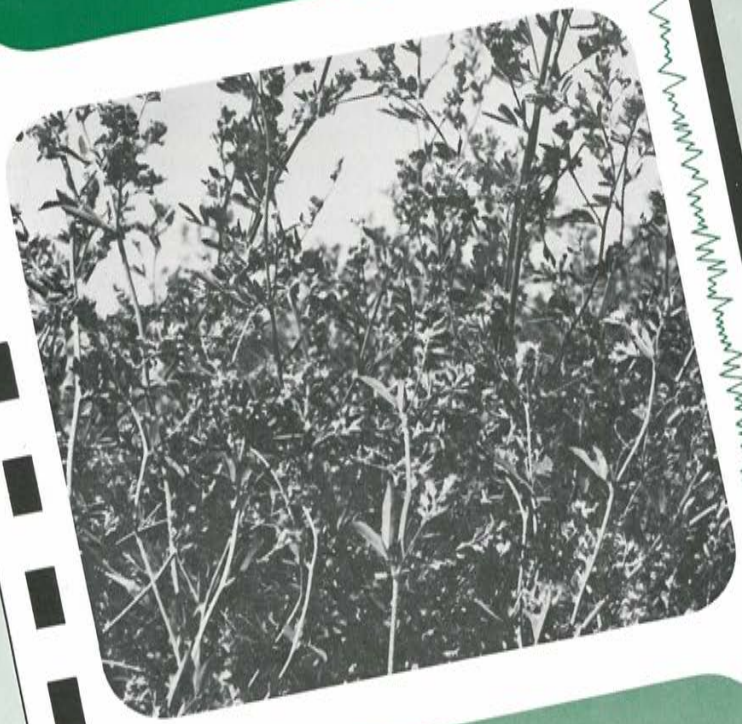
Better Crops

WITH PLANT FOOD

May - June, 1960

20 Cents



GROWING ALFALFA SUCCESSFULLY

NEW POTASH INSTITUTE MOVIE FEATURES LATEST TECHNIQUES IN GROWING ALFALFA— PLUS TIME-LAPSE SCENES TO SHOW HOW THE PLANT ACTUALLY FEEDS AND GROWS.

SEE PAGE 20

Better Crops
WITH PLANT FOOD

The Whole Truth—Not Selected Truth
$1.00 for 6 Issues, 20¢ Per Copy

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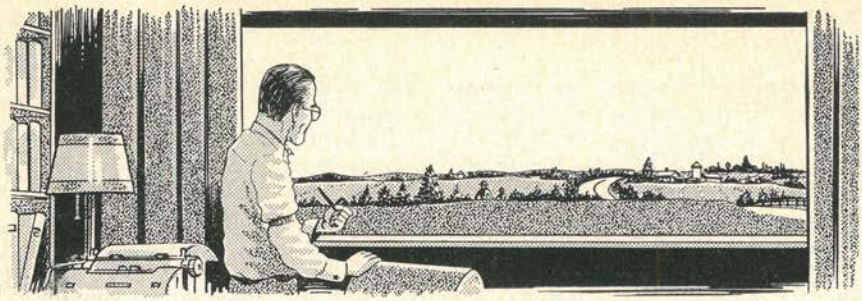
ON THE COVER

. . . GROWING ALFALFA SUCCESSFULLY is the title of a new movie just issued by the American Potash Institute . . . treating the crop the U. S. Department of Agriculture has called "more nearly a perfect forage crop than any other crop in this country."

SEE PAGE 20 FOR DETAILS



Agriculture still needs its

Agents and Teachers

Jeff McDermid
(ELWOOD R. MC INTYRE)

FOR many happy years I've reported the meetings of the national association of county agricultural agents and the "NVATA", the organization of vocational agriculture teachers.

No ribbon-tearing, rat-tat-tatting key puncher by night in lonesome hotel rooms has taken on a more pleasing and informative role than that. Both of these well known educational units have planned programs of high professional value, lightened with fun and competition. Reporting them is stimulating.

This sharpened the wits of these agricultural college graduates whose paths of duty took them along parallel lines. Members of both associations were dedicated to youth and to mature adult service—with the county agent serving largely the grown men and the vo-ag teachers largely the rising generation.

This side-roads scribe first set forth with a folding Corona and a flashless 3-A brownie kodak (call 'em outside in the sun for a group grimace). I practiced on the regular farmers' rip-roaring sessions of over 30 years ago. Few high schools gave agricultural instruction back then. County agents were the chicken-culling, hog-vaccinating, lamb-docking itinerants. They lived laboriously (dedicated men) for $1,500 a year before group action and local leadership transformed our farm extension system for us.

Those were the primitive times just before agriculture began to remedy their recessions by cooperatively processing, storing, and marketing their cashable commodities and to quit paying tithes to the shrewd country stock buyer and the small, inefficient cross roads creameries. As that era of change broke over us in our hamlets and town halls, farmers saw the light and began to adjust to the different fashion of farm salesmanship.

Most of them did it on careful recommendations from college economists and few relied for long on those barn-stormers, Aaron Sapiro and A. C. Townley. Along with this innovation in rural ways came the county agent and the high school ag departments.

Of course, nobody visualized another upheaval in the wake of inflation—when farmers would be fewer, acreages larger per man, with much less room for willing youth to stay on farms.

It's just that dilemma that prompts a lot of us older wiseacres to wonder why the NVATA and the NACAA don't really have a nice big union meeting. They could tighten their belts and snap into a discussion of their misgivings and miseries.

To a lot of us who lived through some of the hair-raising elections of times gone by it seems passing strange why we no longer rely so much on the power of the farmers' ballots. Farmers find themselves a petered-out minority group. At the same time they have a whole passel of botheration and disturbance to avoid ahead —if they *can* in the shape they are in.

Taking stock of mutual dilemma and dismay, one expects that the folks who follow the farm indirectly for a living ought to insist on team work. That means the vo-ag instructors and their cousins, the agricultural agents. Many of the land-grant colleges harking back in pride to the Morrill Act have mighty small enrollment in their prime divisions teaching agriculture.

Anyone half informed can tell you that the future of our state agricultural colleges and of vocational agriculture is closely related. One authority has said that the colleges should make it a practice to encourage farm youth to take vo-ag courses in high school. Some of them do. Others prefer to have farm boys take the usual college entrance program and short-cut vocational training. Some land-grant colleges maintain good "short courses", claiming they do not interfere with the high school enrollments.

Broader than this assumption is the belief of some that any agricultural education for a life career is a waste of time, in view of the lower incomes currently noted and the constant hassles over this or that federal farm program. Such a situation affects student attendance at the college or the high school with agriculture as his major.

I have found in my fairly close associations with the extension system and the vo-ag courses that cooperation prevails in most cases, and many vo-ag workers have been proficient enough to be elected county agents by observant agricultural committees. Changes in the other direction are not so common—but they could be very constructive.

Recently there was some professional discussion about the ability of former vo-ag students getting good marks in agricultural college. I am told that since 1929 at least 32 investigations on that subject have been conducted. To get results of honest worth, they took the records of nearly 18,000 students in 20 states.

About 54% of the total studied showed that the vocational-trained group did somewhat better than the non-vocational students. Another 36% did just as well, while the last 10% of the vo-ag group did worse than the fellows not having such advantage prior to college.

This leads educators to believe vocational agriculture is equal to other high school projects in preparing for college. Given a strong, qualified vo-ag teacher, a boy's constant exposure to the varied class work gives him incentive to choose a good college of agriculture for his degree.

