufficient to permit adequate lactic acid formation or the pH does not go low enough to prevent protein decomposition. Silage with high levels of butyric acid may be good feed but it is objectionable to handle. It frequently flavors milk, should not be used when certain types of cheese are to be manufactured, and it may be responsible for some cases of ketosis in dairy cows.

Lactic acid. This acid should predominate in well-made silage. Its presence in large quantities gives a

Table 1. Characteristics of Forages Which Affect Silage Fermentation and Silo Filling.

	Legumes	Grasses	Cereals
General Characteristics:			
1. Protein content	High	Medium to low	Low
2. Ash content	High	Medium	Low
3. Buffer capacity	High	Medium	Low
4. Carbohydrate content	Low	Medium	High
Problems Encountered:			
Above 80% moisture: Speed of filling silo: Slow	High pH with low lactic acid and high butyric acid Correct by adding 200 lb. organic preservative or 80 lb. molasses.	Medium pH with low acetic and some butyric acid. Correct by slow filling or by adding 100 to 200 lb. corn or 60 lb. of molasses.	Not recommended for cereals other than oats, barley or wheat. Handle them same as grass.
70% to 80% moisture: Speed of filling silo: Normal	Same as above. May be ensiled more rapidly and less preservative used.	Ideal for silage making. The addition of a preservative may increase feeding value.	Ideal for preserving. No special problems.
Below 70% moisture: Speed of filling silo: Rapid	Too mature. Difficult to ensile under most conditions.	Too mature. Use short chopping and heavy packing.	Chop short and pack heavily.

Experimental silos at Georgia Experiment Station used in studying effects of stage of maturity, preservate, method of filling, and temperature on silage quality.

pleasant odor to the silage with a minimum of fermentation loss.

Factors Affecting Silage Fermentation

1 The *forage itself* contributes the first set of factors affecting silage fermentation.

The general characteristics are shown in Table 1. Legumes are normally high in protein and ash, causing a high buffer capacity that increases the quantity of acid needed to lower the pH. This condition is accentuated by the low carbohydrate content of legumes, which limits the quantity of acid that can be produced. Thus, legumes are difficult to ensile and *should have a preservative added.*

The reverse is true for *cereals,* such as corn and sorghum, with poor fermentation seldom occurring in these crops.

In general, *grasses* may be ensiled without difficulty, if attention is given *to rate of filling* and *degree of packing.*

2 The second factor involved in silage fermentation is the *exclusion of air* and the resulting *temperature control.*

In high moisture crops, the material will normally pack without too much assistance. The material placed near the bottom of a silo may pack so rapidly that there is insufficient air to insure a temperature rise. For this reason, it may be desirable to *slow down the rate of filling to insure some temperature rise in wet material.*

The reverse is true of dry material, since it is difficult to exclude enough air to prevent severe overheating. The addition of water to such material does not compensate for dry forage at late stage of maturity, since the water does not remain but drains away. Packing can be aided by decreasing the length of the cut, *but the best solution is to ensile at an earlier stage of maturity.* The ideal amount of dry matter seems to be between 25 and 30 percent.

3 The third factor affecting silage fermentation is the *quantity of carbohydrates available for acid production.* This factor is very important in legumes and in some early cut grasses.

The deficiency of carbohydrates in legumes can be corrected only by carbohydrate additions, while the grass problem can be aided by proper ensiling techniques that provide ideal conditions for lactic acid fermentation.

Silage making losses may be divided into three categories:

(1) *Losses due to seepage.*
(2) *Losses due to spoilage.*
(3) *Losses due to fermentation.*

Nutrient loss due to seepage decreases as the dry matter increases, and ceases at about 25 to 28 percent dry matter. In general, losses are greater with legumes than with cereals or grasses. This loss may account for from 2 to 10 percent of the forage dry matter. The dry matter in the seepage has an average content of *25 percent minerals, 20 percent nitrogenous substances,* and *55 percent non-nitrogenous extracts.* In high moisture crops, this loss can obviously become quite serious.

Forage losses due to spoilage are largely preventable by using *airtight silos, adequate covers,* and *packing to prevent air pockets* along the sides of the silo.

The most difficult loss to handle is that due to *fermentation.* Since this loss is unseen, it can be measured only *by weighing both the forage put into the silo and the silage removed.* Fermentation losses as high as 30 percent of the dry matter have been reported. This loss is best prevented by rapid production of lactic acid. As a general rule, such loss will be inversely proportional to the adequacy of the silage-making techniques employed. ◄◄◄

THE EDITORS TALK

"More people—less land!" Everywhere today, it seems, people are writing and talking this theme. More people—less land.

Farm acreage declines each year. But the great clocks in the Department of Commerce in Washington tick on—recording a birth every 8 seconds, a death every 21 seconds, an incoming immigrant every 2 minutes, an outgoing emigrant every 24 minutes.

And when the tally is made at the end of each day, it shows 7,200 new Americans to be fed, clothed, educated, and ultimately employed. At this rate, the United States is predicted to have over 200 million citizens by 1975—less than 17 years from now.

Of Clocks and Corn

And this is just America. The same growth is true of most other nations of the world. Millions of more mouths to be fed. Less land—more people! How?

Maybe one of the characters in *Gulliver's Travels* had the answer when he said: "Whoever could make two ears of corn, or two blades of grass, to grow upon a spot where only one grew before, would deserve better of mankind and do more essential service to his country than the whole race of politicians put together."

Jonathan Swift was too bitter about politicians —perhaps. But he was wise about his corn and grass. In fact, if men had not been trying for years now to grow two ears of corn where one grew before—*and succeeding at it*—this nation would be hungry today.

Many nations *are* hungry today. And one of the finest foreign relations programs we have is the agricultural scientists we send abroad to show our earthly neighbors how to use fertilizers, new hybrids, insecticides, fumigants, and scientific conservation to grow two ears of corn . . . two blades of grass . . . two grains of wheat where one has always grown.

HOW SOON WILL POTASH BE NECESSARY

From
Through the Leaves
Denver, Colorado

HEAVY cropping of our farmlands since the advent of irrigated farming, and especially in the last twenty years of more intensified farm practices, and increased yields through improved varieties, has developed a profound need for replacing some of the natural plant foods. The standby practice of trying to keep up soil fertility by returning plant and animal residues to the soil has fallen short of the total requirements necessary to produce maximum yields on every field of the farm. Hence, the tremendous increase in the use of commercial fertilizers in maintaining or adding to the soil plant food level to reach highest production.

Of the fifteen plant food elements known to be essential for normal plant growth, twelve are taken from the soil. Of these phosphorus, nitrogen, and potassium (potash) are the primary plant foods and are required in relatively large quantities by the plants.

History has shown the depletion of natural nitrogen and phosphorus supply and also the recovery through the use of commercial forms of these elements. Farmers are keenly aware of the need for nitrogen and phosphates, are acquainted with their function in plant growth and realize a greater profit from increased yields. This need for nitrogen and phosphate has resulted in a tremendous growth and competition within the fertilizer industry. The need for these plant foods is established, the increased production has been proved, and great profit has been realized. Will potash follow the same pattern? *Are we on the brink of a definite need for potash in our beet growing soils?*

Let's take a look at potash, and its function within the plant. Although about one million tons of potash fertilizer is used in the United States annually, practically all of this is used in the eastern and southern agricultural areas. Soil scientists report that our western soils have a good supply of potash.

However, most soil potassium compounds are highly insoluble and, therefore, may be unavailable to the plant in sufficient quantities to keep up with the rapid growth stimulated by liberal quantities of commercial phosphorus and nitrogen being applied.

Much remains to be learned about the function of potassium in the plant and why plants need so much of this plant food. Apparently, potassium acts as a balancer of the other plant foods, especially nitrogen and phosphate. More is known about what happens to the plant when potassium is lacking.

