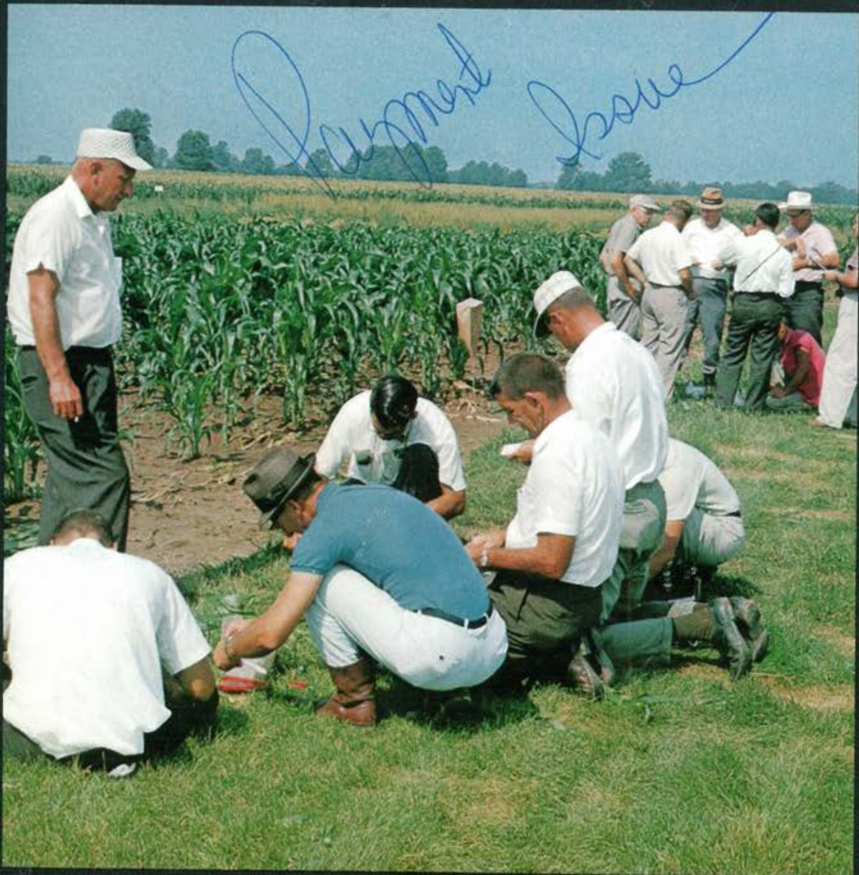
Better Crops
WITH PLANT FOOD

SPRING 1966 25 CENTS



HOW IS YOUR PLANT-SIDE MANNER?

. . . Page 20

CONTENTS

Better Crops WITH PLANT FOOD

The Whole Truth—Not Selected Truth

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THE COVER

The farmer's factory is his field. That's where his quality control, his mass production, his personnel problems, his economic life and blood flow—in his field!

He often faces far more problems (and risks) in his field than his city cousin faces in his factory, with its weather conditioning, its electronic controls, even its industrial psychologists to keep production lines "happy."

To keep his rows of crops "happy", the farmer needs all the help he can get from field diagnosticians: folks who can go to a trouble area and pinpoint the problem or call in someone who can.

Field diagnosis is both a science and an art, as portrayed in the new Potash Institute slide set, FIELD DIAGNOSIS and TISSUE TESTING. It is the science of trouble shooting—searching out the causes behind problem areas:

- **was the best variety grown?**
- **was it planted early enough?**
- **are the rows too wide, wasting sunlight?**
- **were enough seed planted?**
- **what about diseases and insects?**
- **were roots damaged from too deep cultivation?**
- **where was the fertilizer PLACED?**
- **is the crop running low on certain nutrients?**
- **what about lime needs?**

Field diagnosis is the art of communication—identifying and explaining the trouble in a way that convinces the grower to take steps that may prevent the trouble from showing up in next year's production.

The Potash Institute's new color slide set not only identifies many problems a field diagnostician might run up against, but it also gives steps to successful plant tissue testing in the field.

Turn to page 20 for the highlights from this new slide set and order it on page 40.

Fertilization insures bigger plants . . .

Steps To Top-Profit

BY J. W. (BILL) McKIE

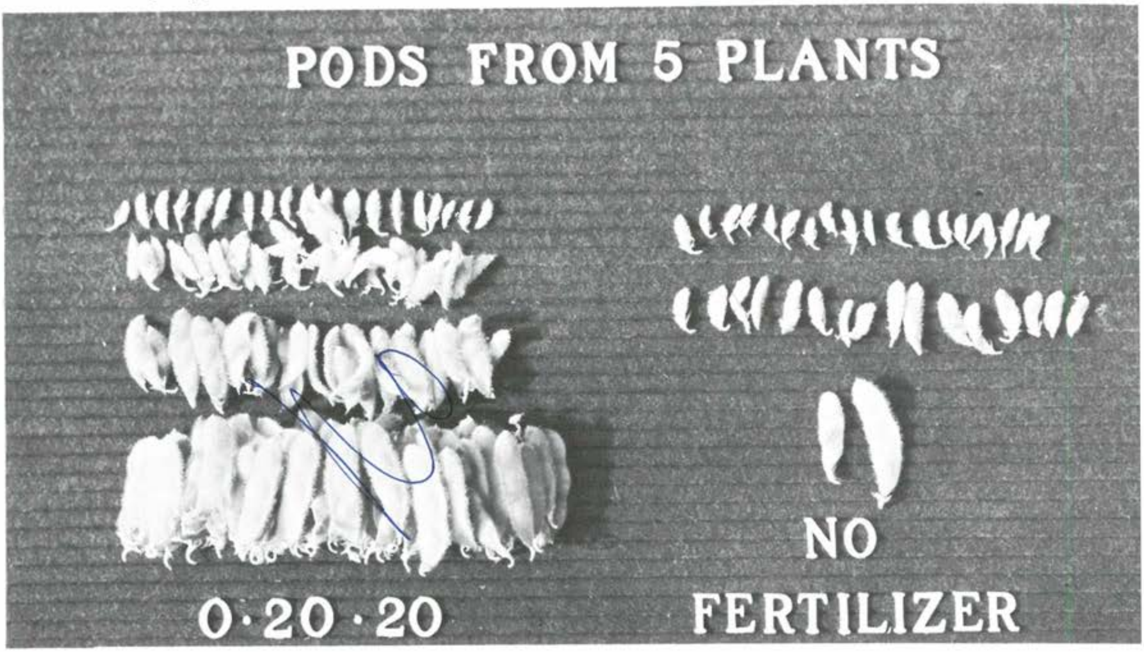
TO PRODUCE top-profit soybeans, study your management program, locate the weak spots and eliminate them. A well-managed, full-season production program is necessary to produce high yields—**and you cannot produce high profits without high yields.**

The "break-even" yield for Mississippi and many areas of the South is around 16 or 17 bushels per acre. Yet, many states do not average much more. Proper management brings twice or three times such yields. In Mississippi, a goal by 1975 is to raise state yields from the now 22 to a 30-bushel average.

A top profit soybean crop demands certain steps. The more important practices include these:

(1) CONTROL WEEDS

Weeds probably reduce soybean yields more than any other factor. They must be controlled to make the other practices pay off. The final yield is substantially affected by who



. . . more pods better filled.

SOYBEANS

MISSISSIPPI STATE UNIVERSITY

Rapid emergence of soybean seedlings and rapid early growth help control weeds. Soybeans planted in mid-April require 12 to 14 days to emerge because of low soil temperature. But plantings in May and June will emerge in 5 to 7 days if seed are placed in moist soil. When only conventional cultivation practices are used, it is important to get the soybean plants up and growing **ahead of the weeds.**

wins this battle, the farmer or the weeds.

Soybeans should not be planted until late spring or early summer in Mississippi, enabling you to use shallow preplanting cultivation to destroy weeds. By continuing this shallow cultivation on weed-infested fields, you can destroy several crops of germinating weeds before you plant.

For early-season weed control, use the rotary hoe as soon as the soybeans are up to a stand. The rotary hoe will do its best work when weeds are just breaking through the soil. To avoid injury, do not do it early in the morning when plants are brittle. The rotary hoe can be run every five days and discontinued when soybean plants have the third trifolium fully expanded.

When following conventional cultivation practices, set the cultivator to run as close to the seedling row as possible on the first cultivation. This will throw soil into the drill area and smother young weeds. Do not do this if pre-emergence chemicals were applied with satisfactory results. When using only conventional cultivation, do it shallow and only as often as required to control weeds.

Control early season problems such as crabgrass, bracharia, goosegrass, pigweed and annual morning glory with pre- and post-emergence chemical treatments. Use the chemicals recommended for your area.

(2) FERTILIZE AND LIME RIGHT

The soybean plant has created a mystery with its varied response to fertilizer. This plant can salvage and utilize residual plant nutrients available in the soil. And it will mine your soil!

On soils high in phosphorus and potassium, such mining may not cut yields for sometime—but on border line soils the plants may suffer from hidden hunger. **If you continue to draw plant food from a soil without replacing any, you may be headed for trouble.**

A soil test tells you where your soil fertility level stands. Lime is the first soil building practice, where needed—correcting soil acidity, increasing phosphorus availability, reducing potash leaching, improving yields. For maximum production, the soil pH should be from 6.0 to 6.5 with adequate amounts of phosphorus and potassium.

In the Mississippi Delta, soybeans grown on heavy clay soils usually do not need additional phosphorus and potassium. But this cannot be said for all clay soils. Soil tests reveal many cases where lime, phosphorus, and potassium are needed on loamy and sandy soils of the Delta area.

In the less fertile soils of the foothills and hill sections of the state, phosphorus and potassium are generally needed for top production. With no soil test, apply 40 pounds each of P_2O_5 and K_2O for average management. For higher management levels, apply 60 pounds each.

Remember, a pH of 6 or above makes phosphorus and potassium applications more profitable. On Mississippi hills soils with a pH of 4.8 to 5.0, 10 bushels per acre more can be obtained from two tons of lime alone. Lack of lime, phosphorus, or potassium can limit your soybean yields.

Phosphorus should be readily available to give germinating plants a fast start so they can get ahead of weeds and other hazards. Phosphorus should be banded near the seed, especially on low phosphorus soils. Deficiencies cause stunted growth and low yields.

Potassium is necessary for efficient soybean production. K-hungry plants show yellowing leaf edges cupped up until bloom time. Such plants will suffer delayed maturing, late defoliation, and low yields.

(3) PLANT QUALITY SEED

Quality seed get high yields. Poor quality or weed-infested seed may reduce your yields 5 to 10 bushels per acre. Plant 12 good seed per foot of row if seed have 90 per cent or better germination. More seed will be needed as germination percentage drops. So, know your seed to get proper planting rate. Avoid over-planting. Too many plants can cause lodging and excess competition for moisture, light, and plant nutrients. A moist, firm seed bed helps insure rapid germination and uniform stands.

(4) INOCULATE PROPERLY

Soybeans will produce their own

WEEDS OR SOYBEANS? Believe it or not, this is a soybean field paying the high price of weeds.

nitrogen if properly inoculated with nodule bacteria. Inoculate soybean seed if it has been more than five years since soybeans were grown on a field. When in doubt, inoculate. The cost is small. And it is better to inoculate than to take the chance.