I believe in the old "saw" that the peacemaker is sure of reward. Recently a university teacher of agricultural education has listed reasons why these important groups of educators and community leaders need each other for their own and the public welfare. Mutual benefit is almost certain.

Teachers of vocational agriculture need the agricultural college for three vital reasons, he claims. They need them (1) for a source of teachers, (2) for the technical information made available to them, (3) for the services performed for them.

In turn, the agricultural colleges need the vo-ag people because the teachers are in close, constant contact with prospective college material. Such teachers can develop favorable attitudes toward agriculture as an occupation at the high school level. And the colleges find that the high school ag departments disseminate the latest research conclusions through exhibits, journals, books, and films.

The little mistakes and differences of opinion, the stubborn refusal to meet for frank discussion without prejudice—such things blow up and disappear when good men and true meet to share each other's views. It would be a sad day indeed for all forms of agribusiness if the two great educational and leadership forces in our field got tangled up in mistrust and failed to plan a united convention.

So I stand at my big bay window and watch for the vo-ag instructor to drive along my road. When he gets here, I'm all set to grant him a preview of this saucy suggestion. He is a state association director and might have some influence. Next, I'll go into town and tackle the county agent.

This is no time to stay ornery. We should keep cool if we meet the challenge of change as agricultural brothers must.

THE END

A GREAT LOSS

"Over the years science in the world has suffered a great loss, the loss of the amateur. Time was when the amateur led the field and won all of the prizes in science.

"Darwin gained his living as a member of the great family of English potters, the Wedgewoods.

"Mendel was an Austrian monk who discovered the principles of inheritance in plants and animals. Many of our modern varieties of plants and animals would not be on hand had not Mendel 'played' with peas in the monastery garden.

"Leeuwenhoek, who first saw bacteria and other germs with his 'do-it-yourself' microscope, was a Dutch lace merchant.

"In this day of cyclotrons, Benjamin Franklin's kite and key may seem premature tools of science but they proved his point. Franklin's fame rests not on the key and the kite. He is remembered as an amateur scientist because he possessed the basic requirements—the curiosity of a child and the persistence of an adult.

"His inquiring mind, his mastery of intelligent observation, his ability to think and to express his thoughts remain hallmarks of the scientist today. On these the professional has no patent.

"But alas! The amateurs are gone, replaced by professionals, and many fields of discovery lie fallow because the amateurs have deserted us. I bespeak their return.

"Most of the professionals are glad to help amateur scientists and other experimenters track down new knowledge. Both can gain. For the wise investigator has learned to weigh the folklore and the fancy as well as the facts before he undertakes a new line of inquiry."

Dr. James G. Horsfall, Director
Connecticut Agricultural Experiment Station

By N. D. Morgan
Shreveport, Louisiana

PLANT TESTS AND PLANT TISSUE TESTS

PLANT TESTS

THE nutritional problem of plants is being approached by two important types of tests—soil tests and plant tests. Soil tests give an estimation of the essential plant food elements available in the soil for plant use and should be used extensively.

However, the final answer to plant nutrition should come *from the plant*. Consequently, many agriculturists in this and other countries are using plant analyses as aids to the fertilization of crops.

Plant analyses may be made in a chemical laboratory or in the field. These laboratory tests are usually referred to as "plant analysis" or "leaf analysis". The field tests are usually referred to as "plant tissue tests" or "quick tests".

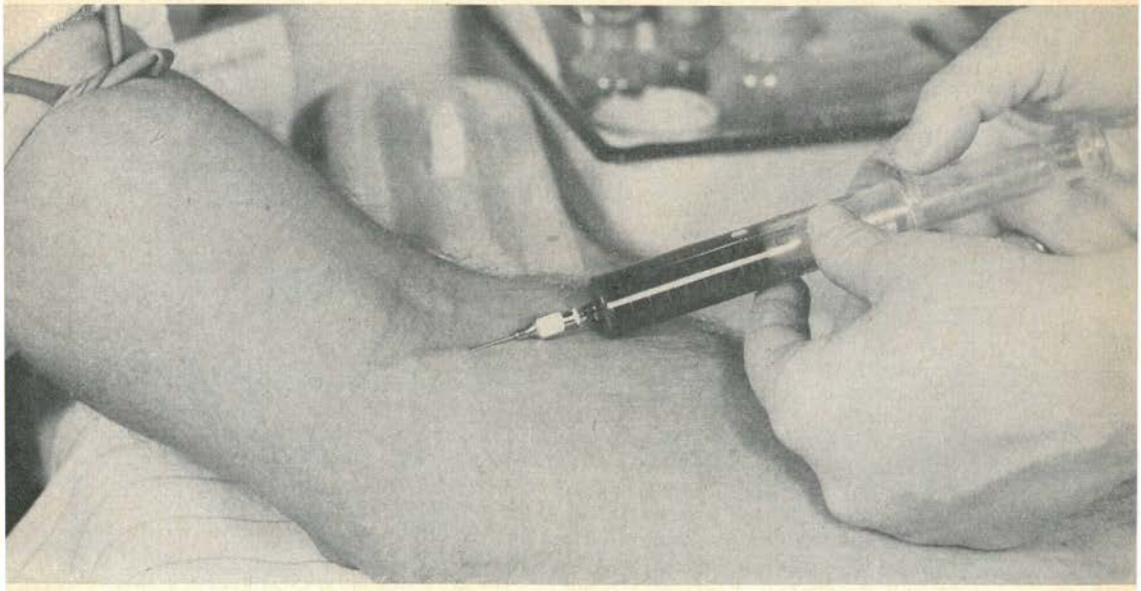
Naturally, the tests in the laboratory are more accurate but the field tests are very useful in determining if the plant has been well fed. In using plant analysis (in the laboratory or in the field) as a guide to fertilization of crops, a foundation for using these tests must be carefully established. Each crop and each nutrient is a special problem, but once the basis for evaluating the nutrient status of a crop has been established, the same system can be used reliably over a wide range of soil and climatic conditions.

When the quantities of the essential plant food elements necessary for normal growth and production have been established along with the critical nutrient levels, it is a simple problem to analyze the plant in question and compare with the established nutrient levels to determine the degree to which the plant has been properly nourished or fertilized.

In other words, when the nutrient concentrations of the plant in question are above the critical level and remain there throughout the entire growth period, there is very little chance of a growth or yield response from the addition of more nutrients. But, if the nutrient concentrations of the plants fall to or below the critical level, the chance of a growth response increases rapidly as the nutrient concentrations decrease.

WHAT PART TO TEST

In selecting a part of the plant to test, *the leaf or petiole of the leaf is usually*



. . . to the plant what blood tests are to man

the most reliable, because the leaf plays such a vital part in the nutritional processes of the plant. It is in the leaves that the plant food elements are gathered and used in manufacturing the various plant products.

The very high crop yields expected and needed by farmers today for economical production makes the problem of plant nutrition a major factor in agriculture. Leaf analyses are becoming much more of a needed guide to use in determining if crops are being adequately fertilized.

For example, cotton producing two bales per acre will make a much greater demand on a soil for plant food elements than cotton producing one bale per acre. The demand will be further increased if the cotton makes three bales per acre. The need for the essential plant food elements by a very highly productive plant is terrific at the time it is in full production. Through leaf analysis, a person may determine if the plant was well fed, or if it fell to or below the critical level of plant nutrition.