The following are some of the known functions and deficiency symptoms of potassium.

. . . IN OUR BEET GROWING SOILS?

By Carl Luft
Fieldman
Great Western Sugar Company

1. Potassium helps to protect the plants from excessive losses of water during periods of drouth.

2. Potassium increases the plant's resistance to low temperatures.

3. It definitely promotes the health and vigor of plants and increases their resistance to disease.

4. Potassium seems to balance or buffer the action of phosphorus and nitrogen. A sufficient supply of potassium tends to offset the harmful effect of an over-supply of nitrogen.

5. Plants deficient in potassium tend to droop or lodge. Potassium increases the turgidity of the leaf and stem, thereby adding strength to the plant structure.

6. Potassium deficiency symptoms usually occur in cases of high yields which could logically indicate that the availability of soil potash is insufficient to keep up with the rapid growth due to high levels of available phosphate and nitrogen. Sugar beets are hogs for potassium.

7. Theories are advanced that potassium functions in the process whereby sugars are made from carbon dioxide and water.

Along with the above mentioned functions of potassium are practical observations made in the field.

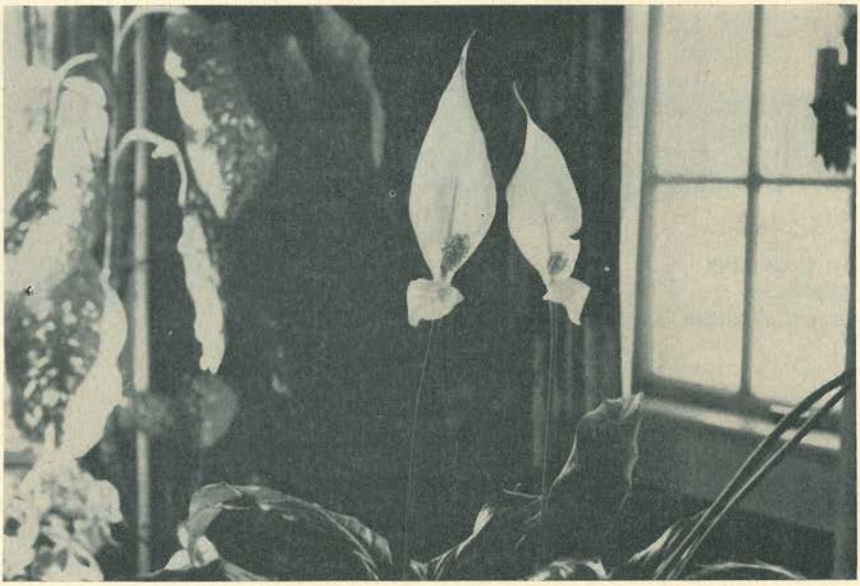
Local vegetable growers, generally, have since 1947 discovered that a small amount of potassium in their fertilizer program greatly improves the quality and reduces disease susceptibility to their vegetable crops.

Potato growers have accepted potash as means to *firmer, smoother* potatoes and *reduction of the number of watery tubers.*

Local cases were observed in the past two years in which potash applications were credited with eliminating the lodging of small grain in fields with a high nitrogen content; the same effect has been observed in corn in fields that tended to go down in high winds.

In a local fertility experimental plot of beets conducted in 1957, two plots fertilized with 200 pounds of potash per acre, added to the standard treatment of phosphate and nitrogen, produced the highest yield of sugar per acre. These incidents are not meant to indicate a positive need for potash; they are, however, sufficiently significant to be worthy of mention.

In view of all the foregoing statements and observations and the fact that, generally, soil analyses indicate a plentiful supply of potash, perhaps the question of availability as required to balance the high levels of nitrogen and phosphate, and the resulting rapid growth is a problem worthy of consideration by all who have a question as to more effective fertilization for the individual crop or farm. ◄◄◄



When they started blooming, things started happening . . . **. . . the**

LOVE LIFE OF A PLANT—SPATHIPHYLLU

Earl Bailey, Institute agronomist in Mississippi and house plant enthusiast, recently ran across a plant in a greenhouse that intrigued him—*Spathiphyllum floribundum.*

He liked the plant largely because it is a member of a large group of interesting plants that require little sunlight—such as Chinese Evergreens and Dumb Canes—growing on the tropical forest floor.

He bought it and took it home. And when it started blooming, things started happening.

"It acted rather curiously for a plant," Bailey reports, "behaving almost like an animal."

As the flowering heads came up, they began to move toward each other in pairs.

"The flowering heads are evidently staminate and pistilate and come together in pairs for pollination," Bailey decided.

"The heads may move five or six inches in the process of coming together," he observed.

Separate flowering heads, or flowers, are not unusual, but this process of

y moved toward each other . . .

M

. . . until the flowering heads were together

the flowers coming together was new to Bailey. It has probably been reported, but he had not heard of it—nor we.

So going to our *Hortus,* we found this plant is a native of Colombia, growing in the half light that seeps through the cover of the trees above. It is a relative of the lowly skunk cabbage.

It is described as "tropical American nearly stemless herbs, having oblong leaves with strong midribs and sheathing petioles, and bisexual flowers on erect densely-flowered spadices which are shorter than the spathes; grown as foliage plants in a warm greenhouse."

Its leaves grow up to 6 inches long, 2½ inches wide, unequal sided, dark green above and paler beneath. Its petioles grow up to 6 inches long, its spathes to 2½ inches long, white, with the spadix greenish-yellow or white.

All of which is interesting—but not quite as interesting as the flowering heads moving toward each other for the miracle mankind has long known but never been able to explain. ◄◄◄

For more profit!

FERTILIZE FIELD CROPS

From the *Sunshine State Agricultural Research Report*, published by the Agricultural Experiment Station of the University of Florida, comes a convincing presentation on why farm profits depend on high yields per acre, on how the unit cost of production is related directly to yield—*the higher the yield the lower the cost per unit and the better the net income.* A major factor in higher yields, according to Soil Technologist Pritchett, is proper fertilization—*the right amount at the right time.*

By
William L. Pritchett
Soil Technologist, Main Station
Agricultural Experiment Station University of Florida

CAUGHT in the cost-price squeeze? Want to up your yields of corn, cotton, oats, soybeans, peanuts, pasture?

Then: In time of cost-price problems to economize, *fertilize.* In other words *"Don't be a miser—with your fertilizer."*

Many factors contribute to higher crop yields, such as good seedbeds on suitable lands, using recommended seed varieties, rates and dates; weed, insect and disease control—and feeding the crop what it needs at the right time.

Experience has shown, however, that one of the easiet and most economical ways to increase yields is by proper fertilization.

This involves testing of the soil to see what plant foods are already present; determining the amount of plant food it will take to produce that higher yield; and supplying the difference between what the soil can supply and what crops need by fertilization at planting time or by sidedressing.

On the majority of Florida's high value crops—fruits and vegetables—high rates of fertilization already are used. Proper fertilization, therefore, does not necessarily mean the use of still larger amounts of fertilizer. Rather, it means using the *proper balance between the major and secondary plant nutrients.*

For example, phosphorus has accumulated in many of these fruit and vegetables soils to where it may be omitted from the fertilizer mixture for years to come.

On the other hand, thousands of acres of field crops and pastures never receive a pound of fertilizer, and other thousands receive only low rates. This is one reason average field-crop yields are so low.

But while the sandy soils are inherently low in native fertility, they are highly productive when properly managed.

For instance, in 1953, the average application of fertilizer on Florida corn fields was about 35 pounds per acre. The average yield on these Florida corn fields was 16.5 bushels.

Average fertilizer applications to corn, as well as state corn yields, have increased notably in the past three years. However, yields are still far below optimum.