(5) TREAT SEED WITH FUNGICIDE

Treating seed with arasan, captan, or spergon will usually improve stands. When it is necessary to inoculate, seed treatment is not recommended. As germination of seed goes down, the need for and value of seed treatment is greater. You must have a stand to produce a high-yield soybean crop.

(6) CONTROL INSECTS

Insects can play havoc in soybean fields. Check carefully for root, stem, and pod feeders. Your county agent has information about proper control measures.

(7) HARVEST EFFICIENTLY

Improper setting of harvesting equipment can leave 10 to 20 percent of the soybean crop in the field. Follow the manual closely in this practice. Harvest all the beans you grow.

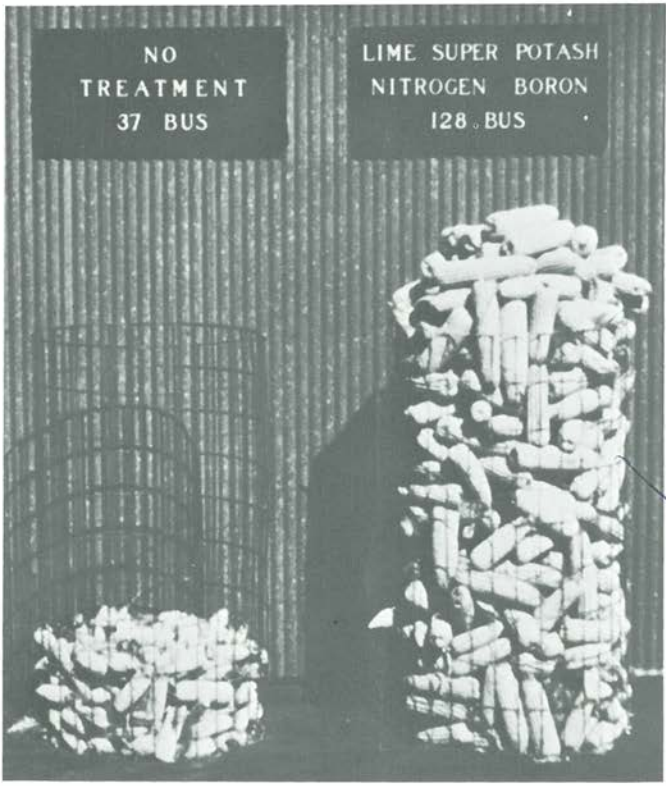
IN SUMMARY

As a major cash crop, the soybean is a late comer to much of the South. Acreagewise, it is one crop on the increase. Soybeans now exceed cotton acreage in Mississippi.

How profitable are soybeans? The answer depends on yield. Most farmers only break even with a 16- or 17-bushel yield. But proven practices can give much higher yields—and better profits for soybean growers!

The End

18



EARLY PLANTING, HIGH plant population, weed control, soil insecticides, proper hybrids, higher fertilization GET RESULTS!

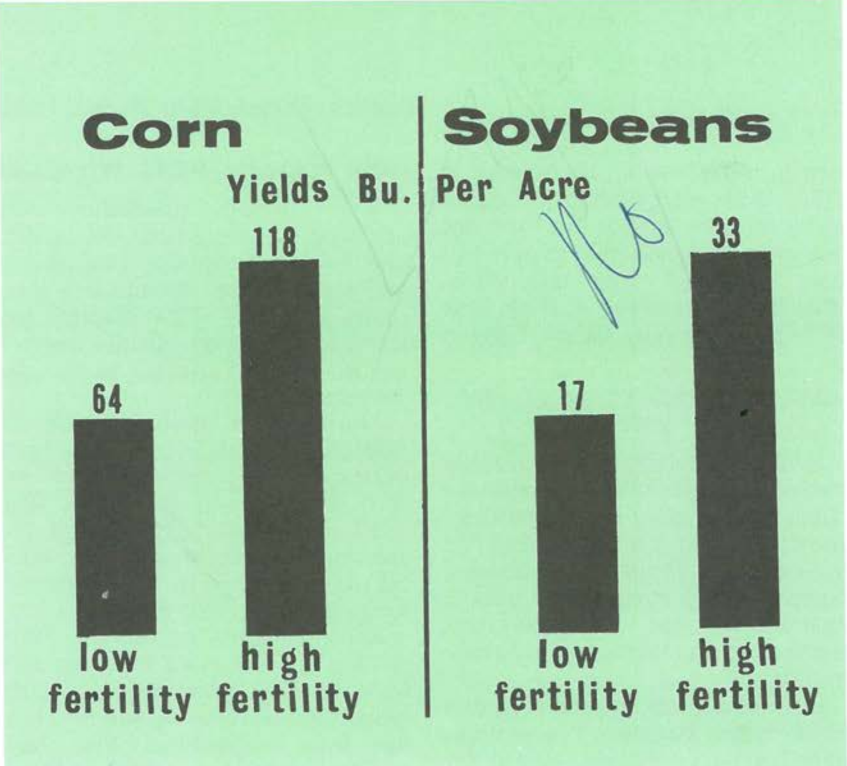
FERTILIZER

KEY TO BEST MOISTURE USE

WILL HIGH fertility "burn up" corn in a dry season? Research at Columbus, Kansas Experiment Field indicates well fertilized corn will survive temporary droughts more successfully.

The Columbus Field is located on a low fertility soil typical of the claypan soils in southeast Kansas—acid in reaction, low in available phosphorus, medium in potassium. Nitrogen, phosphorus, and potassium responses on corn have been excellent during years of abundant moisture. **And substantial yield increases have occurred during periods of moisture stress.**

In southeast Kansas, 100-bushel corn was once considered impossible. In fact, corn was considered a hazardous crop because of summer drought periods. **Our research indicates proper fertilization will minimize this risk.**



PROPERLY FERTILIZED early plantings matured soon enough to bring 118 bu. yield after mid-summer drought.

DURING LIMITED rainfall periods, soybeans have responded well to fertilizer—up to 16-bushel increases.

BY VERLIN PETERSON
KANSAS STATE UNIVERSITY

WORKS WITH STORED WATER

Fertilizer is no substitute for soil moisture, but well-nourished corn at Columbus has stayed green longer during periods of moisture stress. Fertilizer has allowed rainfall and stored soil water to be used efficiently.

Knowing weather patterns pays off. For example, a summer drought normally begins in southeast Kansas about mid-July. Early corn planting along with proper fertilization has gotten good moisture use during April, May, and June when rainfall is generally abundant. With this practice, summer drought problems have been averted.

Farmers are keenly aware of drought hazard—so the employment of all tools needed for 100-bushel corn production has not been popular. **But at Columbus, we have learned that early planting, high plant population, weed control, soil insecticides, proper hybrids, and high fertilization will produce outstanding results.** We have consistently produced over 100 bushels of corn per acre when moisture supplies were adequate. The highest yield ever recorded was in 1962—128 bushels.

High fertility does not "burn up"

corn in a dry season, we learned in 1963. With precipitation 10 inches below normal during the growing period we were still able to approximate 60-bushel corn production. **Plots Which Received A High Rate Of Nitrogen Stayed Green Longer.**

FAST STARTING CORN COVERS SOIL

How did fertilizer make these results possible? We learned the value of adequate starter fertilizer properly placed. Corn treated in this manner grew rapidly and covered the soil surface early in the season. Such shading was vitally important to reduce soil moisture loss by evaporation.

Proper fertilization promoted root development. Extended root systems tapped a larger volume of soil for water. This was one reason the well fertilized corn at Columbus withstood the 1963 drought more successfully.

With 16,000 plants per acre, weed control was no problem following timely early cultivation. The fertilized corn grew away from the remaining weeds. Shading by the thick stand of corn soon killed the few weeds left. Moisture was saved for use of the corn plants.

The value of early planting became clear at Columbus, shown on page 6. Moisture supplies were abundant early in the growing season, but drought prevailed in July and August. Late planted corn suffered. Properly fertilized early plantings matured early enough to reduce damage from mid-summer drought and bring a 118 bu. yield.

HIGH FERTILITY HELPS SOYBEANS

Top soybean production was achieved by correcting soil acidity and liberally applying phosphorus and potassium on all crops in a good rotation system. This practice has increased soybean yields over 7 bushels per acre average in the past 10 years.

During years of limited rainfall, responses to high fertility have been outstanding—10 and 16 bushels per acre increases on two plots. The 1963 season was dry through the growing period. But in 1965, rainfall was abundant in the spring but limited in July and August.

Several factors caused the 1965 results. **Narrow rows together with high fertility promoted an early ground cover, reducing soil moisture loss from evaporation. Also, high fertility applications on this field for many years resulted in a large amount of residues to plow under. With improved soil structure, more water penetrated into the soil.**

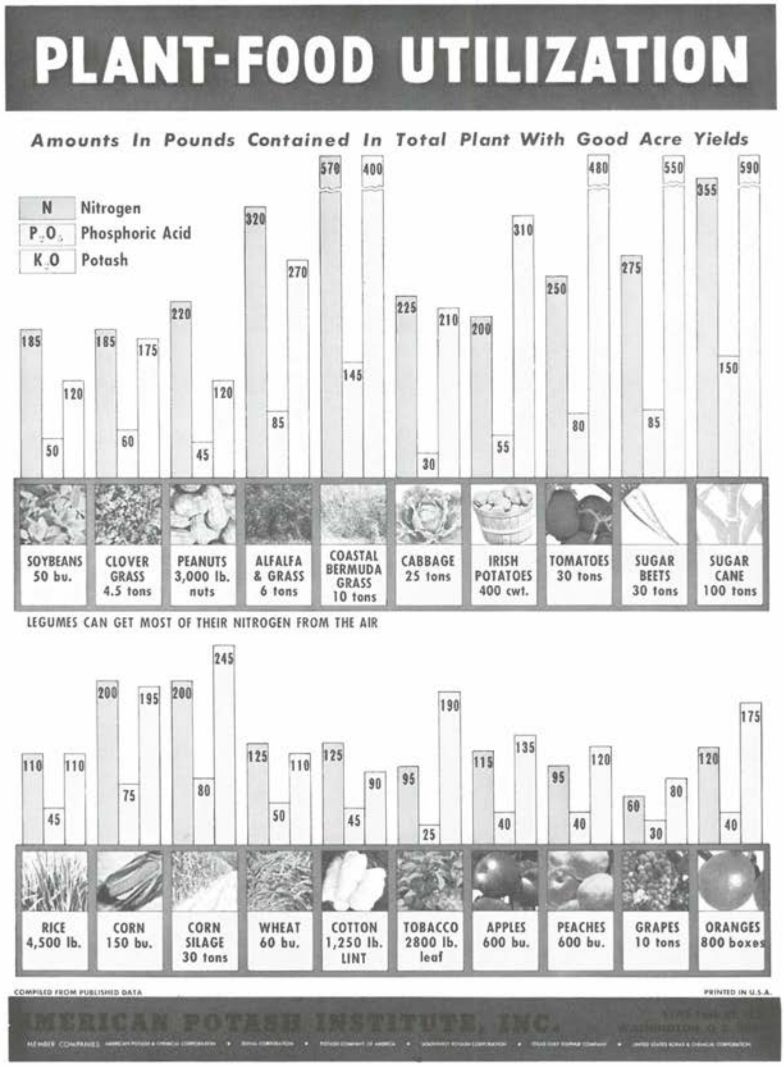
Soybean plots treated with barnyard manure have consistently produced somewhat better yields than plots receiving commercial fertilizers. We have also learned soybeans grown on manured areas weather temporary droughts more successfully.