THE BEST INDICATOR

The plant itself is the best indicator of the availability of the elements in the soil vital to its nutrition under the conditions which it is growing, since it is the plant that extracts those elements from soil and utilizes them.

The time and method of taking leaf samples for laboratory tests or field tests are important steps in the process. It is generally agreed that samples taken too early in the season or too late in the season do not give a true picture of the nutrient supply situation under which the plant is growing throughout the season.

The plant should certainly be checked at the time of the greatest demand for plant nutrients to see if it is adequately supplied at that time. The time of day for testing or taking samples is also important.

Although there are a number of apparently satisfactory techniques in selecting the leaves to be tested, it is of greatest importance to gather leaves of the *same approximate age* and *from the same relative position.* Recently matured leaves are used in most cases.

Many times when a plant is not performing as it should in the field a leaf analysis may give the answer. The test will supply information as to whether the problem is nutritional or some other factor.

If a person desires to have a laboratory

chemical analysis made of a plant or plant part, he should send the sample to an official state laboratory or to a reputable commercial laboratory equipped to make the determinations needed for determining the nutrient status of the plant. If a plant-tissue test is desired on the crop in the field, he should contact some reliable person who has had experience along this line.

PLANT-TISSUE TESTS

Plant-tissue tests are easy to make in most cases, but the real problem is in the interpretation of the results you get. They are to the plant what blood tests are to man.

Tests for nitrogen, phosphorus, and potash are made on the plant tissues to see if the plant sap has any unused nitrogen, phosphorus, or potash. As long as there are any of these unused plant food elements in the sap the plant is not starving for that particular nutrient.

A test for N, P, or K alone means very little. A check for *all three elements* is absolutely necessary before the proper interpretation can be made. If any one of these plant foods becomes limited in the plant, there may be an accumulation of one or both of the other elements. That is, if the test shows nitrogen to be absent, phosphorus and potash may be found in the plant even though the soil is very low in these elements. The reason for this situation is that the plant was unable to use the phosphorus or potash, or both, due to the lack of nitrogen, resulting in an accumulation of the unused elements in the plant sap.

NITRATE TEST

The nitrate test may be made by placing a very small amount of Brays' nitrate powder on a filter paper previously prepared for these tests and expressing plant sap on the powder. In the presence of nitrate, the powder turns pink to reddish depending on the amount of nitrate in the sap.

This test may be made directly on a plant such as a cut corn stalk where the powder is applied to the cut and moistened with the sap.

With older cotton plants, there is a pinkish or reddish pigment which may mask the true nitrate reading on the test paper. To avoid this trouble, select leaf petioles, usually two, and mash with pliers a small portion of the end of each petiole which would give the equivalent of ⅛ teaspoonful of macerated tissue. Place mashed ends of petioles into a glass vial with about 5ml distilled water. After stirring for about one minute, add Brays' nitrate powder, allow to stand for about five minutes and read according to color developed.

Color range is from *white*, for no nitrogen; *light pink*, for low nitrogen; and *cherry red*, for high nitrates.

PHOSPHATE TEST

The phosphate test may be made by expressing plant sap on the filter paper and adding one drop of P-K reagent 1 (Denham Laboratory Reagent). Then add one drop of phosphate reagent 2 (stannous oxalate in distilled water) to develop a blue color which will be in proportion to the phosphate in the plant sap.

In the case of the cotton plant and in many other cases, it is more desirable to use vials containing 5ml P-K reagent and mash leaf petioles as described above for nitrates. Stir tissue for one minute. Add phosphate reagent 2 or use tin strip to develop blue color. The tin strip is preferable. The addition of too much phosphate reagent may alter correct color.

POTASH TEST

The potash test is made by squeezing a little sap from the cut end of the plant material onto each of the "dipic" spots on the filter paper previously prepared for this test. Allow about 30 seconds for reaction. The excess "dipic" is then washed off with a weak acid as P-K reagent in Plant-Aid-Test Kit, Denham Laboratory, and the remaining orange color indicates the potassium in the plant sap.

If there is no orange color remaining in any dot, the plant is very low in potash—extreme deficiency.

If the orange color remains only in the lower dot, (1000 ppm), the plant is low—deficient.

If the orange color remains in dots 1 and 2 (1000 and 2000 ppm) the plant sap is medium in potash and this amount is usually considered sufficient for normal yields of most agronomic plants,

—CONTINUED ON PAGE 13

COLOR FOLDERS FOR YOU TO DISTRIBUTE AND USE IN TEACHING • AT MEETINGS • FOR EXHIBITS

FOLDER C-59

Do you want to prevent hidden hunger in crops? If so, this folder will acquaint you with that all-important hidden hunger zone on the yield curve and how to deal with it. It points out how crops often do not show definite deficiency symptoms but still need extra plant food.

FOLDER E-59

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FOLDER B-59

Here is shown the role of potash on yield and quality. How much potash certain basic crops take from the soil in a year. How heavy nitrogen treatment can cause crops to use up available potash *fast*. How potash affects quantity, quality, drought and disease resistance.

FOLDER D-59

This folder capsules plant food corn absorbs during different periods of its 4-month growing season—the minerals used by corn producing 100 bushels per acre. It shows what corn ears look like when they suffer from shortages of nitrogen, phosphate, and potash.

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FREQUENCY OF POTASH APPLICATION?

AN ILLINOIS TEAM GETS INTERESTING RESULTS IN A ROTATION EXPERIMENT

THE effect of muriate of potash (0-0-60) applied broadcast *every second year* has been compared with applications *every fourth year* on potash deficient Cisne silt loam at the Toledo experiment field in Cumberland County, Illinois.

In a rotation of corn, soybeans, wheat, and mixed hay, yields have been secured (1) without potash, (2) with 100 pounds of K_2O per acre applied ahead of each corn and wheat crop, (3) with 200 pounds of K_2O applied ahead of corn, (4) with 200 pounds of K_2O applied ahead of wheat as shown in this table:

Eight-year Average Yields 1951—1958

Potash Treatment[1]	Average acre yields			
	Corn	Soybeans	Wheat	Hay
	bu.	bu.	bu.	tons
No potash	28.6	13.2	27.4	1.61
K_2O 100# on corn, 100# on wheat	70.6	24.4	31.9	2.37
K_2O 200# on corn	73.2	25.3	33.4	2.30
K_2O 200# on wheat	73.9	24.9	34.3	2.44

[1] The entire area was limed and phosphated. All potash broadcast.

The potash caused average yield increases of 44.0 bushels of corn, 11.7 bushels of soybeans, 5.8 bushels of wheat, and .76 tons of hay for the 8-vear period.

In comparing different times of applying potash in the rotation, the average yields of corn, of soybeans, and of wheat were slightly lower when the potash was applied twice in the rotation than when it was applied only once.

Average hay yields were highest when potash was all applied ahead of wheat and lowest when all was applied ahead of corn. However, these differences were small. Corn yields and bean yields were low because of drought in 1954 and extremely wet conditions in 1958.

This long-time experiment on Cisne silt loam indicated that a single broadcast application of 200 pounds of K_2O applied either ahead of corn or ahead of wheat is as effective as 100 pounds of K_2O on each of these crops in a four-year rotation of corn, soybeans, wheat, and mixed hay.