When Experiment Station tests were run, an average of 140 pounds of fertilizer per acre was applied to certain fields, and the average yield was upped to 45 bushels per acre.

In cotton the same year, the average state yield was 182 pounds of lint per acre when an average of 86 pounds of fertilizer per acre was applied. Experiment Station tests upped this average to 150 pounds of fertilizer per acre and the average yield jumped to 400 pounds of lint per acre.

Oats, soybeans, peanuts all showed good yield responses when the average fertilizer application was raised by Experiment Station testers. Oats averaged 20 bushels more per acre; soybeans rose to an average of 30 bushels from 18 bushels per acre; and peanuts rose from an average of 975 pounds per acre to an average of 1,300 pounds an acre.

When the testers applied an average of 200 pounds of plant feed per acre on pasture, the average number of cow-days per acre was 300. Previously, census reports show, the average was 165 cow days per acre for an average application of 39 pounds of fertilizer per acre.

Money gains possible by proper fertilization are very high. Cost of fertilizer per extra unit on a corn crop was 44 cents a bushel—and the possible profits amounted to $30.21 an acre. On cotton, the cost per extra pound of lint was only 4 cents, but the possible extra profit per acre was $58.86. Oats, soybeans, peanuts and pastures showed similar possibilities.

Farm profits depend on high yields per acre—especially important during periods of low farm prices. Since the unit cost of production is related to yield, the higher the yield the lower the cost per unit and the better the net income.

For example, a farmer producing 45 bushels of corn per acre instead of the state average of about 21 bushels might have a production cost of about 85 cents instead of $1.25 a bushel. If the farmer sold his corn at $1.25 a bushel, the one having the high yield would make a profit of about $18.00 per acre, while the farmer producing the low yield would gain nothing for his efforts.

If it sells higher, he makes more; if it sells lower he loses less. ◄◄◄

Number 1 potatoes are big business in the southern part of Baldwin County, Alabama, and adjoining counties of Mobile and Escambia—ranging in yields from 5,000 to 15,000 pounds per acre.

In Baldwin County, Alabama

EFFECTS OF FERTILIZER PRACTICES

EARLY potato production in Alabama is concentrated in a small area in the southwestern part of the state. From 15,000 to 30,000 acres are planted annually in the southern part of Baldwin County and the adjoining counties of Mobile and Escambia. Yields of No. 1 potatoes in this area range from 5,000 to 15,000 pounds per acre.

In the Baldwin County area, rainfall is usually high during the potato-growing season, and considerable amounts of nitrogen and other soluble fertilizer salts may be leached from the fertilizer applied at time of plant-

Dr. John I. Wear is leader of the Minor Element Research Project in the Department of Agronomy and Soils, Alabama Polytechnic Institute. He has headed this work since 1949. Native of Alabama, he earned his B.S. and M.S. at Alabama Polytechnic Institute, his Ph.D. from Purdue.

By
John I. Wear

•

And
W. A. Johnson

In recent tests, per acre yields have been upped 1,000 pounds by certain nitrogen treatment, 960 pounds by certain potassium treatment, 487 pounds by certain phosphorus treatment.

ON MARKETABLE POTATOES

ing.

In the past, most of the fertilizer was applied in one application. In recent years, farmers have changed to a *split application* of approximately *two thirds at planting time* and *one third one month later*. The average fertilizer application is approximately *2,500 pounds per acre.*

Experiments were conducted at 11 locations over a 3-year period to obtain information on such fertilizer practices at time of application of N, P_2O_5, and K_2O; and magnesium and minor elements as supplements.

In 1952, a series of five field tests

Alabama
Agriculture Experiment Station

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Auburn
Alabama

W. A. Johnson, a native of Alabama, is Assistant Horticulturist at Alabama Polytechnic Institute. He is doing important research in vegetable production there. He earned his B.S. and M.S. degrees there and has been associated with the Horticulture Department since 1937.

were located on representative soil types in the potato growing areas of Baldwin County. Yields for the initial application and for additional side applications of N, P_2O_5, and K_2O are presented in Table 1.

The base rate of fertilizer produced an average yield of 7,312 pounds per acre of No. 1 potatoes. The base rate plus 32 pounds of N as a side application *increased the average yield 1,000 pounds;* an addition of 56 pounds of K_2O in the side application *increased the average yield 960 pounds;* and an addition of 80 pounds of P_2O_5 *increased it 497 pounds.*

Soil tests for the five locations prior to establishing the tests showed all soils to be high in P_2O_5. Two of the soils tested medium for K_2O and three tested low for K_2O.

The second series of tests was conducted the following year at three locations. An average yield of 10,720 pounds of No. 1 potatoes was produced where 1,000 pounds of 4-12-12 were applied at time of planting. A side application of 64 pounds of N gave an average increase of 2,640 pounds of potatoes. No increase was obtained for the side application of P_2O_5 plus K_2O. The soils tested high for P_2O_5 and medium for K_2O.

For the three tests conducted the third year, 9,360 pounds of No. 1 potatoes were produced with 1,000 pounds per acre of 4-12-12 at planting plus 64 pounds of N as a side application. An additional average increase of 683 pounds of potatoes was obtained when 64 pounds of P_2O_5 and 64 pounds of K_2O were added to the side application. Soil tests for these areas showed one high and two medium for P_2O_5 and one high and two low for K_2O.

Soil tests were made for each area prior to establishing the test. Results are given in Table 2. A relationship between initial fertility level of P_2O_5 and K_2O and high yields is evident. Tests with high initial P_2O_5 and medium K_2O content consistently produced high yields.

Lowest yields were obtained when the initial soil test for K_2O was low. When adequate amounts of phosphorus and potassium are added to the soil over a period of years, a thorough distribution of these elements is effected throughout the root zone. This distribution is not accom-

Table 1. Yields of No. 1 Potatoes from Different Fertilizer Practices

	Fertilizer applied per acre			Average yield no. 1 potatoes per acre
	At time of planting Pounds		Side application [1] Pounds	Pounds
1952				Average yield for 5 locations
1.	1800	4–10–7	None	7,312
2.	1800	4–10–7	32 N	8,312
3.	1800	4–10–7	32 N, 56 K_2O	9,272
4.	1800	4–10–7	32 N, 56 K_2O, 80 P_2O_5	9,769
1953				Average yield for 3 locations
1.	1000	4–12–12	None	10,720
2.	1000	4–12–12	64 N	13,360
3.	1000	4–12–12	64 N, 64 K_2O	12,839
4.	1000	4–12–12	64 N, 64 K_2O, 64 P_2O_5	12,887
1954				Average yield for 3 locations
1.	1000	4–12–12	64 N	9,360
2.	1000	4–12–12	64 N, 64 K_2O, 64 P_2O_5	10,043

[1] Side applications made 1 month after planting potatoes.

Table 2. Available Phosphorus and Potassium Content of Soils with Yields of No. 1 Potatoes from Standard Fertilizer Treatment.[2]

Soil type	Soil test [1]		Yield of no. 1 potatoes
	Available P_2O_5 Pounds	Available K_2O Pounds	Pounds
Norfolk sl	286 (High)	76 (Low)	7,759
Norfolk sl	177 (High)	192 (Medium)	13,361
Norfolk fsl	229 (High)	110 (Medium)	11,201
Malborough vfsl	220 (High)	62 (Low)	7,721
Ruston vfsl	252 (High)	76 (Low)	8,801
Malborough vfsl	220 (High)	140 (Medium)	9,900 [3]
Norfolk sl	177 (High)	192 (Medium)	17,721
Faceville fsl	183 (High)	128 (Medium)	11,040
Faceville vfsl	351 (High)	248 (High)	14,760
Malborough sl	99 (Medium)	68 (Low)	9,540
Ruston ls	121 (Medium)	51 (Low)	5,830

[1] Determined by Soil Testing Laboratory at Auburn. Samples were taken before fertilizer was applied and crops planted.