IN CONCLUSION

Fertilizer is the key to best moisture use. Failure to fertilize properly often wastes soil water that is available. Our Columbus research has proved it is a sound practice to *apply fertilizer as if every year will be a good year moisture-wise.*

The End

ORDER



AS A NEW WALL CHART

AS A NEW PLANT FOOD CONTENT PAMPHLET

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American Potash Institute, 1102 16th Street, N. W., Washington, D. C. 20036

	Free Sample	Extras at Cost Stated
Plant Food Utilization Chart:		
Style 1, on light paper, 5¢	________	$________
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Plant Food Content Pamphlet, 2¢ each	________	________
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Enclosed Total Payment $________

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City______________ Zip Code__________ State______________

Organization ____

Soil Fertility Facts..

FERTILIZER MAKES UP ONLY 10% OF ALL CROPPING COSTS — YET ACCOUNTS FOR 20% OF FARMER'S NET INCOME. UNIVERSITY OF MISSOURI SOILS SPECIALISTS SAY $1 INVESTED IN FERTILIZER BOOSTS CROP VALUE AN AVERAGE OF $3. PLANT FOOD COSTS PER POUND HAVE FALLEN SINCE 1950. FARM WAGES HAVE RISEN 59%. LAND COSTS HAVE DOUBLED. STILL, ONLY 11% OF U. S. FARMERS FERTILIZE CROPS AT RATES RECOMMENDED BY SOILS SPECIALISTS . . . 37 PERCENT USE NONE.

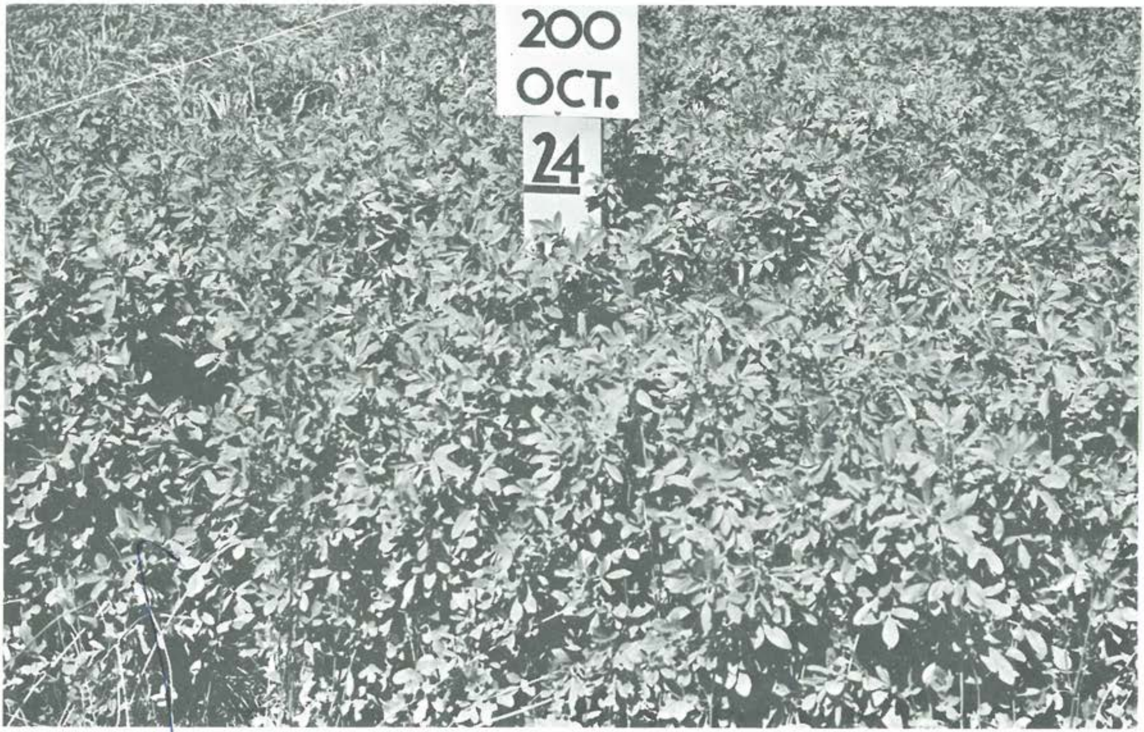
Missouri News

PLAN AHEAD!

TWO GOOD MEETING—SALES AIDS

KNOW PLANT FOOD CONTENT OF YOUR CROPS
KNOW ROLE OF POTASH IN AGRICULTURE

ORDER PAGE 9—10



SINGLE LARGE POTASH applications in October (200 lbs. K_2O) maintained excellent stands.

SIMPLIFY ALFALFA TOPDRESSING

BY CECIL S. BROWN
RUPERT F. STAFFORD
UNIVERSITY OF MAINE

Fertilizer use is changing on dairy farms. Rapid increases in herd size have increased fertilization of forage crops while reducing farm labor available for crop management.

The result: an increasing demand for custom spreading of bulk fertilizers.

Large-scale use of custom fertilization has forced a careful review of topdressing schedules. Dairymen and commercial fertilizer dealers have a mutual interest in more flexible timing of fertilizer applications for alfalfa and other established forage stands. **A single annual topdressing, applied whenever convenient throughout the growing season, is very desirable.**

Phosphorus needs of forages can be adequately supplied by a good topdressing once every third year.

TABLE 1. LEACHING LOSSES OF POTASSIUM FROM SOILS TREATED WITH A MASSIVE APPLICATION OF KCl.

Soil type	Leached K (% of total applied) Soil horizon A	B	C
Hinckley gravelly loam	52	64	72
Merrimac sandy loam	45	49	59
Charlton loam	36	45	51
Suffield silt loam	27	27	4
Suffield clay loam	17	4	1

Potassium chloride at 1,000 lbs. K per acre, mixed throughout 1-gallon pots of soil, leached with equivalent of 10 inches distilled water.

But nitrogen fertilization is not adapted to large infrequent applications. Forage plants rapidly absorb excessive amounts of nitrogen. So, fertilizer nitrogen must be supplied at least twice annually in an intensive program for grass sods. Good legume stands, of course, require little or no supplemental nitrogen.

Potassium, then, is the primary consideration in an annual topdressing program for alfalfa. Busy dairymen want to get the topdressing job done in a single application annually, especially if it promotes the adoption of labor-saving custom spreading services.

PROJECT TACKLES PROBLEM

In 1960, we began a research project, in cooperation with the American Potash Institute, to study efficiency of single annual applications of fertilizer K—designed to compare fall, spring, and summer applications, as well as split vs. single applications.

The effect of potash timing on the seasonal pattern of K uptake by forage crops was studied over a 3-year period. Two test crops, alfalfa and high nitrogen timothy, were compared in pure stands.

Site selection was vital to our project planning. We included extremes of soil textures to maximize potential leaching and fixation of potassium—on five locations throughout central and southern Maine. Table 1 shows the wide range in potassium retention of these soils through data from a supplementary greenhouse leaching study.

Soil differences were especially marked in the subsoil horizons, with the gravelly Hinckley soil proving quite susceptible to leaching and the Suffield clay loam showing virtually no leaching loss.

The experimental plots, established in 1960, received 220 pounds K_2O and 300 pounds P_2O_5 per acre overall. We limed liberally to minimize luxury consumption and potassium leaching from topdressings in 1961-63.

Winterkilling occurred at two coastal locations in 1961-62, confining K uptake data for alfalfa to the three remaining locations. The timothy plots were continued at all five locations. This paper covers only the alfalfa plots.

SEASONAL EFFECTIVENESS OF SPRING-APPLIED K

Early May applications of 200 lbs. K_2O or above proved adequate for high yields and good survival of alfalfa at all three locations. Table 2 shows no major increases in yields from three split applications totalling 300 lbs. K_2O annually.

Potassium analysis of the forage showed aftermath crops of alfalfa

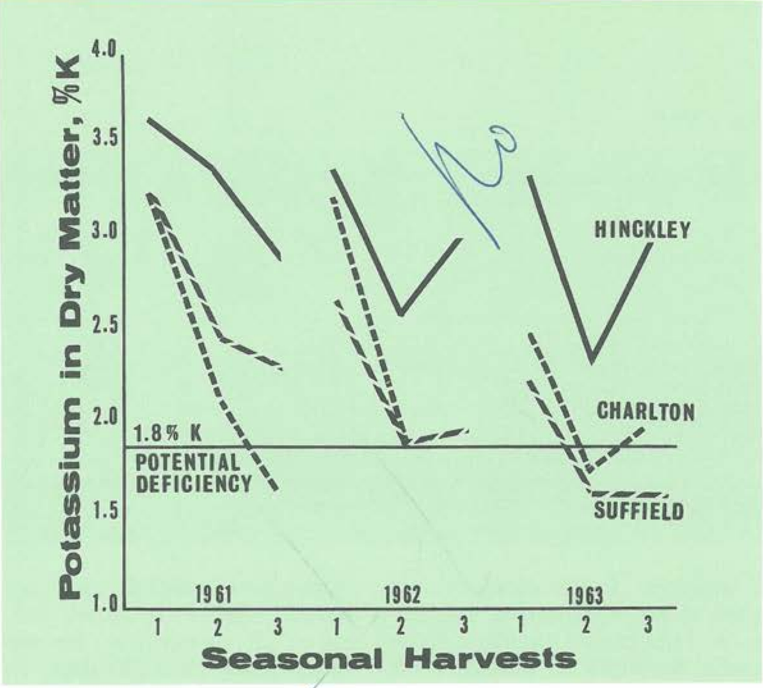


FIGURE 1—POTASSIUM CONTENT of successive harvests of alfalfa fertilized with 200 lbs. K_2O annually in early May.

approaching deficiency when supplied only a spring application of 200 lb. K_2O on low potash soils. See Figure 1. The K percentage of second or third crop forage declined to 1.8% K or below on both the Charlton and Suffield soil sites.

The Hinckley soil maintained abundant K in the aftermath forage, apparently because of high potassium reserves from previous row-crop fertilization.

Figure 2 shows late-season residual effects from potassium applied in May. Potassium uptake by third-crop alfalfa in late August was consistently increased by spring fertilization on all soils. The higher the fertilization the greater the K remaining available to third-harvest alfalfa.

CROP RECOVERY OF FALL-APPLIED K

Potassium topdressed in October was less efficiently recovered by alfalfa than fertilizer applied in the spring. This was true for all three

TABLE 2. HOW POTASSIUM RATE AND TIMING AFFECTED DRY MATTER YIELDS OF ALFALFA

Soil type	Annual K_2O lbs./acre	Tons per acre 1961	1962	1963
Hinckley gravelly loam.............	200 (May)	4.04	3.12	3.72
	300 (May)	4.16	2.93	3.73
	300 (split)	4.41	3.49	4.20
Charlton loam......................	200 (May)	4.60	4.10	4.30
	300 (May)	4.69	4.16	4.49
	300 (split)	4.72	4.33	4.32
Suffield silt loam..................	200 (May)	4.80	4.21	4.22
	300 (May)	4.78	4.36	4.45
	300 (split)	4.66	4.15	4.26

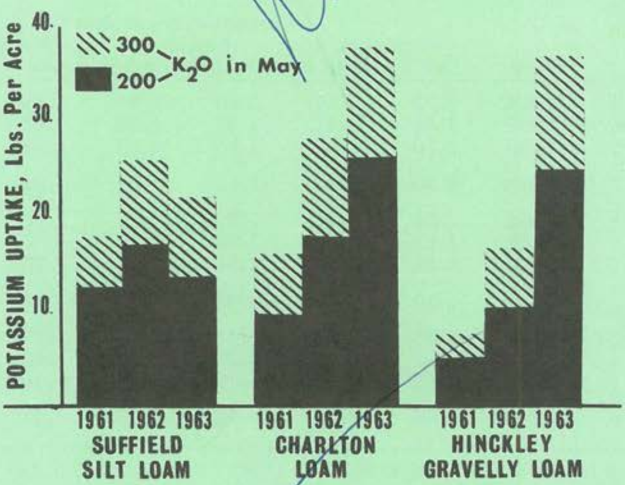


FIGURE 2—EXTRA K in third-crop alfalfa in excess of K uptake from unfertilized soil.

years at all three soil sites. As an overall average, October applications proved 17% less efficient than early May applications, measured by potassium uptake.