THE END

(P. E. Johnson, L. B. Miller, A. L. Lang)

POTASSIUM IN THE SOIL

By J. J. Healey

In Biatas, the Beet Grower

POTASSIUM, being one of the major nutrient elements, is required in an available form in very large amounts in the soil by plants, particularly crops such as potatoes and sugar beets, which contain a high amount of sugar and starch.

It is necessary for:

1. the formation of carbohydrates and their movement within the plant.
2. the synthesis of protein.
3. the development and growth of cells.
4. to neutralize organic acids produced abundantly within the plant.
5. to determine color, flavor, and size of fruit, etc.
6. resistance to disease.
7. reduction in tendency of cereals to lodge.
8. counterbalancing effects of low temperature — soil moisture — poor soil structure, and adverse weather conditions.

In the soluble and exchangeable forms it is readily absorbed by plant roots and transferred rapidly within the plant itself.

At the formation of fruit, reeds, root, etc., it is transferred rapidly from the leaves as required. It is such a mobile element that cereals lose a proportion to the soil at maturity and losses of potassium from the leaves themselves occur in periods of heavy rain.

Natural supplies of potash are quite considerable in our soils in the form of feldspar and mica. These are in the form of aluminosilicate compounds, which are turned into available forms by weathering.

Only very small amounts are got in solution in soil water at any time, but when present in a fairly good supply it seems to be readily available to the plant.

This exchangeable form is got in the clay colloids and is clearly connected with humus. Heavy clay soils generally have higher amounts of available potash than light acid sandy soils, since clay is the major source of the available element.

In turn, peat soils can show, and generally do, a serious deficiency. Most soils, except the peat and sandy, often have up to 2 to 3% potash, *but most forms of it are not available to plants*. Generally, however, some occurs in an available soil-water soluble form—some highly insoluble and some in intermediate forms to these former types.

Clay minerals and organic matter have a certain exchange capacity, and potash constitutes 1 to 3% of this. These exchangeable forms become a reservoir of plant food built up by plant residues—humus—fertilizers—farmyard manure—liquid manure, etc.

Unfortunately, however, it repre-

sents only a very small percentage of the total present and it is an accepted fact that exchangeable potassium is the dominant available form in well drained soils, but in mineral soils generally it is less than 1% of the total.

Soils may contain from 40,000 to 50,000 lbs. per acre, but the amount of this in an exchangeable form may be only a few hundred pounds, or lower. In turn, the soluble potassium is again only 1 to 5% of the exchangeable, so that 10 to 20 lbs. per acre may be got generally. It is fortunate that a law of equilibrium exists, and is set up between the soluble and exchangeable, so that:

(a) If the soluble is reduced by cropping or leaching, it is immediately followed by a build up again from the exchangeable. . .

(b) When a soluble potassic fertilizer is added there is, in turn, a transfer to the exchangeable to maintain the equilibrium but at a higher available potassium level.

Fixation

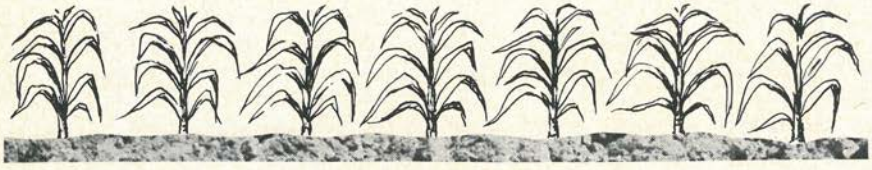
Fixation of potash in our soils by clay minerals is common but not always a disadvantage. It is not fixed as inert iron or aluminum compounds as in the case of phosphate, and should not be regarded as a total loss.

Some immobilization of potash may be an advantage as it adds to the soil reserve, and in fact reduces the loss of potash by:

(a) Leaching.

(b) Excess absorption or luxury consumption by the plant over its needs when the soluble potassium is too high.

Incidentally, this latter action by the plant would reduce the uptake of calcium and magnesium. Fixation of potash in fact is best regarded as a build up of that which might otherwise be lost.



BEING ONE OF THE MAJOR NUTRIENT ELEMENTS

"A deficiency of potash may be slow to show itself visually and a serious reduction in yield or even a failure may occur without the real reason being known. This is unfortunate, as only a soil and plant analysis will show it, and I am afraid it is more prevalent than we think. By the time symptoms are seen, production has been seriously lowered already, and an immediate application can only minimize some of the losses."

In general, then, 1% of a total exchangeable present is in soluble form in the soil water. This can be built up to 5% or more, dependent on applications given, while the remainder is absorbed in the soil particles, where it is replaceable by neutral salts to become available. To this end a build up of organic matter is very desirable.

Deficiency Symptoms

A deficiency of potash may be slow to show itself visually and a serious reduction in yield or even a failure may occur without the real reason being known.

This is unfortunate, since only a soil and plant analysis will show it, and I am afraid it is more prevalent than we think. By the time symptoms are seen, production has been seriously lowered already, and an immediate application can only minimize some of the losses.

In America it was found, where Lucerne and clover were sown with grass, that the legumes just disappeared without showing any symptoms that potash deficiency was the cause. Where symptoms appear they are usually seen first as a yellowing of a section at the edges of the leaf. Then the area spreads as the edges die, and give a scorched appearance. Finally, the whole of the leaf dies.

These symptoms are first seen in the older leaves, since the greatest demand for potash is at the growing points and in young leaves to which it is transferred from the older.

Deficiencies are most prevalent on sandy soils where the natural supply is low, particularly in a wet season, when leaching is severe. Particular care is needed in this respect on our sandy soils on the coastline, where an unfounded belief exists that, due to their nearness to the coast and applications of seaweed, little potash is required. Most farmers would be well advised to apply annual dressings to grassland, not to mention recommended dressings for tillage crops, since it will result in a build up in the potash status.

These losses in leaching are due to exchange with hydrogen in the soil from which it is washed out. Where this occurs, and an alkaline clay subsoil is underneath, then the potash is built up there and can be reintroduced by a gradual deeper ploughing in the rotation.

Crop Demands

Very large amounts of potash are removed by crops, e.g. a 12-ton crop of beets remove approximately 200-lbs. and potatoes over 150-lbs. per acre. As with nitrogen, the rate of absorption throughout the year is not constant. American experiments with potatoes have shown that at the 8th week approximately 1-lb. per acre a day was taken up, but 4-lbs. per day between the 8th and 12th weeks.

It is very important to see that this demand is met at the period of active growth and development. The best means of achieving this is a build up of the soluble and exchangeable forms by liberal dressings, otherwise losses in yields occur.

Heavy applications of nitrogen and phosphate, when unbalanced with potash, will increase growth at first, but the potash in the plant may be reduced to deficiency levels. Balance between all three is necessary and where heavy applications of the other two are given, additional potash is also necessary.

Heavy applications of nitrogen alone can cause serious potash deficiency if the status is low, but it will not generally show up in the following crops. In the case of lime, however, where the exchangeable calcium is very high, the induced deficiency of potash may persist for some time. Generally speaking, it depresses the immediate supply of potash to the plant.

On the other hand, where calcium is brought to the recommended level

it causes the fixation of the soluble or release of the fixed potash, dependent on the abundance or absence of the soluble form. An increase of soluble potash, in turn, tends to decrease the uptake of calcium and magnesium, as when water is added a certain amount of exchangeable potash changes to the soluble form. Both the fixation and release of potash is generally favored by liming.