[2] Standard treatment 1st. year consisted of an application of 1,800 pounds of 4–10–7 at time of planting and 800 pounds per acre to side; for 2nd. and 3rd. year it consisted of 1,000 pounds of 4–12–12 at time of planting and 800 pounds per acre of an 8–8–8 to side after plants were up to stand.

[3] Potatotes in this field were planted 3 weeks later than potatoes in other tests and harvested at the same time as other tests were harvested: therefore shorter growing period had some effect on yields.

plished in one year's application.

Out of a total of 11 tests conducted during the 3-year period, ten resulted in higher yields from use of 40 pounds of MgO per acre. The average increase in yield on seven coarse-textured soils was 1,090 pounds and from four medium-textured soils the increase was 486 pounds.

No increases were obtained from an application of a minor element mixture consisting of borax, zinc sulfate, manganese sulfate, copper sulfate, and sodium molybdate. ◄◄◄

HIGH SPEEDS AFFECT STANDS

Michigan research workers have shown the effect of high speeds in reducing corn stands (right). This may be due to a number of factors—cracking of the seed, excessive turbulence in the seed box with seeds not dropping into cells in planter plates, or drawing the fertilizer back around the seed with subsequent damage to corn stands. *Full stands are essential for top yields.*

Planting Speed Miles per hour	Corn Population Plants per acre
1	14,860
2	14,575
3	14,460
4	13,700
5	12,880

(From "Corn planting speed and its effect on planter operation," Michigan State University release).

MAKING SOIL TEST

By Orlo L. Musgrave **Soil Testing Director**

Regulating the nutrient supply in soils has been a problem of major importance for those concerned with *efficient* crop production.

Concepts on liming and fertilizing soils are undergoing rapid changes as we move from ordinary levels of production to the ever higher acre yields required by the economics of modern farming.

Many outstanding farmers are now thinking in terms of *100 bushels* of corn or oats, *40 to 50 bushels* of wheat or soybeans, *500 bushels* of potatoes, *5 tons* of alfalfa, *20 tons* of tomatoes or sugar beets, *10,000 pounds* of milk, and *400 pounds* of beef per acre annually.

In favorable locations some farmers aspire to, and occasionally achieve, *twice these levels and more.*

Importance of Maintaining a Desirable Soil Reaction

The starting point toward increasing acre yields or improving crop production efficiency in humid climates is to adjust the soil reaction by liming the normally acid soil to the point where as many of the essential nutrient elements as possible are kept in a relatively high state of availability.

Liming an acid soil puts new life into the microbial population. It aids in getting rid of toxic organic and inorganic substances and helps to re-

RECOMMENDATIONS IN OHIO...

WHERE recommendations are geared to develop nutrient levels far above average crop yields—toward 100 bushels per acre corn and correspondingly high yields of other field crops generally grown.

WHERE soil test summaries show Ohio farmers are using only 50% of the nitrogen, 40% of the phosphorus, and 50% of the potash that their crops actually need.

WHERE official agriculture emphasizes a soil fertility program for the farmer's entire crop rotation pattern, instead of fertilizer recommendations for only a specific crop or just the next crop to be grown.

Ohio State University

lease nitrogen and other nutrient elements from the soil organic matter. It helps maintain applied soluble phosphate in a more readily available state.

In addition, liming materials supply calcium and magnesium which are essential to plant growth. *The soil test is an invaluable aid for the farmer in determining the lime need of his soil.*

Determining Soil Nutrient Status

The current fertility status of a soil can best be determined by a soil testing procedure.

While soil test results do not give absolute values, they do help us characterize the relative level of a nutrient in the soil and classify that level as low, medium, or high in comparison with similar soils of *known* productive capacity.

The soil test, then, is actually *a guide for using fertilizer in any pro-*

Dr. Orlo L. Musgrave, extension agronomist and director of soil testing at Ohio State University, is a native of Ohio. He earned his BS, MS, and PhD from there, and served as a county agent for 10 years before joining Extension.

gram of soil management. Several thousand Ohio farmers use soil tests each year to evaluate and guide their lime and fertilizer practices.

For optimum results, your fertilization program should supply nutrients to balance the soil nutrient supply, in order to get maximum or near maximum net return.

A well-balanced soil fertility program involves two definite stages: (1) building up the soil to a reasonably high level of production and (2) maintaining it in a fertile condition after a high level of fertility is reached.

Three Approaches to Phosphate and Potash Fertilization

Maintaining soil fertility at medium or higher levels is a desirable long-term soil fertility program. It sets the stage for high yields and the use of labor saving practices in fertilizer usage.

Continued high crop yields are most certain when soils contain *abundant, well-balanced supplies of available phosphate and potash.*

When the soil does not furnish adequate quantities of phosphate and/or potassium necessary for normal development of plants, several steps may be taken to supply these nutrients.

1. One approach, sometimes called the *soil fertilization method*, is to apply nutrients in sufficient quantity to build up the soil fertility level to the point where acre yields are dependably high. When this has been accomplished, these elements are then applied on a maintenance basis to take care of *crop removal, fixation*, and losses by *leaching* and *erosion*. With this procedure in some soils, certain amounts of phosphorus and/or potassium will be fixed. This method may also lead toward luxury consumption of potassium by legume crops.

2. Another approach, often called the *crop fertilization method*, is to gear the fertilization practice to meet the needs of the specific crop through localized or placed fertilizer. Placement refers to *time of application* in the rotation as well as *placement in the soil* with respect to the plant roots. With band placement of fertilizers, only a small portion of the root system is exposed to a high level nutrient supply. This approach gets as much of the current year's application used as possible. On soils testing low in phosphorus and/or potassium, sufficient quantities of nutrients for optimum yield of row crops cannot be safely applied with planter fertilizer attachments in all instances.

3. A third approach is a *combination of the soil and crop fertilization systems.* In this case, amounts of phosphate and potash in excess of plant requirements are applied where needed. The idea is to supply sufficient nutrients for good crop yields and add extra nutrients for the gradual build-up of the fertility level in soils, *both at the same time.* Proper fertilizer placement is employed for the row crops and extra amounts are applied at other points in the crop rotation to accomplish the build-up of soil nutrients.

Yield Level and Nutrient Removal

The combination of crop and soil fertilization more nearly describes the system used in Ohio for fertilizer recommendations based on soil tests.

For soils having *average or above* potential production capacity, the fertilizer recommendations are designed to supply sufficient nutrients for approximately *100 bushels of corn, 40 bushels of wheat, 35 bushels of soybeans, and 4 tons of hay per acre.*

For such yields, the average *annual nutrient removal* by the crops would approximate *30 pounds of phosphate* (P_2O_5) and *50 pounds of potash* (K_2O) *per acre,* especially when careful residue management is practiced. In using these values, we assume *crop residues* will be *returned* to the soil.

Though specific fertilizer recommendations are given for each crop, the more important phase concerns

Table 1—Phosphate and Potash Recommendations According to Soil Test Level

Soil Test Level	Average Annual Application In a Corn–Soybean–Wheat–Hay Rotation	Comments
Low	60–70 lb. P_2O_5 and/or K_2O	Sufficient to produce above average yield and to provide extra nutrients for build-up.
Medium	40–50 lb. P_2O_5 and/or K_2O	About 1½ times the phosphate removal and approximate maintenance for potash.
High	20–30 lb. P_2O_5 and/or K_2O	Similar in amount to phosphate removal and considerably below potash removal.*

* Ohio soils testing high in exchangeable potassium usually have a high annual potassium release from the native form in the soil. Consequently, less potash than is removed by crops is suggested.

the over-all or total fertility recommendations for the entire crop rotation. Soil test recommendations in Ohio are specially designed with this in mind. The facts in Table 1 show the average annual application of phosphate and/or potash suggested at the various soil test levels.