But timing of potash applications had little effect on alfalfa yields at liberal fertilization levels. Table 3 shows the flexibility in potash timing obtained at the 200-pound K_2O rate. High yields were obtained regardless of application time, in spite of moderate drought.

MINERAL CONTENT OF FORAGE

How do large potash applications affect mineral content of forage?

Heavy potash rates sharply increased potassium content and moderately depressed calcium and magnesium percentages. Table 4 shows the effects of the most extreme treatment, an application of 500 pounds muriate of potash (300 pounds K_2O) in a single application in early May.

TABLE 3. TIMING OF ANNUAL POTASH AFFECTS TOTAL ALFALFA YIELD IN THREE CUTS

Soil type	Time of application (200 lb. K_2O)	Dry matter—tons/acre 1961	1962	1963
Hinckley gravelly loam.............	Fall	4.2	3.2	3.7
	Spring	4.0	3.1	3.7
	After first cut	4.3	3.2	3.9
	After second cut	4.2	3.2	4.0
Charlton loam......................	Fall	4.6	4.1	4.0
	Spring	4.6	4.1	4.3
	After first cut	4.6	4.2	4.2
	After second cut	4.5	4.1	4.2
Suffield silt loam..................	Fall	5.0	4.3	4.0
	Spring	4.8	4.2	4.2
	After first cut	4.5	4.1	4.1
	After second cut	4.8	4.0	4.2

TABLE 4. LARGE APPLICATION OF KCl (300 LBS. K_2O) IN EARLY MAY AFFECTS MINERAL CONTENT OF FIRST CROP ALFALFA.

		Percent of dry matter					
		Potassium		Calcium		Magnesium	
Soil type	Year	*Low K	High K	Low K	High K	Low K	High K
Hinckley gravelly loam	1961	2.93	3.59	0.90	0.86	.19	.18
	1962	2.46	3.61	1.12	1.05	.28	.25
	1963	2.10	3.59	1.35	1.12	.31	.22
	Mean	2.50	3.60	1.12	1.01	.26	.22
Charlton loam	1961	2.04	3.45	1.60	1.36	.22	.18
	1962	1.57	3.53	1.84	1.45	.28	.19
	1963	1.16	3.11	1.97	1.37	.30	.19
	Mean	1.59	3.36	1.80	1.39	.27	.19
Suffield silt loam	1961	2.21	3.40	1.37	1.26	.28	.25
	1962	1.42	3.08	1.75	1.40	.42	.33
	1963	1.23	2.65	1.33	1.21	.40	.30
	Mean	1.62	3.04	1.48	1.29	.37	.29

* Low K—no topdressed K after seeding in 1960.
High K—300 pounds K_2O annually 1961-63.

Heavy potash rates did not affect phosphorus content significantly nor the levels of copper and certain other trace elements of potential importance in ruminant nutrition.

AGRICULTURAL SIGNIFICANCE

(1) On most well-limed soils, alfalfa can be adequately supplied with potassium for a complete season with a single, large fertilizer application. Split applications may be needed on extremely coarse-textured soils in a season of unusually heavy rainfall.

(2) Single annual topdressing require extra fertilizer potassium, above the total needed in two or more split applications. Luxury consumption, greater when large applications are used, must be offset by increased fertilization rate. Around 50 pounds extra K_2O per acre per year will compensate for discontinuance of split applications under northern conditions.

(3) Timing annual topdressing for alfalfa can be flexible for most soils. Spring applications are most efficient for recovery of applied K but least effective for adequate nutrition of alfalfa during critical fall months. Rate is more important than time of application. But very sandy or gravelly soils are poorly suited to fall applications because of potential leaching losses. Spring or midsummer treatment is best for these soils.

(4) Forage quality was not seriously impaired by heavy annual potash rates, within economic fertilization levels. Calcium and magnesium depressions are the chief effects. The calcium decline is too small to be important, since high-K alfalfa will contain over twice as much calcium as low-K grass hay. The magnesium decline is more difficult to evaluate. In some U.S. areas, isolated cases of "grass tetany" of dairy and beef cattle have been associated with grazing low-magnesium grass pastures. There is no report of similar problems with alfalfa.

CONCLUSION

Agricultural advisors must distinguish between agronomic efficiency and economic farm practice in alfalfa fertilization programs. Dairymen do have a choice!

Small split applications, one before each growth cycle, is the ideal system for best crop use of topdressed potassium. But, under present conditions, it appears more profitable for many dairymen to substitute extra fertilizer K in large single applications for costly labor.

The End


ON IT GOES—a phenomenal 30 tons of granular fertilizer daily by a single light helicopter, applied by the industry's first successful spreader for dry chemicals and fertilizers.

Fast, economical and uniform, the new device was recently patented by Evergreen Helicopters, Inc., McMinnville, Oregon, and will be the first of its kind marketed.

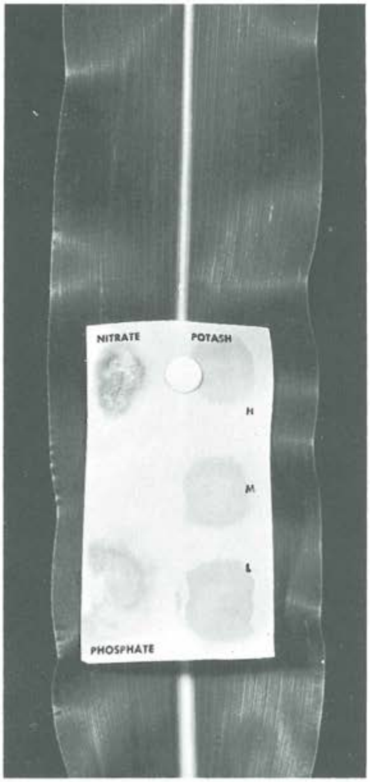
It was originally developed by Evergreen to treat thousands of acres of nutrient-starved sugar cane fields in Puerto Rico (above) with a half-ton of dry fertilizer per acre. A simple conversion permits seeds broadcasting at rates as low as one pound per acre.

(See Inside Back Cover)

IN FOCUS WITH GARRARD

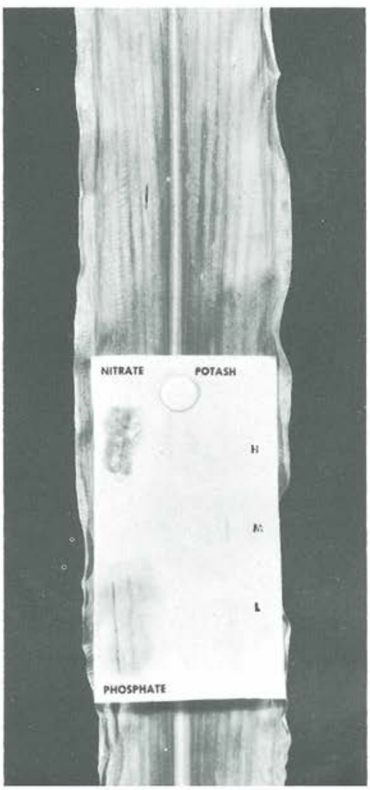
WHY Contradictory Test Results

HERBERT L. GARRARD
NOBLESVILLE, INDIANA



NORMAL PLANT

POTASH STARVED



Do not expect soil tests, plant part analyses, and sap or tissue quick tests to agree fully.

Many logical reasons may explain why nutrients found in plants do not correspond to nutrient availabilities predicted by soil tests. Finding the "whys" behind such contradictory results often uncovers key problems or limiting factors.

Soil tests merely indicate what nutrients probably will be chemically available if other factors are favorable. Correlations between predicted and actual responses from lime and fertilizers are usually fairly high. But what about the exceptions? Here is the place to start plant tests.

You may sometimes find a nutrient accumulated in plants where soil tests indicated deficiencies. If plants are stunted for any reason, as by a major deficiency, other unused nutrients may accumulate in sap, so test results may be higher than expected, but may not reflect high reserves in the soil. In normal growing plants, test readings are more likely to reflect nutrient reserves. In multiple-deficiency soils, applying only one nutrient may increase that nutrient content without boosting yields very much.

There may be many reasons why nutrients are **not** found in plants as predicted by soil tests.

(1) Mechanical damage to roots by machinery or insects may cut off supplies to the plant.

(2) Cool temperatures retard biological activities in soils and delay nitrate availability.

(3) Wet soils, low in oxygen, not only retard nitrification but may result in denitrification, and a loss of nitrogen. Oxygen in soil is also vital to normal intake of potassium(K) by roots. Even a short period of water-logged soil may damage roots so much that these plants never fully recover.

(4) In very dry soil, both root growth and biological activities are reduced.

(5) Perhaps the most adverse combination would be water-logged soils early followed quickly by a hot drouthy period.

(6) In very acid soils, applied phosphates may be fixed into less available forms, and nitrogen may be less efficient. Ca, Mg, and Mo are usually lower in acid soils.

(7) In high-lime soils, K absorption may be low, as well as Mn, B, Fe, and sometimes Zn and Cu.

(8) Soils with certain types of clays (as montmorillonite) have high fixative appetites for applied K, greatly reducing the plant's intake of potassium.

Responses to applied potassium are often reported on soils where some soil tests indicate high replaceable K. Check with plant tests and recheck soil samples taken *under* growing crop at same time. Do not dry samples before testing. Drying some soils releases K and indicates higher than actual availability. Avoid sampling frozen soils.

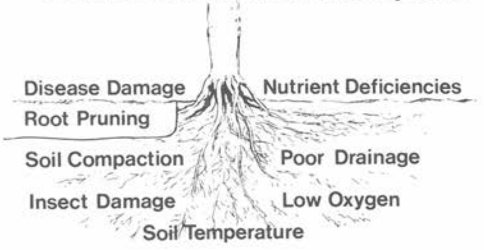
Crop species and varieties vary greatly in total requirements and abilities to extract nutrients from the same soil. Such differences may be the greatest problem facing specialists trying to interpret plant tests. But the plant must be the final judge of availability.

Chemical tests are never "wrong"! Our calibrations, manipulations, or interpretations may be wrong, but results are always right under the chemical conditions prevailing. Our problem is to explain the "whys" of any puzzling or contradictory results.

"Dissatisfied customers" represent the basic problem—consisting of sets of conditions where responses do not follow the predictions by ordinary diagnostic procedures. The easiest out may be to blame it on the weather. But a real scientist will look for the "whys" behind the confusing facts. This may require an *all-factors diagnostic approach,* rather than just one diagnostic tool.

The End

Anything Which Restricts Root Growth Reduces Nutrient Uptake



IF SOIL AND PLANT tests don't agree, look for root damage, adverse physical conditions, or extreme nutrient imbalance.