Recommendations

In sandy, organic, and acid soils (provided the pH has first been raised by liming) frequent dressings during the rotation are necessary. One heavy dressing is uneconomic, due to leaching.

In the case of beets, potatoes, hay, legumes, etc., large amounts of potash are removed and must be replaced on all soils by frequent applications. Heavy dressings before these crops are grown are advisable, followed by light applications.

In the case of corn crops and livestock on grassland, applications are also advisable, though not at the height required for potatoes, hay, etc. In general, it is a wise procedure to have your soils tested and apply what is recommended for each year of the rotation. **THE END**

PLANT TESTS—CONTINUED FROM PAGE 6

but is questionable for alfalfa and vegetable crops.

And if the orange color remains in all three dots, (1,000, 2000, and 3000 ppm), potash is considered to be high for practically all plants except potatoes and tomatoes.

For additional information along the line of "plant-analysis" and "plant-tissue" tests see: Better Crops With Plant Food, December 1944, January 1950, December 1953, May 1956, and June 1956. The May 1956 issue of Better Crops With Plant Food gives solutions and test papers for use in these tests.

Plant tissue testing kits may be purchased from Denham Laboratory, 496 Rosemill Drive, Lexington, Kentucky; Urbana Laboratories, Urbana, Illinois; and Department of Agronomy, Purdue University, Lafayette, Indiana.

THE END

WANT TO SHOW NEW ALFALFA MOVIE?

SEE PAGE 20 FOR STORY AND PAGE 31 TO ORDER

DIAGNOSING AND CORRECTING CITRUS NUTRITIONAL AILMENTS

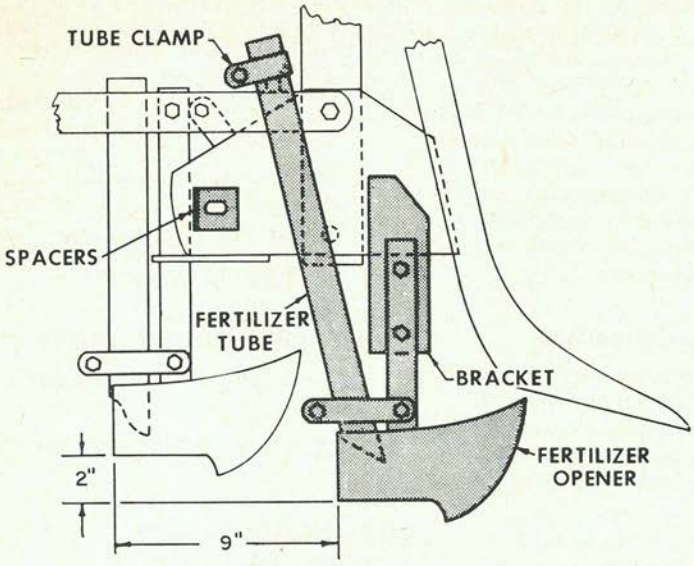
A publication designed to help citrus growers find out how well their trees are doing nutritionally has been issued by the University of California.

The manual brings together for the first time existing information on how to diagnose and correct citrus nutritional ailments.

Written by Homer D. Chapman, of the Department of Soils and Plant Nutrition on the Riverside campus, the work is entitled "Leaf and Soil Analysis in Citrus Orchards."

Copies are obtainable (for 75 cents) from Agricultural Publications, 207 University Hall, University of California, Berkeley 4, California.

Chapman recommends leaf analysis combined with soil analysis and visual observation for fertilizer guidance. Using this system, field men, growers or others properly instructed in sampling techniques would collect leaves and soil samples, send them to a commercial laboratory for analysis, and receive information giving a clearer picture of trees' nutrient status and needs than has hitherto been possible.



FERTILIZER opener was mounted under lister, 9 inches ahead of seed opener and 2 inches to the side and 2 inches below it.

PUTTING FERTILIZER WHERE

MANY tests show listing is desirable in Great Plains corn production. It is efficient and conserves soil and water in contour farming. In that area, where rainfall is often limiting, yields from listing are at least as good as those from conventional methods.

Listed corn, however, starts slowly. The young plants are yellow and grow slowly after emergence. Stands are often poor and yields low with listed corn.

Although fertilizer isn't everything, properly placed starter fertilizer improves emergence and early-season growth. With most of the present equipment available, starter fertilizer is dropped in the lister furrow or placed in a shallow band close to the seed.

Take a common commercial two-row hard-ground lister planter with disk moldboards, for example. This

machine drops the fertilizer in the lister row 2 inches to the side of the seed, placing it poorly—on the ground, 1 to 2 inches *higher* than the seed.

Tests show, however, that plants get to the phosphorus sooner and thus use it more efficiently when fertilizer is banded 1 to 2 inches to one side of the seed and 2 inches lower. This placement also prevents poor stands that result when nitrogen contacts the seed.

To accomplish this, USDA agricultural engineers R. J. Rowe and W. G. Lovely modified a common commercial planter at Iowa State College, Ames, in 1957. This machine places the starter fertilizer 2 inches to the side and 2 inches lower than the seed.

For banding, a short runner-type subsoiler similar to the seed furrow opener was mounted below and behind the lister point. The fertilizer opener was placed 9 inches ahead of the seed opener and 2 inches to the side, bolted to a bracket welded to the lister frame. The manufacturer's planting adjustment was unchanged and the fertilizer depth adjustment made to correspond.

PLANTS NEED IT

When the seed unit was moved back 12 inches in early tests, the implement followed contour furrows poorly. But this was overcome when the unit was again made short from lister to seed-furrow closer, as in the original.

The first unit was used in Iowa in 1957, and listed corn showed good response. In 1958, three were tested in Iowa, one where listing is an accepted practice.

Detailed instructions for modifying a commercial two-row lister-planter are found in ARS 42-26, "A Lister-Planter Attachment for Side-Band Placement of Starter Fertilizer." This publication is available from Agricultural Engineering Research Division, ARS, U.S. Department of Agriculture, Washington 25, D.C.

—USDA ARS Report

FORAGE FERTILIZATION PAYS

THREE EXAMPLES FROM MAINE

As reported by Extension News Editor John W. Manchester

"Don't Believe In Starving Soil"

KNOX—"I don't believe in starving the soil any more than I believe in starving my cows," points out Vaughn E. Hurd, prominent Maine dairyman.

Hurd was the New England Green Pastures sweepstakes champion in 1957, winning out over the best forage-producing dairy farms in the six states. So he knows what he's talking about.

Sweet Rest Stock Farm in Knox (RFD Thorndike) is run by Hurd and his sons, Howard M., 22, and Andrew W., 18.

Taking annual soil tests of their forage land, the Hurds know exactly how much lime and fertilizer each field requires. The fertilizer recommendations of the Extension Service specialists are followed exactly. They use about 100 tons of lime and some 30 tons of fertilizer annually.

Following the test-based recommendations, the Hurds often apply 500 to 600 pounds of 10-10-10 fertilizer to the acre on their legume hayland. This is put on in split applications, in most cases, with one treatment in the fall and the second application after the first crop is cut for the silo. Liming is usually done in the fall, too.

Some 0-15-30 is used, and also another formula is being tried. This fertilizer is 15-10-10, which tends to take the place of the nitrogen they used to apply when they hauled poultry manure from nearby farms. They've given up using poultry manure now, and apply only their own dairy manure, plus the commercial fertilizer.