Nitrogen Fertilization

The method we use for nitrogen recommendations is considerably different from the one we use for phosphorus and potassium. Nitrogen does not accumulate in the soil to any extent. Recommendations therefore are made from year to year and are influenced largely by the *rotation employed, texture and organic matter content* of the soil.

A small amount of nitrogen is important in early plant growth. Consequently, a small amount of nitrogen is included in the complete fertilizer suggested for corn, small grain, and certain other row crops.

In addition to the nitrogen in the starter or complete fertilizer, supplemental nitrogen is recommended for corn, as shown at the bottom of Table 2.

To establish the soil nitrogen rating, the soils are classified in a general way into two groups *according to their ability to release nitrogen.*

Sandy, silt loam, and clay soils with less than 1.5%, 2.5%, and 3.5% organic matter respectively, are rated as low in nitrogen.

Soils exceeding this amount of organic matter in each textural class are rated as high in nitrogen.

Nutrients and Fertilizer Ratios Suggested According to Soil Test Levels

Based on the procedure described (in Table 1) for interpreting soil test results, a system for suggesting ratios and amounts of nutrients at *each of three soil test levels of phosphorus and potassium* is shown in Table 2. The nitrogen represents the amount that would be included in a complete fertilizer.

After suggesting the amount of nutrients according to the soil test level shown in Table 2, we then suggest the average amount of phosphate and potash shown in Table 1 will serve most crop rotation patterns.

These recommendations *are not inflexible* and are meant *only as a guide,* showing one procedure for the farmer to follow. Alternative plans are also given the farmer to guide his soil fertility program.

For example, a larger amount of the nutrients recommended may be applied in one application, then the fertilizer applied at planting time reduced accordingly. Thus, over the period of a crop rotation, a similar amount of

Table 2—Pounds per acre of N, P_2O_5 and K_2O and Ratios of Fertilizer Suggested for Major Field Crops at Each of the three Soil Test Levels

Crop	Phosphorus	Potassium		
		Low	Medium	High
Corn	Low	*12–48–48 **1–4–4	12–48–24 1–4–2	12–48–24 1–4–2
	Medium	12–48–48 1–4–4	12–48–48 1–4–4	12–48–24 1–4–2
	High	9–27–54 1–3–6	8–25–50 1–3–6	15–30–30 1–2–2
Small Grain (seeded)	Low	18–72–72 1–4–4	18–72–36 1–4–2	18–72–36 1–4–2
	Medium	18–72–72 1–4–4	16–64–64 1–4–4	16–64–32 1–4–2
	High	12–36–72 1–3–6	10.5–31.5–63 1–3–6	15–30–30 1–2–2
Meadow	Low	0–70–70 0–1–1	0–70–70 0–1–1	0–70–0 0–1–0
	Medium	0–0–75 0–0–1	0–40–40 0–1–1	0–40–20 0–2–1
	High	0–0–60 0–0–1	0–12.5–37.5 0–1–3	0–30–30 0–1–1
Soybeans	Low	0–40–40 0–1–1	0–40–20 0–2–1	0–40–0 0–1–0
	Medium	0–40–40 0–1–1	0–20–20 0–1–1	0–20–0 0–1–0
	High	0–20–60 0–1–3	0–10–30 0–1–3	None

In addition to the nitrogen in the mixed fertilizer, extra nitrogen is recommended as follows:

Corn following legume, low nitrogen rating soil.......... 30 lb. N/A
Corn following non-legume, high nitrogen rating soil.......... 60 lb. N/A
Corn following non-legume, low nitrogen rating soil.......... 90 lb. N/A

* Pounds of nitrogen, phosphate, and potash ($N–P_2O_5–K_2O$) per acre.
** Ratio of fertilizer.

nutrients would be applied, regardless of the procedure followed.

As indicated in Table 2, phosphorus and potassium test results are classified into three categories (*low*, *medium*, or *high*).

The nitrogen recommendations are divided into two categories (*low* or *high*).

Thus, a total of eighteen different combinations of recommendations are possible. To facilitate the making of recommendations, we have devised a special coded system, using a total of eighteen codes. Each code lists all the common field crops grown in Ohio and along with each crop the suggested grade and amount of fertilizer and total pounds of N, P_2O_5 and K_2O for that particular combination of soil test results.

While such a system means little to the person having his soil tested, it serves the laboratory well by combining some of our basic principles of soil test interpretation into an easily workable system. Such a device *speeds up* recommendations—a very important factor where thousands of samples are tested each year.

Relationship Between Nutrients Recommended and Used

The amount of nitrogen, phosphate, and potash currently used in Ohio each year falls far short of the amount our soil tests say should be used.

Using our present system of interpreting soil test results to suggest remedial treatment and the fertility levels shown by soil test summary together with cropland acres as reported by the 1954 Census of Agriculture, we calculated the amount of nutrients that would be suggested on the basis of soil tests.

The present nitrogen, phosphate, and potash usage is approximately 50%, 40% and 50% respectively of the amount recommended on the basis of soil tests.

Although there has been a general increase in plant nutrient usage in recent years, these calculations reveal still *a great potential yet to be reached on Ohio farms.*

SUMMARY

1. We use a combination of fertilizing the crop by proper placement of the fertilizer and fertilizing the soil to bring our soil nutrient supply more nearly into balance.

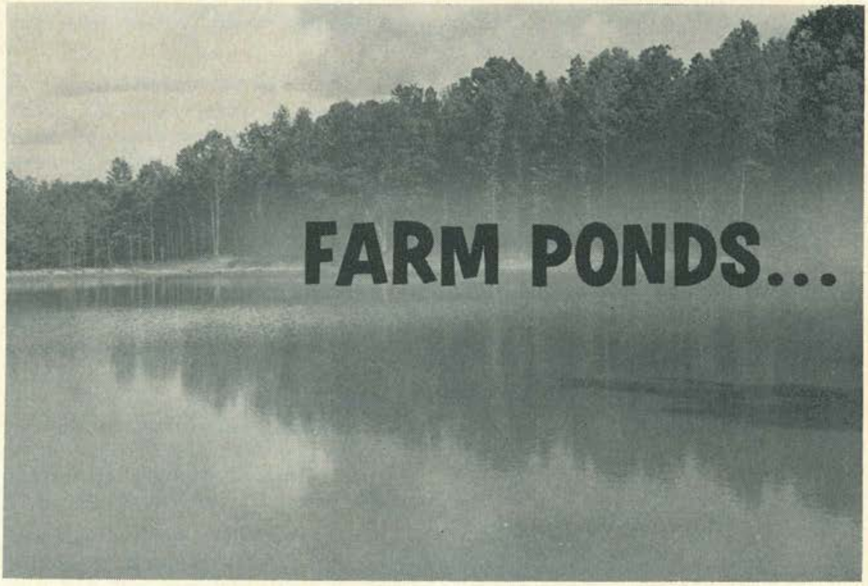
2. Our recommendations are geared to develop nutrient levels considerably *above average* crop yields. We make fertility recommendations for 100 bushels per acre of corn and correspondingly high yields of other field crops generally grown.

3. We emphasize a soil fertility program for the farmer's *entire cropping pattern*, rather than a fertilizer recommendation for only a specific crop or just the next crop to be grown. This gives the farmer considerable flexibility in selecting the nutrients and materials to use in his over-all fertility program.

4. At the low or medium soil test levels, we suggest sufficient nutrients to produce good yields and at the same time provide *a surplus for gradual soil build-up.* Thus, after a period of one or two crop rotations, the soil fertility level will be sufficiently high to support high crop yields through a maintenance fertility program. For farmers interested in adjusting nutrient unbalances more rapidly, alternative suggestions include larger amounts of nutrients for the initial build-up.