Many of the photos in the new slide set on field diagnosis, highlighted on page 20, were taken by Mr. Garrard who has grown up with developments of modern diagnostic tools.

FIELD DIAGNOSIS and TISSUE TESTING

HIGHLIGHTS FROM NEW SLIDE SET & SCRIPT

Advisors from official agriculture or industry contacting farmers have unique opportunities to become "field diagnosticians" or consultants. It is essential to study growing crops in the field.

There is something wrong in every field, regardless of the yield. These problems we call "limiting factors." Field diagnosis identifies limiting factors. Correcting the problem points the way to higher yields in the future. (C-3)

Several problems may appear at the same time. Weeds, insects, and K deficiency are obvious here. Eliminating all three could increase yields greatly. For successful field diagnosis do the following:

a. Check available information
b. Make field observations
c. Tissue test

Start with the soil test report. Consider fertilizer and lime applications since the test was made.

Some crops remove heavy amounts of nutrients. So, check cropping history. A field "high" in potassium by soil test four years ago and cropped heavily with alfalfa could now be in the "low" range. Check on previous yields.

Is the best variety being grown? In this case, the tall variety responded best to high fertility. Official agriculture and/or industry leaders know the variety that will respond best to top management.

Planting early pays off—in this case, with short corn planted April 26

producing 35 MORE bu. per acre than the tall corn planted June 3. In the Midwest each day's delay in planting corn after the first week in May may drop yields one to two bushels per day. Shorter plants insure greater grain production efficiency and pave the way for narrower rows and higher populations.

Wide rows waste sunlight. The trend is to 30 and even 20-inch rows with crops such as corn, soybeans, and grain sorghum. Many varieties do best at higher populations.

To estimate the number of corn plants per acre:

(a) Measure or step off length of row equal to 1/1000 acre, as shown in the table below.

(b) Count number of stalks and multiply by 1000. Check several sections of row and take average.

Row width (inches)	Length of row for 1/1000 A. (feet and inches)
20″	26′-1″
30″	17′-4″
36″	14′-6″
40″	13′-1″

For example, for 30-inch rows, measure 17′-4″ or step off about 6 paces. Count back. If you have 23 stalks, this means a population of 23,000 per acre.

Certain diseases may be mistaken for a nutrient deficiency. This maize dwarf mosaic is one example. Resistant varieties (now being developed) are the best solution for this particular disease.

Insects can seriously cut crop production. Boring insects destroy the vascular system, or "pipelines" in the plant, preventing movement of nutrients to the leaves. Leaf chewers destroy leaf area needed for manufacturing foods.

In diagnosing field problems, always examine the roots of plants for insect or disease evidence. Cultivation damage is a possibility. Good roots are easier to develop under minimum tillage. How about drainage?

Corn rootworm is a serious limiting factor. It can retard uptake of nutrients and their concentration in the plant. The adult beetle of the northern corn rootworm feeds on silks and may cause barren ear tips.

Watch for root pruning caused by too deep cultivation. This hinders water and nutrient absorption. Chemical weed control and careful cultivation eliminate the problem. On crusting soils cultivation may increase corn yields 5-10 bushels per acre.

Where fertilizer and lime are PLACED is very important. Fertilizer broadcast and disced in for row crops will be unavailable when surface soil is dry. Roots grow laterally and downward, not up. Plow-down and banded fertilizer will be in the root zone.

Secondary or micronutrient shortages can limit production. Zinc deficiency on left, sulfur deficiency on right show limiting factors that could hold down yields regardless of the N, P and K applied.

Soil pH level is very important in crop production. Be sure a lack of lime or *improperly placed* lime is not a limiting factor. Make a test. This can be done with indicator solutions. A popular one is Brom Cresol Purple covering the range pH 5.2 to 6.5. Use a sampling tube with an open face to test sub-samples at ½″, 2½″, 4½″, 6½″ or any depths or intervals to 18″ and compare with the pH ranges on the color chart. Here, three different soils are compared at the mentioned depths.

The use of plant tests can be compared to a medical examination. Chemical tests of the blood are made, but only as part of a rather complete diagnosis. All information bearing on the patient's health is obtained and evaluated. The blood sample can be checked for iron content, for example. Questionable levels require supplemental iron for the diet. A clean bill of health does not guarantee life to 105 years of age, but just for the immediate future.

Plants, too, have minimum chemical requirements. These requirements are determined by research that allows no other limiting factor except the element being studied. The concentration of that element is increased beyond the point of yield increases. For example, corn plant analyses show the leaf opposite and below the ear at silking should contain about 3% N, 0.3% P, and 2% K to be on the safe side. Plant samples may be taken in the field and dried for detailed analysis in the laboratory.

Tissue tests are semi-quantitative tests that can be run in the field. With them, we can spot-check to see if N, P or K is a *Limiting Factor*.

Materials needed for tissue tests are simple and easy to carry. It can be a mere handful of tissue test papers, extracting pliers, two solutions, a knife, and nitrate powder.

Or variations that include supplies of chemicals and vials plus materials for making quick soil pH tests.

Before making tests, check solutions because they can deteriorate. This is easily done by testing saliva (which is high in P) and a blank where no P is present.

If the solutions are good, a deep blue develops in the saliva test and no color shows on the blank. Should they be otherwise, the solutions are discarded and made up fresh. Be sure potassium test papers and nitrate powder are FRESH! Start each season with a fresh-made supply.

Standardized sampling procedure requires the plant sample to be a recently matured leaf—not the youngest leaves at the top nor the old leaves at bottom. This corn leaf is the one sampled until the ear node is identifiable. Then sample the leaf opposite and below that node.

On the cotton plant, the same rule applies—test the most recently-matured leaf.

Take the most recently-matured leaf on the soybean plants.

The test for P and K on the soybean petiole should be run on the swollen base of the leaf petiole or pulvinus. On corn, the mid-rib is used. Use the base of the stem on small grains and the middle of the stem of alfalfa. In all crops, take enough samples in a field to get a good average. Sample both soils and crops from good and poor areas and compare.

These are the complete ranges of colors developed for the nitrate, phosphate, and potassium test. Plants tested early in the season should have high levels of N, P and K. By mid-season, these may safely drop to medium except for the stalk base nitrogen test which should remain high.

If one of the three elements tested shows "very low" range, we can say IT is the most limiting but not claim the other two are in adequate supply. Why? Because the deficient element limits growth so that the plant may accumulate the other two elements. If the deficiency had been corrected and the plant allowed to grow vigorously, the other elements may not have been sufficiently supplied for top yields.

Do not test plants under abnormal weather conditions. This corn is obviously limited by low moisture—and a tissue test would mean nothing.

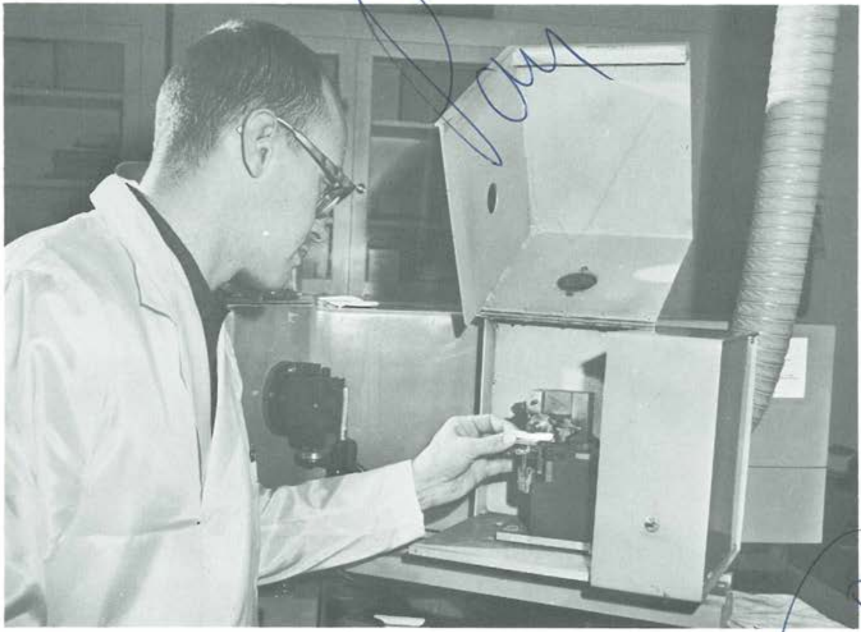
Do not test as plants approach maturity. Corn should not be tested after it reaches the milk stage.

Put all the information together. One advantage of tissue tests is that they can be completed right on the spot. Chemical results can be compared with visual observations of the growing crop. Unusual results can be re-checked to satisfaction. Consider the many limiting factors. Follow up with soil tests.

Tissue testing can be a real service tool. Here a grower SEES a nitrogen-deficient corn plant test contrasted with good nitrate in the base of the stalk. Usually, tissue tests verify N, P or K shortages that were already suspected because recommendations were reduced or not followed. This process helps sell good soil fertility.

"Hidden Hunger" can be detected by plant tests long before deficiency symptoms show up. Detailed plant analyses in the laboratory are particularly helpful for micronutrients.

ORDER COMPLETE SCRIPT AND COLOR SLIDES ON PAGE 40



THIS SAMPLE, BEING PLACED on the arc stand of the emission spectograph, will be read out on the automatic system.

PLANT ANALYSIS
USEFUL TOOL FOR DIAGNOSIS

BY J. BENTON JONES
OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER

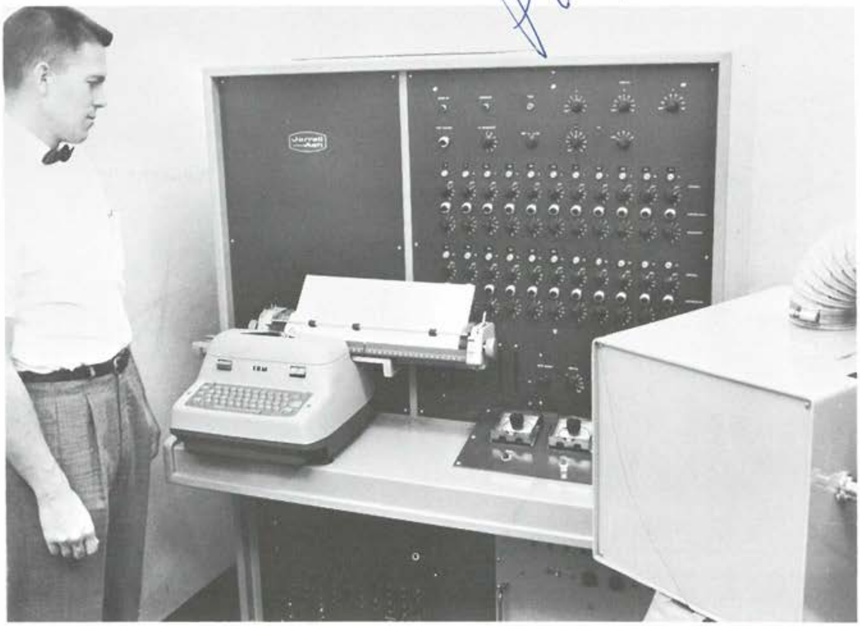
The nutrient status of a plant can determine its ability to grow and develop. This status can be measured by plant analysis, a relatively new technique for the agronomic farmer.