"There were too many weed seeds in the poultry manure," said Hurd. "Also, a lot of extra labor was involved in cleaning out the poultry houses and hauling and spreading it. Another thing, it was hard to balance your fertility program when you used poultry manure, as you were never sure just how much actual fertilizing material you were applying. Quality of forage sometimes suffered."

Hurd used to apply fertilizer in the gutter in the barn and spread manure daily. However, he has now given it up because of the winter killing he was getting in his fields where the spreader wheels made icy areas. Also, Hurd lost much of the fertility value through runoff and leaching.

The Hurds have plenty of modern equipment and machinery with which to operate their 135-animal dairy farm. They're milking about 65 cows right now, with 7 animals dry. Hurd, his two sons, and two hired men do the work—both in the barn and in the field. Needless to say, it's strictly a dairy operation.

They built their new dairy barn in 1947. It includes a gutter cleaner, a Harvestore silo and other silos, silo unloaders, a bunk feeder and conveyor to feed the heifers in their loose housing

setup, a pipeline milker, a bulk milk tank, and a herringbone milking parlor. Although the cows are now kept in stanchions, Hurd is considering loose housing for them, too.

The Sweet Rest Stock Farm cows are on either Dairy Herd Improvement Association or Herd Improvement Registry test. They're registered Holsteins. Hurd has his own Holstein bulls but also breeds the cows artificially, using both regular and frozen semen.

The year 1957 was Hurd's best on DHIA test. His 58 cows that year averaged 15,096 pounds of milk, testing 4.0 percent, and 607 pounds of butterfat.

His Myrtle cow made about 950 pounds of fat in 365 days in 1958. Another cow as a 14-year-old topped all states in New England but Massachusetts with a 305-day record of 17,460 pounds of milk, testing 3.8 percent, and 677 pounds of fat in 1959. The herd includes several 100,000-pound cows in lifetime production.

From the looks of the contented, high producing cows and the top quality hay, silage, and pastures on the Hurd farm, Vaughn certainly doesn't believe in starving either his cows or his soil! And it has paid off in both green pastures and greenbacks!

Green Pastures Pay Off

PALMYRA—Green pastures and an excellent forage program pay off, says James W. Smith, of Palmyra, prominent young dairyman. Smith has proved this by twice being a Somerset County Green Pastures champion and once the second-place winner in Maine.

Without his 22 milking cows Smith would have been in dire straits last year, since his 30 acres of dry beans were a total loss due to heavy, warm rains and premature sprouting just before harvest time. But a fine forage program enabled him to produce his milk *economically,* and that saved the day financially.

Smith has been in the Green Pastures (now Green Pasture-in-Winter) Program every year since he began farming here in 1950.

In addition to milking an average of 22 head of Holsteins (including two Jerseys) and caring for 23 young stock, Smith has 3,000 laying hens on another farm producing table eggs, the sadly lamented 30 acres of dry beans, 12 acres of sweet corn, and 5 acres of carrots for canning. In addition, he has about 500 acres in woodland and it has been designated a "Tree Farm."

Jim uses artificial breeding for his animals and has the herd on Dairy Herd Improvement Association test. The herd averaged a little more than 12,000 pounds of milk and 462 pounds of fat last year. A few animals are registered, the rest are good quality grades.

"I use a lot of fertilizer and lime," says Jim. "I have soil tests taken on the whole farm each year and follow the results religiously. I keep an Extension Service Soil Fertility Record Book up to date for each field and seed down land as needed.

"I rotate my animals during the summer from one small plot to another. In fertilizing, I use the analysis and amount of fertilizer and the lime called for in the soil test results. Analyses vary from 15-10-10 to 12-12-12 to 0-15-30. I used an additional 500 pounds of superphosphate (0-20-0) on all my grassland last year, as it needed a boost. In addition, I use a lot of liquid nitrate applied by the company for me.

"Through the Agricultural Conservation Program I use about 20 tons of lime each year on my grassland. I feel that the fertilizer and lime is simply a good investment. Many farmers lose out because they don't use enough of these materials.

"Take one piece of ladino clover and orchard grass which winterkilled badly last winter. On that, I put on 500 pounds of superphosphate and 500 pounds of 0-15-30 per acre and seeded it to millet. Next spring I put on 100 pounds of nitrate of soda (20-0-0) on this five-acre piece. I put 15 head of young stock in it to graze for nearly a month before they could get it eaten down. It was very lush growth, but the animals finally cleaned it up."

One silo holds 100 tons of grass silage on the Smith farm. Jim fills it each year with early cuttings in June. He averages to make about 70 tons of hay when the weather improves after the silage is in the silo. He has a hay baler and a field chopper. A heat dryer helps him to put up high quality hay, and saves a lot of worry about the hay-making weather. One batch of second cutting hay was made in one day with this equipment.

Smith relies mostly on ladino clover, brome grass, orchard grass, and is starting some alfalfa. He also sometimes plants oats for green feed and silage.

Smith has been an Extension cooperator over the years, reports County Agent Lloyd H. Button, Jr., of Skowhegan. He is now the county crops and soils leader for the Somerset County Extension Association. He's a county director of the Farm Bureau, and is a member of the Somerset County Poultry Improvement Association.

As in so many cases in Maine, the Smith farm has shown that following the recommended Green Pastures-in-Winter practices has paid off in dollars and cents. It's just good business!

Large Herd Demands Plenty Of Forage

EAST HAMPDEN—When a dairyman has 89 head of cattle, he needs plenty of high-quality forage to feed them for high milk production. And to grow that forage he needs to use large quantities of fertilizer and lime.

That's the experience of N. Searle Perry & Son, James, of the Old County Road, East Hampden. Last year they used about 100 tons of lime and 37 tons of fertilizer. And they used 100 tons of lime the previous fall, too. These amounts were concentrated on certain portions of their 250 acres of cropland, owned and rented.

The Perrys last year put up about 250 tons of grass and corn silage in two of their three silos. They also made 8,000 bales of hay. One silo is filled with corn, another with half corn and half grass. Jim Perry has gone in heavily for grass silage in 1960. He seeded down about 20 acres this spring, and probably will plant another 25 acres to Sudan grass.

His fertility program includes applying 400 pounds of 10-10-10 fertilizer per acre after the first crop is taken off. Also, they use 400 pounds of 0-15-30 on the new seedings, where they're working in more legumes with the grasses.

The Perrys topdress their forage land with manure during the fall and winter, spreading the manure as it comes from the gutter cleaner every day.

On the silage corn the Perrys use 1,000 pounds of 10-10-10 per acre. They base their fertilizer and lime usage on soil test results from samples taken by the Agricultural Conservation Program or a fertilizer company.

This is a good herd of Holsteins, too. At a recent count it included 36 head of young stock, two bulls, and 51 cows. The Perrys use both natural breeding and the services of the Maine Breeding Cooperative.

To prove that they're good animals,

the cows averaged to produce 13,600 pounds of milk and 511 pounds of butterfat last year. That was on Dairy Herd Improvement Association test. One cow made almost 900 pounds of fat and nearly 25,000 pounds of milk.

To get this production the Perrys fed *one pound of grain to get 3.1 pounds of milk for the year. The high-quality forage helped keep this grain-milk ratio at a reasonable level.*

On the basis of pounds of milk produced for one man's yearly labor, the Perry farm produced about 180,000 pounds of 4 percent milk, a very respectable figure.