5. We devised a system employing different combinations of recommendations for each of the eighteen different soil test levels. Phosphorus and potassium are classified into three categories (*low*, *medium*, or *high*). The soils are rated in two categories for nitrogen (*low* or *high*).

6. Our latest soil test summary revealed that we are using about 50% of the nitrogen, 40% of the phosphate, and 50% of the potash that our Ohio soils actually need. ◄◄◄



This pond on the farm of Don Bishop is one of the 400 in the Greenwood County Soil Conservation District of South Carolina. Bishop followed SCS recommendations in building, stocking, fertilizing, and managing this pond.

By J. B. Earle — **Soil Conservation Service**

THE Southeastern States are full of farm ponds. And these ponds are full of fish.

According to Soil Conservation Service reports, there are more than 250,000 ponds in nine of these states: In Virginia, 16,519; Tennessee, 41,208; Mississippi, 57,795; North Carolina, 38,871; Georgia, 21,905; Alabama, 15,706; South Carolina, 17,800; Kentucky, 56,627; and Florida, 2,468.

Wherever you ride in these states you see farm ponds. They dot the countryside on the highways and byways. Some of the ponds were made by building dams, others are dug pits.

They are built for stock watering, irrigation, recreation, fish production, and flood prevention.

Most of them were surveyed and designed by Soil Conservation Service technicians. Many of them, which are being used for irrigation or stock-watering, were built with Agricultural Conservation Program cost-sharing help.

Most of the ponds are stocked with fish. Fertilized ponds receive 1,000 bluegills and 100 bass per surface acre of water. Unfertilized ponds receive half this number of each species. These fish are furnished by the U. S. Fish and Wildlife Service.

Fertilizer helps the growth of plankton (single cell algae-microscopic plants). This plankton is the pasture for insect larvae. The larvae feed bluegills and the little bluegills are eaten by the bass.

The water plants must be fertilized

. . . For Fish

. . . For Irrigation

. . . For Flood Control

Archie Wayne Davis smiles at the pay off—big beauties just caught. The pond is on David Dows' Green Pastures farm in the Greenwood SCD.

Columbia, S. C.

just as plants growing in soil. The amount required per acre is about comparable to properly fertilized and managed pastures in the Southeast.

Fish Production

"The yield of catchable fish from an *unfertilized pond will* probably be about *15 to 30 pounds per acre* as compared to about *150 to 200 pounds* of catchable fish per acre from a *fertilized pond*," says W. W. Neely, SCS Biologist of Walterboro, S. C.

"It is easy to have a good fish pond but just as easy to have a poor one," he says. To develop a good pond, Neely recommends the following pointers:

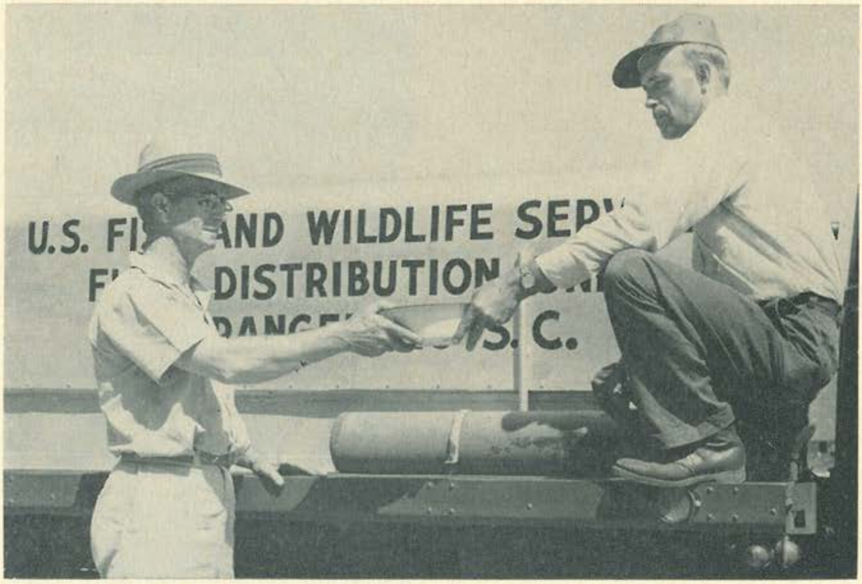
"(1) *Pick the right kind of location.* The site should be in a watershed protected from excessive erosion to avoid muddy ponds and undue siltation. The amount of water flowing through the pond should not be too great to permit practical fertilization.

"(2) *Clear the basin of all trees and shrubs.* Proper management of the pond demands this.

"(3) *Get rid of all wild fish.* Rotenone should be applied to springs and runs above the dam to remove wild fish and prevent later troubles.

"(4) *Stock only with bluegills and bass.* Fingerling creek fish or even a few adults cause later regrets.

"(5) *Plan to keep the pond well fertilized.* Start fertilizing in the spring when the water begins to get warm—late February or early March. This is when the bluegills begin to grow, and they need ample food supply to grow big. Fertilizers just for



Ponds are stocked with bluegills and bass furnished by the U. S. Fish and Wildlife Service. Here W. C. Highsmith, left, a cooperator with the Greenwood SCD, receives the right number of bass from Linwood Carter. These bass are for a pond stocked with bluegills six months earlier. New ponds are stocked with bluegills in the fall and with bass the following spring.

ponds are available in many communities. They are usually 8-8-2 or 8-8-4 or 20-20-5. Use 100 pounds of 8-8-2 or 8-8-4 per surface acre of pond water at each application. Use 40 pounds of 20-20-5. Most pond owners prefer the high analysis 20-20-5 as it is easier to apply and is completely water-soluble. The fertilizer should be applied in the shallow water—less than five feet deep.

"Weekly applications of fertilizer should be made until the water becomes so dark a white object can't be seen 12 to 14 inches under the water. Each time the water gets clear enough thereafter for a white object to be seen at this depth under the water an additional application of fertilizer should be made.

"A fertilized pond will support 400 to 500 pounds of fish per acre as compared to 100 to 150 pounds for an unfertilized pond. This is as many pounds of fish per acre of fertilized water as a good pasture will produce of beef. Thus, when we conserve water in a farm pond or soil beneath a pasture sod, we are producing an abundance of high quality food at the same time.

"The growth of plankton resulting from the fertilization makes good fishing. It also shades out waterweeds by darkening the water and thus cutting out the light from the waterweeds.

"A pond will support a certain amount of fish in pounds. This poundage can be thousands of fish too small for use or a smaller number of larger and more usable fish depending on how the pond is fertilized and managed. Fish from an unfertilized pond may well cost about $1.60 per pound as compared to less than 30 cents per pound in a properly fertilized and managed pond.

"(6) *Don't fish the pond for the first year.* Wait until the bass have spawned before fishing.

"(7) *Prevent or control waterweeds.* Waterweeds interfere with fishing. Some kinds give fish an unpleasant taste. They also clog irrigation pumps and sprinklers. They also cause the pond balance to become upset by protecting the bluegills from the bass. This results in poor fishing.

"Prevent waterweed troubles by: (a) Clearing the pond basin of trees and shrubs. (b) Keeping the pond properly fertilized. (c) Deepening the edges of the pond to eliminate shallow water. (d) Pulling up cattails and lilies when they first appear."

Water for Irrigation

The first step in irrigation is to provide a supply of water. In many cases, this source is farm ponds. Hundreds of irrigation reservoirs have been built to store water for use in irrigating peaches and other crops. There are also thousands of dug pits in the coastal plain area which store water for use in irrigating tobacco, truck crops, and other crops.