In the past, agronomists have used soil testing primarily to determine nutrient needs. But the demands for high yields and top quality mean the nutrient status of the plant cannot be ignored any longer. A sound fertilizer program begins with a soil test recommendation, followed by plant analysis, to root out and correct deficiencies and imbalances.

OBJECTIVES

There are three main reasons for a plant analysis:

(1) To determine how effectively fertilizer treatment and soil supply is meeting plant nutrient need.



THIS NEW AUTOMATIC read out system from the emission spectograph helps meet the increasing demand for plant tests.

. . . where below normal plant nutrients are most frequently found with farmers who fail to soil test or follow soil test recommendations.

(2) To evaluate those nutrients where soil tests are not available.

(3) To diagnose suspected nutrient element deficiencies.

Though plant analysis has long been considered a diagnostic tool for suspected deficiencies, its usefulness as a follow-up is proving valuable. Test results at Ohio Plant Analysis Laboratory showed about half the so-called "normal" farmer samples in 1965 testing low or deficient in one or more elements. This indicates many farmers were unaware nutrient deficiencies existed in their crop.

INTERPRETATION & RECOMMENDATION

A plant analysis is interpreted through three factors: crop, plant part, and stage of growth. Scientists interpret nutrient element concentrations in plants by grouping them as sufficient or normal. Table 1 shows the categories.

The terms sufficient or normal are used interchangeably by the author since there is some disagreement among analysts as to the proper terminology. The author tends to favor normal rather than sufficient

TABLE 1. CATEGORIES USED IN OHIO FOR INTERPRETING A PLANT ANALYSIS.

Category		
Old Terms[1]	New Terms[2]	Definition
Deficient	Shortage	Plants should be showing clear visible symptoms of a nutrition deficiency.
Low	Below Normal	Plants may be normal in appearance but probably will be responsive to fertilization with low-testing element.
Sufficient	Normal	Plants are normal in appearance and have adequate concentration of this element for maximum yield.
High	Above Normal	Plants are normal in appearance and optimum yield levels can be expected. However the concentration of this element is higher than normally anticipated.
Excess	Excess	Plants either show clear visible symptoms of a nutritional disorder or have normal appearance. Yield may be significantly reduced by excess of this element.

[1] Earlier terminology given in Ohio Plant Analysis Report Forms in 1964 and 1965.
[2] Terminology to be used in 1966, adopted from terms used by Dr. A. L. Kenworthy, Michigan State University.

to describe the desired concentration for proper plant growth and development.

When All Elements are Normal:

This ideal situation indicates the plant has sufficient quantity of tested nutrient elements to produce maximum yield. The soil fertility level and fertilizer treatment supplied the nutrients for maximum yield.

When One or More Elements are Below Normal:

Maximum yields may not be realized. Fertilizer treatment may be changed to bring the low-testing element or elements to normal level.

When An Element is Short:

Yields may be severely reduced. A change in fertilizer treatment is usually needed to bring the low-testing element or elements to normal level.

When an Element is in Excess:

Excessive levels may come from improper fertilizer treatment. Low soil pH may cause excessive manganese (Mn) levels and poor drainage may cause excessive aluminum (Al) levels. Yet, excessive levels of some elements may be due to contamination. Excessive iron (Fe) and aluminum (Al) levels frequently result from dust or soil contamination. Many insecticide dusts and sprays contain copper (Cu), and can result in contamination. When herbicide

TABLE 2. LISTING OF ITEMS REQUESTED ON QUESTIONNAIRE.
(Ohio Plant Analysis Program)

Crop	Soil Test Results
Variety or Hybrid	
Plant Part Sampled	Fertilizer Applied to Crop
Position on Plant	Last Lime Application
Stage of Growth	
Date Sampled	Soil Type
Appearance of Plants Sampled	Drainage
Date Planted	Sprays or Dust Applied to Crop
Previous Crop — Crop Rotation	Rainfall Last 30 days
	Air Temperature Last 10 days

TABLE 3. CURRENT SAMPLING INSTRUCTIONS (OHIO PLANT ANALYSIS PROGRAM)

(1) General Instructions:

CROP	Stage of Growth[1]	Plant Part	Number of Plants to Sample
CORN	(a) Prior to tasseling	(a) Fully developed leaf below the whorl	(a) 15 to 20
	(b) At silk initiation[2]	(b) Ear leaf	(b) 15 to 20
SOYBEANS	Prior to or during initial flowering[3]	Upper fully open leaves	20 to 25
SMALL GRAINS or FORAGE GRASSES	Prior to heading	Upper-most leaves	20 to 25
ALFALFA or OTHER LEGUMES	Prior to flowering	Top 6 inches	20 to 25
SUGAR BEETS	8 to 10 Weeks after emergence	Center leaves and petioles	15 to 20

[1] If plants are developing abnormally in the initial stages of growth, take the whole plant, remove the roots and submit the tops of the plant for analysis. Plants which have entered the reproductive stage are not suitable for sampling and analysis. See instructions in (2) below.

[2] Samples should not be taken after pollination.

[3] Samples should not be taken after pod set.

(2) **For plants ABNORMAL in appearance:**
Take that portion of the plant exhibiting the abnormality and check the proper plant part selection on questionnaire. An evaluation is best made when a comparison can be made between samples taken from normal and abnormal plants in the same general area. Plants showing any abnormality should be sampled early since element accumulation usually continues even though the plant is not growing normally.

(3) Do not sample or include diseased or insect damaged plants as a part of the composite sample.

and insecticide sprays are applied to the foliage with brass equipment, copper (Cu) and zinc (Zn) contamination can occur.

The ideal situation is all elements at normal range. When the concentration of a particular element falls outside this range, that element should be brought into proper concentration.

It is difficult to base a recommendation entirely on a plant analysis. A particular element may not fall within a normal concentration range for many reasons. Failure to consider recent soil test results or fertilizer treatments makes it very hard to set a recommendation. To get this necessary information, a completed questionnaire must be submitted with each plant sample, as shown in Table 2.

Below normal concentrations are most frequently related to a failure of the farmer to soil test and/or follow soil test recommendations, the Ohio Plant Analysis Program has discovered.

PRACTICAL UTILIZATION

The following steps should be followed when evaluating plant analysis results:

(1) Were the plant samples taken as prescribed by current instructions? See Table 3.

(2) Do samples represent the area under consideration?

Turn to Page 33

- High-Yielding Variety
- High Potash Fertilization
- Frequent Cutting

TEN TONS ALFALFA HAY!

BY R. J. BUKER, FARMERS FORAGE RESEARCH COOPERATIVE
LAFAYETTE, INDIANA

Farmers Forage Research Cooperative at Lafayette, Indiana, has combined a new high-yielding variety named Scout with high potash fertilization and frequent cutting **to produce ten tons hay in a single crop year.**

This yield was obtained in 1965 on a variety trial planted on May 23, 1963. The nursery, established to compare Scout with standard varieties, **was not designed as a maximum yield demonstration.**

We simply wanted to provide adequate fertilizer and frequent harvest to determine which varieties have genetic potential to produce most forage. The yields below show average production of the four plots of each variety.

Rainfall was good in 1965, except for a short midsummer drought, and with very good growing weather in September and October. The plots were not irrigated.

LIME & POTASSIUM NEEDS MET

These plots are located on Ockley Loam soil. An Ockley soil is a terrace soil with good-to-excessive internal drainage over a coarse sand and gravel subsoil. We limed the field in spring, 1962, and established the plots in spring, 1963, following

Alfalfa variety test seeded May 23, 1963 on the F.F.R. farm at Lafayette, Indiana. (Yield reported as hay containing 12% moisture.)

	1965					
Variety	**June 1 tons**	**June 25 tons**	**July 28 tons**	**Sept. 9 tons**	**Oct. 25 tons**	**Total tons**
Scout	3.2	2.1	2.0	1.5	1.2	10.0
Vernal	3.0	2.0	1.7	1.3	1.0	9.0
Ranger	2.9	2.1	1.8	1.4	1.1	9.3
Flemish Type	2.5	2.0	1.7	1.7	1.2	9.1
LSD.05	.41	NS	.27	NS	.15	.70
C.V.	9.6%	7.5%	10.3%	10.5%	9.5%	4.7%

PLOTS WERE HARVESTED with a flail-type plot harvester, with a wind break to protect scales where research aids weigh forage from each plot.

soybeans. In winter, 1963/64, a soil test indicated a two ton lime need which was applied to the surface. A year later, a soil test indicated a pH of 7 with 132 pounds of P and 300 pounds of K available in the soil.

Potassium hunger signs had been noted on this farm in 1962 and 1963—so, after the first cutting in 1965, we applied 240 pounds of K_2O.

Though other nurseries were harvested as early as May 17, 1965, the first cutting on this nursery was delayed until June 1, 1965 when it was in the tenth of bloom stage. The remaining four cuttings were taken at bud stage.

Protein analysis on the first four cuttings ranged from 17 to 19 percent and on the last cutting ranged from 21 to 24 percent.

HIGH POTASSIUM REMOVAL

First cutting forage samples, taken on an adjacent nursery, and the last cutting samples on this nursery were analyzed by the Plant Analysis Service at Ohio State University.

These tests showed a 3.0 to 4.7 percent potassium level in the forage. Over half a ton of 0-0-60 fertilizer would be needed to replace the potassium if all the cuttings contained this high potassium level.

These levels are much higher than those generally used in determining potassium replacement requirements. More accurate potassium fertilizer removal estimates will be attempted in 1966 harvests.

Following the last harvest, we added 150 pounds of 0-0-60 fertilizer to the plots to try to prevent winter kill from potassium starvation. Soil tests following this application and plant analysis of the last cutting indicated that lime, phosphorus, and potassium should be applied in 1966 along with micronutrients.

These yields represent only from one year's production, while Illinois University reported over nine tons hay from the same nursery two years in a row. Most of the varieties yielding over nine tons in their tests are wilt susceptible flemish type varieties. Scouts' performance indicates high yield can be obtained from hardy wilt resistant lines.

The End

400 lbs. N to grass as Ammonium Nitrate (NH_4NO_3)

NO POTASH—NO LIME

POTASH—NO LIME

NO POTASH—LIME

POTASH & LIME

Crimson Clover Grown On A Coastal Bermudagrass Sod NEEDS Lime & Potash

BY JOEL GIDDENS
UNIVERSITY OF GEORGIA

Producing both crimson clover and Coastal bermudagrass on the same area is sometimes attempted to get best land use. Combining this high producing grass and crimson clover requires careful management because of differences in fertility requirements.

Crimson clover failed to grow successfully for several years at Athens, Georgia on a Coastal bermudagrass sod that received high nitrogen applications annually. The experiment reported here was conducted on a high potash-supplying Cecil soil that had previously received 1000 pounds 20% superphosphate and 3000 pounds of dolomitic limestone, bringing the soil pH to 6.5.