Since he's a firm believer in the value of growing, harvesting, and feeding abundant, high quality forage, Jim Perry has enrolled the farm in the Maine Green Pastures-in-Winter Program. He has been a county winner one year, and had a chance to take the Maine Dairymen's Tour of outstanding dairy farms.

He was a County Green Pastures judge this winter, and feels that a dairyman learns a lot by scoring the forage programs on other farms and then seeing his own setup evaluated.

The Perrys built the main barn in 1954 and can tie up 57 animals there. It features a 340-foot gutter cleaner and excellent fan ventilation and fluorescent lighting. When the barn was built, the retail milk route was given up and now the milk is sold to a Bangor dairy.

The old barn is now being used for young stock. It will also have a gutter cleaner when the old one from the new barn is installed.

Jim feels that it's just common sense to fertilize the land adequately in order to produce the most and best quality forage. This, in turn, helps his cows produce more milk economically. The net result is larger profits, and that's just what he needs for his growing family.

THE END

SLIDE SETS FOR LOAN AND SALE

ORDER ON PAGE 32

GROWING ALFALFA SUCCESSFULLY

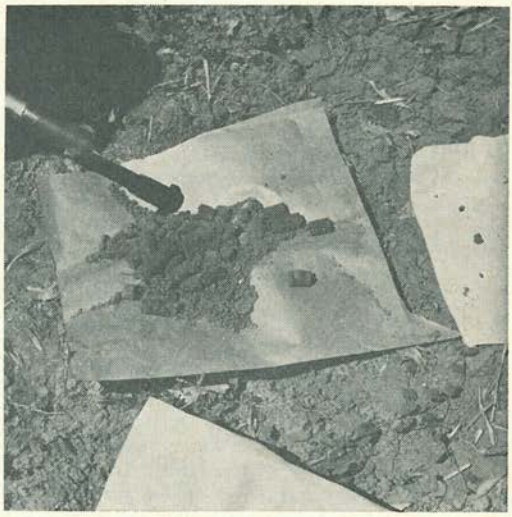
. . . A NEW POTASH INS

a new film, 16mm, color, 975 feet, 25 minutes running time . . . covering the value and uses of alfalfa, its origin and introduction into North America . . . featuring the soil and nutrient requirements of alfalfa, as well as cultural methods . . . the latest management techniques, including fertilization, liming, seeding, inoculation, cutting, pests, and weed control . . . with special time-lapse photography to show how the plant feeds and grows.

from original script by Dr. E. T. York, now Director of Agricultural Extension of Alabama, assisted by other members of the Potash Institute staff.

about a crop the U. S. Department of Agriculture describes as "more nearly a perfect forage crop than any other crop in this country."

condensed on the following pages for *Better Crops* readers . . . accompanied by the distribution center from which the film can be scheduled and a convenient booking coupon on which to book it.

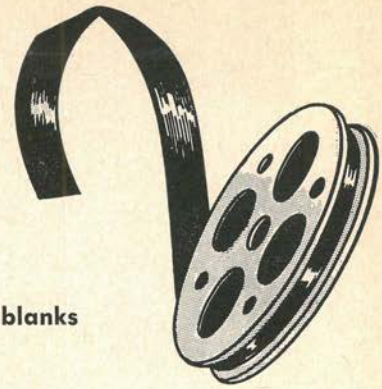


KNOW YOUR SOIL

THE name "alfalfa" is taken from an Arab word meaning "best fodder." Throughout the centuries, its superiority has continued to be recognized, with the U.S. Department of Agriculture calling it "more nearly a perfect forage than any other crop grown in this country." There are many reasons why alfalfa justifies such a reputation.

It is one of our most widely adapted forage legumes, being grown in every state and in most Canadian provinces. In fact, throughout North America there is now a greater acreage of alfalfa than any other seeded legume.

It is well suited to either short or long rotations.



STITUTE MOVIE IN COLOR . . .

See page 31 for order blanks

A Herb Garrard Picture

. . . YOUR SEED

DEEP ROOTED

Alfalfa can also improve soil productivity. Its ability to fix large amounts of nitrogen from the atmosphere and the effects of its deep, penetrating root system loosening up the subsoil contribute to top yields of crops which follow alfalfa in the rotation.

It is one of the highest-yielding of all forage legumes.

Its superiority is particularly evident during drought. Its deep root system permits it to withstand dry weather conditions much better than crops with shallow roots.

VERSATILE

. . . YOUR MANAGEMENT

Of course, versatility of use is another strong point. For example:

(1) For hay, it cannot be surpassed.

(2) For silage, excellent.

(3) For grazing by many different types of animals.

(4) For green feeding.

(5) For manufacturing meal to be used in high protein concentrates.

Another point in its favor: alfalfa can be grown either alone or in mixture with grasses. Mixtures are often preferred when the crop is to be grazed.

To realize the full benefits of this crop—to be truly successful—it must receive proper care and management.

DEEP-ROOTED

For withstanding dry weather

For loosening subsoil to aid crops that follow alfalfa in the rotation.

A USDA Picture

Many farmers have experienced difficulty or even met with failure in attempting to grow alfalfa. This need not happen.

Modern research has answered many of the questions about its culture and now provides the basis for realizing its full potential. Let's look at some of the factors which will help insure success.

To succeed, you should:

1 KNOW YOUR SOIL

Poorly drained or extremely shallow soils are not desirable. Research has also told us that many failures are the result of soils which are too acid and deficient in certain essential plant nutrients.

Water from rainfall or irrigation, passing through the soil, has leached out large quantities of these essential plant nutrients. Harvested crops also remove nutrients from the soil. Agricultural research has shown us how to replace these nutrients lost by leaching and crop removal.

PRACTICE SOIL TESTING

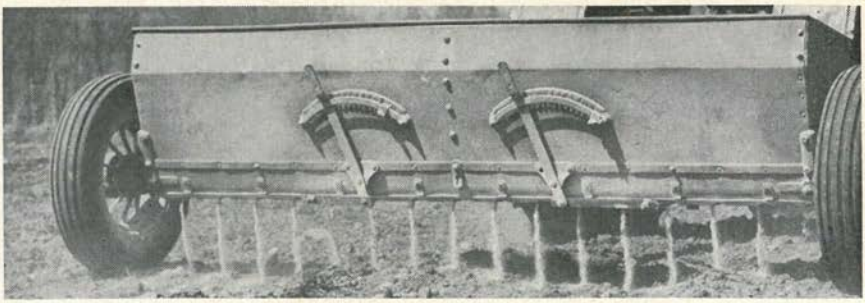
Effective soil testing programs have been developed to help simplify determination of lime and fertilizer needs. Therefore, one of the first steps in growing successful alfalfa is to determine what the soil needs in the way of lime and fertilizer. Begin by taking a representative soil sample and having it analyzed by an approved soil-testing laboratory.

In areas of low rainfall, soils may be naturally alkaline—without the need for lime. But elsewhere—in many sections of the United States and Canada—acid soils or lime deficiencies will seriously limit alfalfa production. Therefore, the need for neutralizing soil acidity.

IMPORTANCE OF LIME

Lime makes soil conditions more favorable for alfalfa and the nitrogen-fixing bacteria found in the nodules of the roots. Where grown on soils too acid, the plants are yellow, stunted and deficient in nitrogen—plants that will be low-yielding and short-lived.

In addition to favoring nitrogen-fixing bacteria, lime supplies calcium and, in some cases, magnesium—both essential to the growth of the crop.