For example, according to the 1950 Census there were 6,408 acres of irrigated land in farms in South Carolina. SCS reports now indicate that more than 60,000 acres of crop land have been irrigated—a tenfold increase since 1950.

Ponds for Flood Prevention

Not only are "Conservation Farmers" in South Carolina and elsewhere storing water for irrigation, stock watering, and fish production but they are storing water for flood prevention also.

On the farm of Sam and Juan Fowler, and their brother-in-law, A. L. Waldin, in the Mountain Rest Community of the Oconee Soil Conservation District of South Carolina, their dam provides for space to store flood water also. The dam was built six feet higher to provide enough flood storage space to hold two inches of run-off in six hours from the entire 80 acres in the watershed.

This means flood storage is provided for what the engineers call a 25-year rain. This is the kind we would normally expect to get on the average of once in 25 years.

Since the extra flood storage gives reasonable protection to the bottom land below the dam, these farmers plan to grow corn there and irrigate it.

Including flood storage in a farm pond is new to South Carolina farmers. SCS technicians believe that other farmers will follow suit and provide flood storage space in more and more farm ponds in this state.

Farmers obviously get more good from their ponds when they put them to several uses. When ponds are mentioned, many people think only of fish. Farm ponds are certainly good for fish, as pictures with this story show, but they also have many other uses.

Ponds not only have a "coat of many colors" when the sun shines on them, but they contain *water for many uses.* ◄◄◄

FOR BUILDING MOISTURE RESERVES

SOILS that are in top physical shape, with good structure and drainage will store up more water from fall rains and winter snows, according to Midwestern agronomists. These specialists say that fall and winter are the most favorable seasons for building up moisture reserves in the subsoil.

Summer rains don't add much to the soil's moisture reserves, because during these months there is actually a net loss of moisture from growing crops, evaporation and minor losses.

UNIQUE PLOTS ON GRASSES AND LEGUMES

Scattered throughout Vermont are more than a dozen grass and legume demonstration experimental plots planted this spring.

Winston Way, Vermont extension agronomist, reports that plans call for conducting more than 20 plots on farms. They will be in every county.

Designed to demonstrate effective management of a single crop, these plots feature pure stands of five legumes and four grasses.

The legumes are: hybrid trefoil, Mansfield trefoil, Empire trefoil, Narragansett alfalfa and Pennscott red clover.

The grasses are: lincoln brome, S-37 orchard, climax timothy and reed canary.

Way reports there are several reasons for establishing these unique plots:

(1) They will have both demonstration and research value.

(2) Principles of band seeding, using a five-row grain drill converted with garden hose, will be demonstrated.

(3) Plots will show that when adequately limed and fertilized, alfalfa and trefoil can grow in many areas.

(4) Legumes in these plots will be demonstrated as preferable to short-lived red clover.

(5) *Potash will be shown as the key to long-lived legumes.*

(6) Demonstrations will show that if a farmer is going to grow grass, it pays to use far more nitrogen than felt practical in the past.

(7) The plots will also demonstrate the vast difference in effective management for the trefoil varieties.

Being tried experimentally for the first time is hybrid trefoil seed developed by Dr. Alexander Gershoy of the Vermont Agricultural Experiment Station. With only small amounts available to be tried, this seed is worth several hundred dollars a pound.

Next year grasses will be compared using three levels of nitrogen. One third will receive double the recommended level, another the recommended and the other half.

Legumes will be compared under the same ratios of potash.

This year dalapon will be used on some plots to demonstrate control of grassy weeds in legumes.

On grasses, 2, 4-D may be used to control broadleafed weeds.

FERTILE FACTS

VIA BROCHURES · REPRINTS · HANDBOOKS

The following article reprints on profitable soil and crop management are available on request. Please indicate the reprint code and the number you desire. The address is: American Potash Institute, 1102 16th Street, N. W., Washington 6, D. C.

SOIL AND PLANT ANALYSIS

- I-4-56 Surveying Corn Fields by Tissue Tests
- L-5-56 Give Your Plants a Blood Test—Guide to Quick Tissue Tests
- O-6-56 Plant Analysis As a Guide to Fertilization of Crops
- Y-12-56 Leaf Analysis, A Potential Forestry Tool
- P-8-57 Soil Tests Spotlight Turf Needs

FORAGE CROPS

- Q-8-57 Georgia Grazing System and Feed Production Program
- R-8-57 Increase Ladino Clover by Timing Your Potash Use
- B-1-58 Growing Good Stands of Alfalfa on Low Fertility Soils
- O-4-58 Potash, Key to Alfalfa Yields
- P-4-58 On the Farm Research

FIELD CROPS

- G-2-55 Seven Steps to Good Cotton
- L-3-55 Soybean Production in the Southern States
- C-1-56 A Successful Corn Crop on the Same Land Every Year Is a Possibility
- M-5-56 The Placement of Fertilizer for Peanuts
- N-5-56 Fertilizer Placement for Corn in Minnesota

VEGETABLE CROPS

- SS-11-54 Foliar Application of Plant Nutrients to Vegetable Crops
- V-4-55 Planned Nutrition for Canning Tomatoes
- M-5-57 Building Tomato Yields Through Deep-rooted Legumes and Fertilizer Treatment
- N-4-58 Vegetable Fertilization

FRUIT AND NUT CROPS

- P-3-55 N-P-K for Deciduous Fruit Trees
- X-5-55 What Is Happening to Our Citrus Soils?
- EE-10-55 Fertilizing for Better Apples
- B-1-56 Certain Practices Are Important for Successful Pecan Production

SOILS AND FERTILIZER—GENERAL

- HH-10-55 Fertilizers Will Cut Production Costs
- G-2-56 Plant-Food Content of Crops—Guide to Rotation Fertilization
- H-3-56 The Application of Fertilizers in Irrigation Waters
- C-2-57 Potash Fertilizers & Their Behavior
- H-3-57 Lime . . . Its Placement & Penetration in Soils
- O-6-57 Fertilizer Placement

GENERAL

- K-4-56 The Value of Green Manure Crops in Farm Practice
- A-1-57 Long-Range Outlook for Agriculture . . . GOOD!
- N-5-57 Growing Azaleas and Camellias—Glory of Spring
- A-1-58 Make Agronomy Your Career
- C-1-58 Potassium, Its Functions and Availability as a Major Plant Food
- Q-5-58 Hidden Hunger
- R-6-58 Irrigation Moves East
- S-6-58 The Fate of Nitrogen, Phosphorus, & Potassium
- T-6-58 Successful Crop Production Depends on Potash
- U-6-58 Band Seed Alfalfa In The Summer
- V-6-58 Balanced Fertilization First Step to Efficient Production

REVIEWS

August-September, 1958

Recent publications of the United States Department of Agriculture, The State Experiment Stations, and Canada on Fertilizers, Soils and Crops. Requests for publications listed should be made directly to the original source.

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"Strawberry Varieties in the United States," USDA, Wash., D. C., Farmers' Bulletin 1043, Rev. Feb. 1958, G. M. Darrow, D. H. Scott, and G. F. Waldo.

ABSTRACTS

The American Potash Institute issues a regular abstracts service, summarizing important findings on the role of potash in good soil management and balanced soil fertility. These abstracts, issued 6 times a year, are available on request to professional agricultural workers of the U.S. and Canada. The summaries below illustrate the style in which the abstracts are prepared. For this free service, write: Abstracts, 1102 16th St., N. W., Washington 6, D. C.

Potash Key to Alfalfa Yields

Gerwig, J. L.

Potash key to alfalfa yields. N. J. Agr. Exp. Sta., New Jersey Agriculture 39 (5):15-16. Sept.-Oct. 1957.