Nitrogen was applied—100 pounds in early spring and 100

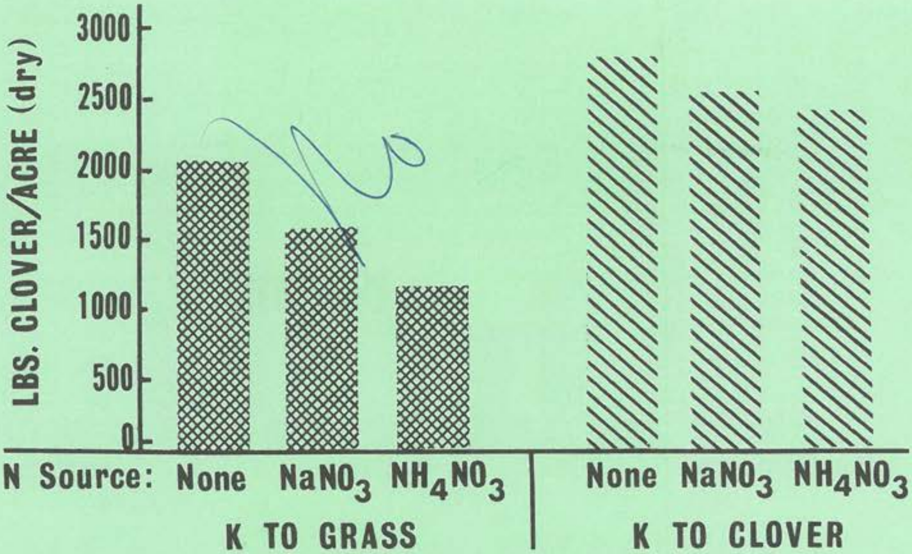


FIGURE 1—BEST CLOVER GROWTH came from potash applied directly to the clover.

pounds after each of the first three clippings of the Coastal bermudagrass. Two sources of N, Nitrate of soda (non-acid forming) and ammonium Nitrate (acid forming) were compared. One half of each plot was limed as needed to maintain the pH at approximately 6.5.

Potassium treatments included 325 pounds muriate of potash per acre applied to the grass—half in early spring, half in midsummer. The clover was reseeded on the grass each fall to insure uniform stand, although volunteer stands would probably have been satisfactory most years.

GRASS AND CLOVER YIELDS

Grass yields were high, averaging about 12,000 pounds of dry forage annually where nitrogen and potash were used, and about 10,000 pounds without potash the first 3-4 years. It must be remembered this was a high potash supplying soil. Without applied nitrogen, the grass yield averaged about 1,100 pounds dry forage per acre.

Exchangeable soil potassium **decreased from about 225 pounds per acre to less than 25 from 1956 to 1962 on plots receiving high nitrogen and no potash.**

Clover yields were low except where no nitrogen was applied to the grass and grass growth was poor. Clover yields were good only on grass plots not receiving nitrogen. Trace element deficiencies were suspected where clover yields were low on plots receiving potash to the grass. But a mixture containing boron, manganese, copper, zinc and molybdenum failed to improve the clover.

POTASH AND LIME NEEDED ON CLOVER

A greenhouse experiment showed that when potash was applied directly to clover on soil taken from the field experiment, good clover

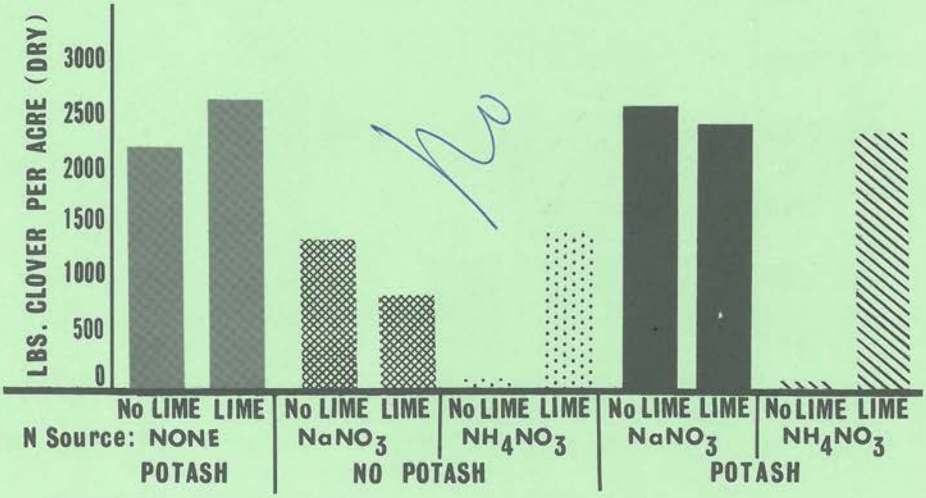


FIGURE 2—BEST CLOVER YIELDS came from areas receiving potash to the clover and potash-nitrogen (and lime with ammonium nitrate source) to the grass.

growth occurred. In fall, 1964, 300 pounds muriate of potash was applied in the field to clover seeded on plots that had been receiving potash on the grass. Figure 1 shows good clover yields resulting from these treatments. This shows that when potash was applied to the grass, most of it was removed by the grass (on plots receiving nitrogen) leaving potassium deficiency for the clover.

Figure 2 compares clover yields on all fertilizer and lime treatments where potash was applied to the clover. Good clover yields occurred on the areas receiving potash to the clover and potash and nitrogen (and lime where ammonium nitrate was used) to the grass. Before this, only fair yields were obtained. When ammonium nitrate was the nitrogen source, lime was needed for good clover yields. Liming was not needed for good yields where nitrate of soda was the nitrogen source.

Following four annual applications of 400 pounds nitrogen as ammonium nitrate and no additional lime, soil pH had dropped from 6.5 to about 5.0. Where the same amount of nitrogen as nitrate of soda was used, the soil pH was 7.0. When nitrate of soda was used and potash omitted, liming decreased clover growth. Liming seemed to increase potash deficiency where nitrate of soda but no potash was used.

CONCLUSIONS

(1) When crimson clover is grown on highly productive Coastal bermudagrass sod, potash should be applied to both grass and clover.

(2) Lime is needed for good clover growth to reduce strong soil acidity caused by acid-forming nitrogen fertilizer applied to Coastal bermuda.

(3) Ample potash application should go with liming.

(4) Crimson clover can be grown on Coastal bermudagrass sods following high grass production if potash and lime requirements are met and good management practices are followed.

The End

From Page 27

(3) Considering all the elements collectively, look for a primary cause for below or above normal testing elements. (Frequently a deficiency in one element may result in low or high levels for others).

(4) Concentrate on major elements in preference to micronutrients unless there is substantial evidence that a micronutrient may be a primary cause.

(5) In the initial analysis, consider deficiencies in preference to excesses. (Excess can be related to either improper fertilizer treatment, low soil pH, poor drainage, or contamination).

(6) Include in the evaluation all information available—such as soil test results, fertilizer treatments applied, visual appearance, cultural practices employed, etc. (Failure to include all the facts can lead to false conclusions and ineffective corrective treatments.)

(7) When initiating corrective measures, use recommended or proven practices.

A plant analysis is only one evaluation of a problem area. To provide a logical sequence of procedures, Ohio farmers are instructed to consider the following:

EIGHT STEPS TO NUTRIENT SUFFICIENCY

(1) Soil test.

(2) Follow recommendations given in the soil test.

(3) Observe visual appearance, color, rate, and character of plant growth.

(4) Plant analyze, following current sampling instructions.

(5) Determine yield and quality.

(6) Evaluate results from soil and plant tests, visual observations and yield.

(7) Make adjustments in fertilizer treatment if necessary to correct deficiencies.

(8) Base corrective adjustments on proven and recommended practices.

The End

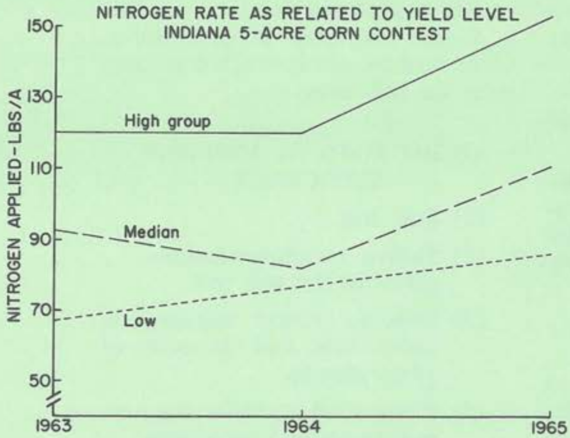
18

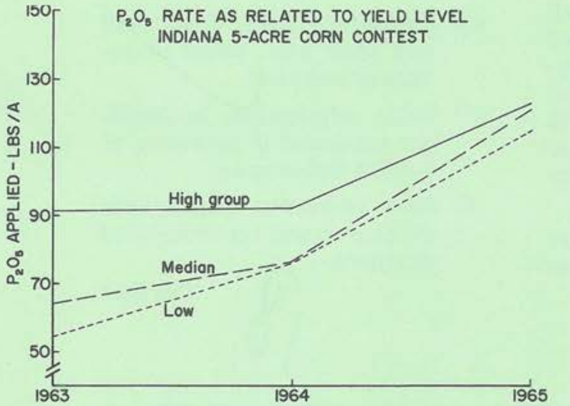
YOU CAN'T AFFORD NOT TO!

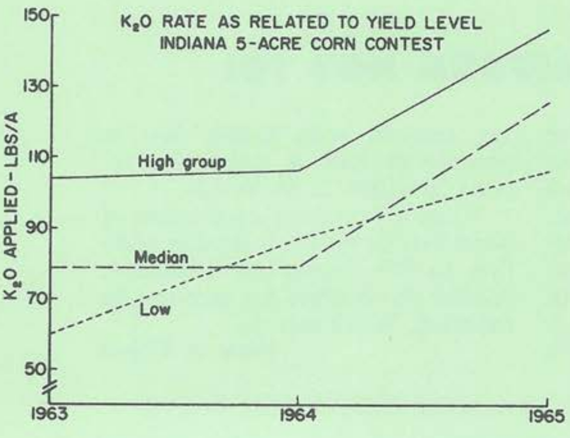
When can you afford to fertilize your corn? That would be a lot easier to answer if you had some idea of the probable return on your fertilizer investment. At the University of Wisconsin, a row treatment of 200 pounds per acre of 5-20-20 has been found to give a consistent yield boost of 15 bushels per acre in soils testing low in phosphorus and/or potassium, reports Specialist L. M. Walsh.

When a broadcast application of phosphate or potash is used in addition to the above row treatment, another five bushels per acre can be expected, Walsh reports.

Farmers Digest







CORN CONTEST SHOWS

"THE FIRSTEST with THE MOSTEST"

Top-yield farmers are like all other top-notch folks: "the firstest with the mostest."

Dr. M. L. Swearingin's (Purdue) summary of cultural practices used by selected contestants in Indiana's 5-acre corn contest reveals that high-yield growers use high-yield management. They plant earlier, drop more kernels, apply more fertilizer, etc.

Among the management practices used by the top group were these steps . . .

- **higher fertilization rates.**
- **increased use of side band applicator.**
- **earlier planting dates.**
- **higher plant populations.**
- **fewer tillage trips and cultivations.**
- **more use of narrow rows.**
- **more use of soil insecticides with better results.**
- **more use of preemergence herbicides with good results.**

	LOW GROUP	MEDIAN GROUP	HIGH GROUP
1963....................	Below 115 bu/A	155-157 bu/A	Above 200 bu/A
1964....................	21-93 bu/A	118-124 bu/A	182-212 bu/A
1965....................	70-115 bu/A	156-158 bu/A	199-234 bu/A

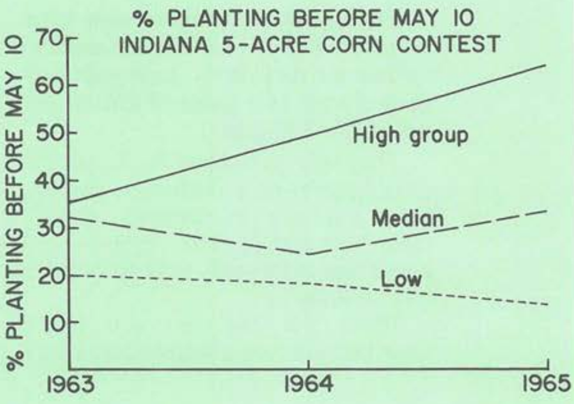
Purdue summary by Dr. M. L. Swearingin shows sharp differences in low, median, and high groups.