Potash is the key to high yields and long life of alfalfa stands in New Jersey. This was concluded from a 5-year study conducted at Rutgers Univ., which included fertilizer treatments of 0-200 lb. N, 0-400 lb. P_2O_5 and 0-400 lb. K_2O in various combinations. Increases in yield and in number of plants per square foot were recorded with each increment of K_2O applied up to the 200 lb. level. Higher rates were not beneficial. Potassium deficiency decreased the stand by as much as 98% on those areas receiving no K during the 5-year study. Similar observations have been made throughout the state, and the use of higher rates of K than were previously thought to be needed is being encouraged.

Fertilizers Affect Oat Lodging

Casserly, L. M.

The effect of nitrogen phosphorus and potassium on lodging in oats. Canadian Jour. of Plant Sci. 37(3) :245-251. July 1957.

Studies under both greenhouse and field conditions have been conducted to determine the effects of N, P and K on lodging of oats. Resistance to lodging in oats is influenced to an important degree by the development of culm, Coronal root system, and plant height. Effects of N, P and K on the 3 characters were measured and combined into single lodging index value in order to determine the complete effect of treatment on lodging. Potassium, alone, improved lodging resistance but was not effective when applied with either P or N. There greatest resistance to lodging was provided by a combination of N, P and K.

FERTILEGRAMS

Corn belt farmers who are high-level users of fertilizer make an average gross income of $67 per acre annually, compared with $42 for non-users and the national average of $46 for all U. S. farmers.

Sixty-four per cent of farmers using fertilizer report they have had their soil tested, compared with 32 per cent for non-users.

About half of those who failed to have tests made blamed their own negligence.

The profit in soil testing is easy to prove. According to Dr. Mervin Smith, Ohio State farm economist, putting on needed extra fertilizer can result in $3.75 worth of increased value in a corn crop for each dollar you spend.

~

***Fertilizer Helps Even Rich Soil* —It isn't always wasteful to fertilize land that will yield more than 100 bushels of corn per acre without fertilizer, according to research by A. C. Caldwell, soils scientist, and John Thompson, agronomist, of the University of Minnesota.**

Tests showed applying fertilizer on land that produced 138 bushels could still boost yields by 21 bushels, to 159 per acre. Fertilizer cost was $12 and yield increase was worth about $25, resulting in a net gain in profit of $13 per acre.

~

To stimulate greater growth after the first cutting of hay or after the first heavy grazing, Les Smith, Purdue University extension agronomist, recommends applying *nitrogen* and *potash* to the pasture.

During early growth, grasses extract nitrogen from the soil and heavy spring rains leach nitrogen from the soil.

Smith says that by replenishing the soil with nitrogen—about 75 pounds per acre—the grasses will grow faster for the remaining summer months.

Using more nitrogen on a pasture stimulates the plants to use more potash. Therefore, pastures may become deficient in potash after a nitrogen application. Potash gives the plants quick growth and disease and insect resistance. Animals like the taste of plants with high potash content better than plants with low potash content.

Smith recommends that 75 pounds of potash be applied along with the 75 pounds of nitrogen. If this fertilizer is added after the first crop, the pasture will be much more productive for the rest of the growing season.

~

Potash treatments upped dollar-values considerably in burley tobacco tests conducted by Kentucky Experiment Station researchers on a high-phosphate soil.

The no-potash treatment was $50.30 a hundred pounds value; but a 375-pound potash treatment per acre upped the value to a flat $60 per hundred pounds.

Poundage yields also increased steadily as varied potash rates were made, the test showed, ranging from 1,597 pounds for the no-potash field to *2,003 pounds* for the 375-pound potash field. The test plot soil was *medium* in potash.

from Across the Land

FOR BETTER SOILS • FOR BETTER CROPS

Good yields of fall seeded crops, such as small grains, pasture, and alfalfa, may be expected provided *adequate amounts of fertilizer are used at seeding time,* University of Tennessee agronomists advise.

A soil test is the best guide to fertilizer needs. However, if no soil test has been made, general fertilizer recommendations may prove helpful.

For example, small grain seeded alone might be fertilized at the rate of 300 to 400 pounds per acre of 4-12-8 fertilizer. The top dressing in the spring might well be 30 to 40 pounds of nitrogen per acre.

Small grain with crimson clover, vetch, etc., might be fertilized with *6-12-12* at seeding, at the rate of 300 to 400 pounds per acre; and a spring top dressing of 30 to 40 pounds of nitrogen per acre.

A general recommendation for establishment of permanent pasture is *6-12-12, or 3-12-12,* at the rate of 800 to 1,000 pounds per acre.

Alfalfa establishment should have about *800 to 1,000 pounds per acre of 3-12-12, with borax at the rate of 20 to 25 pounds per acre.*

~

Fruit trees, vegetables, flowers, and ornamentals literally beg for plant food elements to get them off to a quick start each year, Louisiana State University Horticulturist John A. Cox contends.

Louisiana farmers who continue to use plenty of commercial fertilizer find this one of the *most economical steps* in producing horticultural crops. *Producing vegetables without commercial fertilizer is practically impossible,* he says.

Fruit trees should be fertilized in winter so as to permit the plant food elements to dissolve in soil water, be taken up by roots, and be available when plants begin to grow in spring.

~

Corn lodging and stalk breakage are hard to pin down to any single cause. Soil and weather conditions contribute to the trouble. University of Minnesota specialists suggest some more specific ailments:

1. Root and stalk rot. Fungus organisms called giverella and diplodia are the most important causes of root and stalk rot.

2. Corn borers, corn rootworms, wireworms, and other insects weaken stalks, cause them to break and drop the ear. Entrance made by insects opens a pathway for root and stalk-rot organisms.

3. Nutrient imbalance, *especially when potash is low,* encourages development of stalk rot. Applying nitrogen alone favors stalk rot.

4. Lodging increases when there are more than 18,000 plants per acre. High population results in taller, thinner plants more susceptible to breaking.

5. Varieties differ in their standing ability. Some plants apparently contain soluble substances which slow growth of some stalk-rotting fungi.

6. Spraying with 2,4-D sometimes causes brittleness for about 10 days after the treatment.

The bride of only a few months was at the airport to meet her husband when he returned from abroad. They were waiting for his luggage when he pointed out a good-looking stewardess from the plane, Miss Taylor.

"How do you happen to know her name?" she asked.

He explained that it was listed, together with the names of the pilot and co-pilot, on the door of the cockpit.

The wife's next question was a classic which he could not answer. "Dear," she asked, "what was the pilot's name?"

Unimportance is the sensation that comes when you make a mistake and nobody notices it.

Hostess: "I have a lonesome bachelor I'd like you girls to meet."

Athletic girl: "What can he do?"

Chorus girl: "How much money does he have?"

Society girl: "Who is his family?"

Religious girl: "To what church does he belong?"

Secretary: "Where is he?"

Whether a man winds up with a nest egg or a goose egg depends somewhat on the chick he married.

Utter confusion—four women with one luncheon check.

"It wasn't the Goths that defeated Rome—*it was the free circuses.*

"Luxuries, power, indulgence had made the once-tough Roman people soft. To stay popular, their emperors gave them more and more of the ease they craved—free bread, free circuses, easier living.

"So the Romans softened up themselves for the ambitious, hard-working barbarians. And in 410 A.D. the greatest nation the world had ever seen was invaded and destroyed.

"The greedy cry of 'something for nothing,' the stupid whine of 'somebody else should sacrifice, not me'—could do *exactly the same for this nation, NOW.*"

(Reprinted from a Warner & Swasey public service message appearing in a recent issue of *U. S. News & World Report.*)

It takes no high-powered scientists to explain—or figure out—the philosophy expressed by a hard-working Negro woman who was asked why she put up with her likable, but completely lazy, husband: "Well, I makes de living and he makes de living worth while."

Sign on winding highway: "These curves are different; they get more dangerous after you pass 65."

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