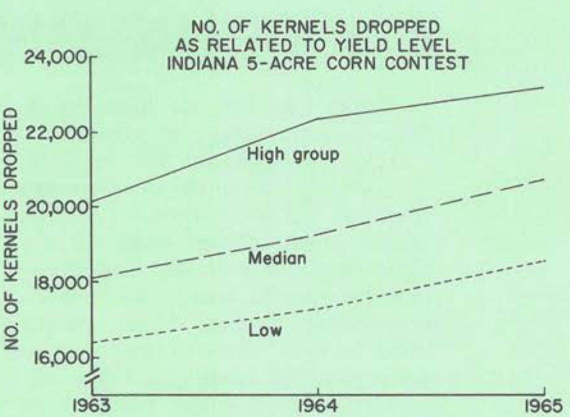
Three hundred field record sheets were summarized; that is, 100 samples each from the low, median and high yield groups of contestants. Since not all contestants completed and returned field record sheets, this approaches, but does not coincide exactly with the low, median and high hundred entrants in the contest each year.

These tabulations are to be considered only as a summary of practices used and not as research information from which cause and effect conclusions may be drawn. The summary does indicate certain trends and substantial differences in practices used by entrants, as reported by themselves, when grouped according to yield.

The contest yields which made up the high, median, and low yield group each year are shown in the table above.

The End





PRACTICING WHAT THEY PREACH

The Jackson Brothers of Johnson County, Georgia, are in a better than usual position to practice what they preach, University agronomist P. J. Bergeaux reports.

The two—W. R. and J. L. Jackson—own and operate a bulk blend fertilizer plant and lime spreading service in Wrightsville. They advise all their customers to use soil test recommendations as a guide to the amount of lime and fertilizer they use.

The Jackson Brothers also farm and they follow soil test recommendations on their farm. Last year they picked over two bales of cotton per acre from 230 acres.

They say you have to know the fertility level of a particular soil before you can intelligently choose what lime and fertilizer to use—and a soil test is the only way to get this information.

When the Jacksons soil tested their farm before planting last year's crop, they found they did not need any lime. This did not surprise them because they had applied a ton per acre the year before. But the soil test did show potassium would be more of a limiting factor than phosphorus.

So, they applied only 60 pounds of phosphate while using 100 pounds of potash. They put out this fertilizer before planting. After the cotton came up to a stand, they applied 100 pounds of nitrogen per acre.

The cotton was planted in a skip-row pattern, Mr. Bergeaux said. Insects were kept under control with insecticide applications based on scouting reports.

"This combination of recommended practices and good management is resulting in high yields profitable to the growers," Mr. Bergeaux said. "The Jacksons are demonstrating that cotton is still a good crop for Georgia growers."

Georgia News

ALFALFA TAILORS AT WORK

Alfalfa breeders are tailoring alfalfa to suit a variety of purposes.

Take Narragansett for instance. This variety was in the development stage at the University of Rhode Island when a hurricane struck. Surviving plants in the agronomy plots became the ancestors of today's best-selling variety. Some people think its only virtue is resistance to salt water, but amazingly it has outperformed most other varieties on Vermont farms and tolerates wet sites better than any other alfalfa.

Now Cornell scientists have taken steps to elimininate Narragansett's weaknesses. Low seed yields have made it more costly to buy. Result? A selection called Mark II, now on sale in limited quantity.

Narragansett lacks wilt resistance. At Cornell they are working on a wilt-resistant Narragansett so far labeled WRN. After snipping out the poor seed producers and those lacking wilt resistance, they may decide to add more leaves by crossing it with one of the new multileaf alfalfas now on trial.

Vermont News

TOOLS TO TELL AND SELL THE FACTS

NEWSLETTERS

FOR EASTERN STATES

Down Corn Cuts Profits—E-123
Alfalfa Will Win—E-125
Fertilize This Fall—E-126
Corn Silage Potential—E-127
Is Your Turf Behind?, E-128

FOR SOUTHERN STATES

Silage—S-135
Stretch Moisture with Fertilizer—S-137
More & Better Cotton—S-142
Pasturize Your Feed Supply—S-144
Know Your Usage—S-145
Soybeans For The South—S-146
Is Your Turf Behind?, S-147

FOR MIDWESTERN STATES

Nitrogen-Potassium Teamwork—M-122
Fertilizer and Lime Carryover—M-123
Corn Silage—M-124
Ten More Bushels of Soybeans—M-125
Midwest Fertilizer Usage—M-126
Fight Hidden Hunger With Chemistry—M-127
Winterize Your Crops—M-128
Corn Lodging—M-129
Lime—A Blue Chip Investment—M-130
Plant Early—M-131
Narrow Rows—The 1860's—The 1960's—M-132
Top Profit Yields—M-133
Two Extra Tons Alfalfa—M-134
Fall Fertilization—M-135
How Potassium Works For You—M-136
The Modern Concept of Fertilizer Use—M-137

FOR FAR-WESTERN STATES

Forages and Pastures—W-29
Cotton—W-30
Roles of Potassium in Plants—W-31
Potash in Fruit Quality—W-32

REPRINTS & FOLDERS

How To Get Good Soil Samples, JJ-12-58
Know What's In Your Fertilizer Bag, Q-11-59
Turf Grasses Need Lime & Fertilizer, H-10-61
Apple Nutrition Can Be Multiple Challenge, K-10-61
Peach Nutrition, L-10-61
Fertilizing Western Orchards, M-10-61
Why Citrus Needs Nutrition, N-10-61
Get Top Cherry Production, R-10-61
Applying Fertilizers To Orchards, S-10-61
50 Bushels of Corn Per Hour, U-12-61
Row & Broadcast Potassium At Work on Corn, A-1-62
How Fertility Level and Balance Can Affect Corn Production, C-3-62
Role of Fertilizer on Corn Diseases, D-3-62
When Corn and Soybeans Need Potash, E-3-62
Dark Green and Fat, F-3-62
Yield and Uptake of P_2O_5 & K_2O in Alfalfa Fertilization, H-7-62
How Testing Tells, K-10-62
Grass or Grass Clover? L-10-62
Nitrogen Potassium Teamwork on Forage Composition, B-6-63
Guide for Corn Needs . . . Plant Analysis, D-6-63-62
Speed Alfalfa Adoption With Fertilizer, E-6-63
Quality Alfalfa Management, G-6-63
Pasture Problems Into Profits, 1-6-63
Potassium At Work On Filbert Yields—And Profits, K-12-63-62
Improving Soil Test Calibrations, M-8-63
Cotton Is Money, N-8-63
Winterize Your Alfalfa Roots, O-8-63
Agriculture A Declining Industry, P-10-63
Potassium Use On Turf, Q-10-63
More Corn Profits From Right Fertilizer Application, R-12-63
Dr. Writer and Mr. Talker, S-12-63
Fit Lime To Plowing Depth, A-1-64
Fish and Horse . . . or Modern Corn Methods, B-1-64
Potassium Helps Bluegrass Face Hot Summer, C-3-64
Ask The Plant With Chemistry, E-5-64
Ask The Soil, F-5-64
Potash Hunger In Lemons, F-8-64

API Order By Code On Facing Page

TOOLS TO TELL AND SELL THE FACTS

Corn Yields with Precision and Ease, G-5-64-63
Scientists Can Be Press Agents—Too!, H-8-64
People Make Forage Pay, I-12-64-F
Snap Beans Snap Back With Potash, J-12-64-F
Alfalfa Needs Potash, K-12-64-F
Test Undried Soil Samples, M-10-64
Is Crude Protein Too Crude?, N-10-64
Animals Need Potassium, Too, O-10-64
Potassium in Animal and Human Nutrition, P-10-64
Keep Bermudagrass Healthy, B-1-65-F
Tomatoes Can Tell Their Needs, A 1-65-F
The Challenge and Outlook for Alfalfa, C-1-65-F
Phosphorus-Zinc Relations In Corn & Sorghum Production, E-1-65
Be a Diagnostician, F-5-65-F
Potash Needs Show On Grape Vineyards, G-1-65-F
N-K Means Profit Corn, H-3-65-F
Beat The Weather—Fertilize This Fall, I-7-65-F
Consider Plant Food Content of Your Crops, J-5-65
N-K Teamwork For Peaches, K-3-65
Potassium Fertilizer Affects Yield & K Content of Alfalfa, L-Su-65
Why Potatoes & Onions Need Phosphorus & Potassium On A , M A-65
Know The Plant Food Your Corn Removes While It Grows—B-63
Potassium In Soils, Crops, Fertilizers, N-A-65
Will Tomorrow's Grower Gamble With Hidden Hunger, O-W-66
How High Are Top Yields, P-W-66
How Much Does Applied Potassium Move, Q-W-65
Make Money With Clover-Grass Pastures, R-W-65
Grow Strong-Stalk Corn With Potash, S-W-66
Put Kuality In Your Lawn, A-1-66

WALL CHARTS (16 x 21 Size)

Plant Food Utilization, WC-1
Potash Starved Legumes, WC-2
Cotton Rust Is Potash Starvation, WC-3
Corn Starvation Symptoms, WC-4
Soybeans Get Hungry, Too!, WC-5

IDEA MAILER CARDS

Plan for "Full-Feed" (corn color card), C-1
How To Check Corn Stands Quickly: Simple Corn Arithmetic, C-2
Overdrawn—Small Increases Pay for Potashing Costs, C-3
Plant Food Utilization, C-4

FACT SHEETS (8½ x 11)

Soybeans Get Hungry, Too!, FS-1
Prevent Potassium Deficiency in Your Corn & Soybeans Now, FS-2

HANDBOOKS

Know Your Limiting Factors In Crop Production, A-1-60
Forage Fertilization Pays, F-12-60
Orchard Fertilization Pays, G-8-61
Plant Testing, G-5-62
Moisture and Fertility, A-1-63
Fight Hidden Hunger With Chemistry, D-5-64
Nitrogen-Potassium Teamwork, N-K-T
Potassium For Agriculture, 3-1-56, Rev. 3-66

NEWSPAPER AD MATS

Do You Grow 150-Bushel Corn?, M-1
Corn Silage—How Much Plant Food, M-2
40-Bushel Soybeans Need Phosphate & Potash, M-3
Soybeans Get Hungry, Too!, M-4
Don't Treat Your Soybeans Like A Red-Headed Stepchild, M-5
Winterize Your Alfalfa, M-6
Topdress Time, M-7
Know Your Cotton Fertilizer, M-8
Know Your Coastal Bermudagrass, M-9
Are Leftovers Enough?, M-10
Why Fight Spring Weather, M-11
Winterize Your Legumes, M-12
Nice Things About Potash, M-13
Beat A Wet Spring—Fertilize This Fall, M-14
Don't Let Your Corn Run Out of Gas, M-15
Balance Your Soil Bank Account, M-16
Know Your Hay-rithmetic, M-17
Beautify Your Lawn, M-18
Pasturize Your Feed Supply Now, M-19
If Corn Lodges, is K Too Low?, M-20

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