Lime makes soil conditions more favorable for alfalfa and the nitrogen-fixing bacteria found in the nodules.

When to Lime

With this in mind, the question now arises—when should lime be applied? Answer: Several months before planting, if possible, due to the fact most liming materials react slowly with the soil in neutralizing acidity.

After the field is covered, be sure to mix the lime thoroughly with the soil by plowing or discing.

NEXT—ESSENTIAL NUTRIENTS

After proper liming, the next step is to provide an adequate supply of essential nutrients. Alfalfa requires an abundance of plant food for maintenance of good stands and high yields. If the soil is deficient in necessary nutrients, fertilizer should be applied *before* or at the time of seeding.

Then, on established stands, topdress applications of fertilizer should be made one or more times annually to maintain the proper level of plant food.

Let's pause now to examine what research has demonstrated about the effects of fertilizer in successful alfalfa production.

In humid areas of the country, liberal applications of phosphorus and potash are usually needed.

Phosphorus deficiency especially results in slow seedling growth and greatly reduced yields. The vigorous growth of both tops and roots resulting from phosphorus fertilization contributes much to alfalfa's reputation as a high producing forage.

WHAT ABOUT POTASH?

Experiment stations are finding that one of the most common causes of failure is insufficient potash fertilization.

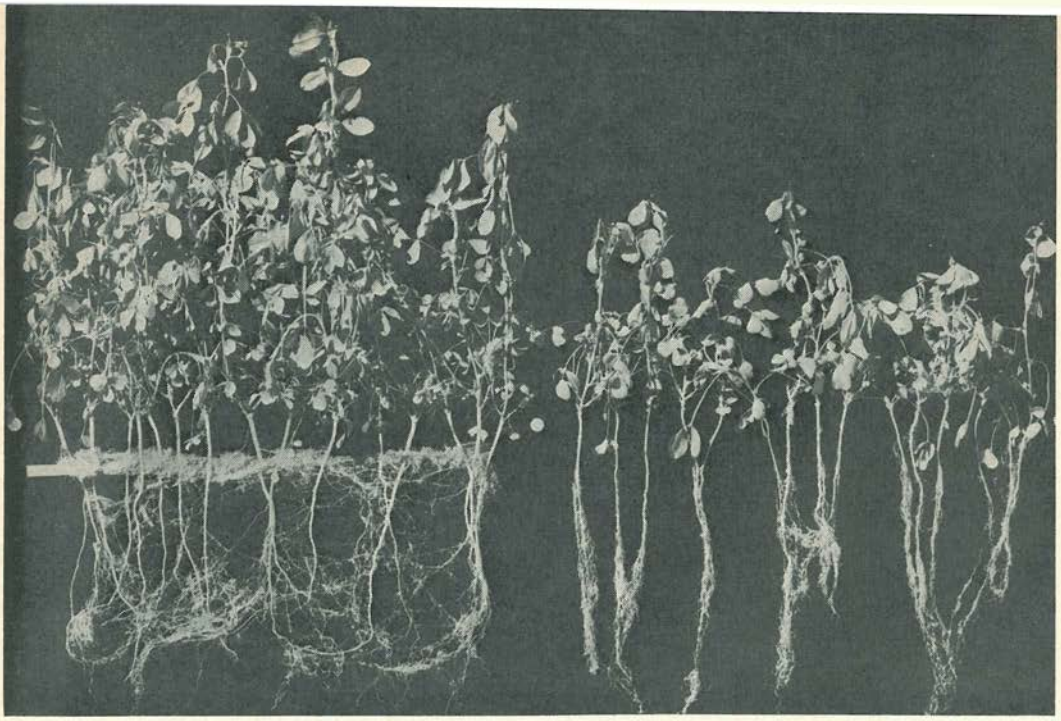
Without adequate potash, yields are not only reduced but the plants may actually die, leaving nothing but grass and weeds in their place.

One indication that potash is deficient may be a thinning-out of stand due to insufficient potash.

Another indication that more potash is needed is the presence of the characteristic white or yellow spots around the margin of the leaves. Remember, however, alfalfa may suffer from deficiencies of nutrients even before symptoms are evident.

That is what we mean by "Hidden Hunger."

Remember, to maintain good stands and high production year after year on most soils, alfalfa should receive topdressing applications of phosphorus, potash, boron, and in some cases, other nutrients one or more times annually. Starter fertilization alone is not enough.



Left—300 lbs. 0-20-20 Banded **Right—No Fertilizer**

Both plots were band seeded with press wheels. Note the expanded feeder roots along fertilizer band and generally larger root system. (A Herb Garrard Picture)

Potash Removal High

As a guide to specific potash needs, consider the amount taken out of the soil by a good crop.

A successful alfalfa crop can yield 4 tons or more of hay per acre each year. Such a yield removes at least 180 pounds of K_2O from the soil during the same period.

Merely to return the amount taken out of the soil would require potash equivalent to that in 300 pounds of 60% muriate—or the amount in 900 pounds of a fertilizer containing 20% potash such as 0-10-20.

These potash removal figures may be even higher when alfalfa is grown in association with grasses. Consequently it may be necessary to maintain a higher level of potash for mixtures than when alfalfa is grown alone.

Of course, some soils can supply a part or all of these requirements from their reserves. A soil test will help determine specific needs.

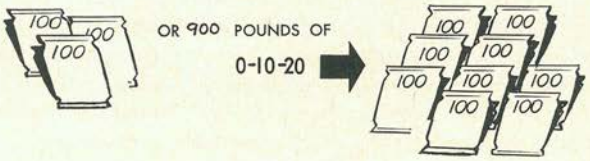
WATCH FOR BORON NEEDS

Another problem is a common condition called "yellow top" which is the result of boron deficiency.

Symptoms are yellowing of the tops along with reduced flowering. The leaves tend to bunch up or give a rosette effect. Due to shortened internodes, the plants may appear quite stunted.

Boron fertilization may result in

To keep your stand going, remember a 4-ton alfalfa crop removes 180 lbs. of potash. To get this much potash back in your soil would require 300 lbs. of muriate of potash.



greener leaves with more vigorous growth and higher yields.

Boron deficiency should not be confused with damage caused by leafhoppers. The yellowing from leafhopper injury usually is a V-shaped pattern and is not confined to the upper part of the plant as is often the case with boron deficiency.

Potash, phosphorus, boron—these are the nutrients most commonly needed in alfalfa fertilizers.

Some nitrogen is often used also at the time the crop is planted to give the young plants an early boost.

In some areas, fertilizers may be needed to provide certain other essential nutrients under special situations.

To succeed, you should:

2 KNOW YOUR SEED

Once the fertility requirements of alfalfa have been met, we are then ready to consider carefully the choice of seed.

Let's consider a plant breeding nursery, where good seeds begin. The plant breeder may search the entire world for plants with high-yielding ability, disease and insect resistance, palatability, winter hardiness, and other qualities.

He then crosses these plants to combine their many different desirable features into a single variety.

Then, the commercial seed grower takes over, producing seed under carefully controlled conditions in order to provide the farmer with a quality product.

The word "certified" or "registered" on the bag is the best insurance of good, clean, viable seed. One should insist upon high quality seed of the variety adapted to his local conditions.

PROPER SEEDBED IMPORTANT

Good seed alone, however, is not enough—proper seedbed preparation is also necessary.

Alfalfa seeds are relatively small. For best results they should be planted in a seedbed that is settled

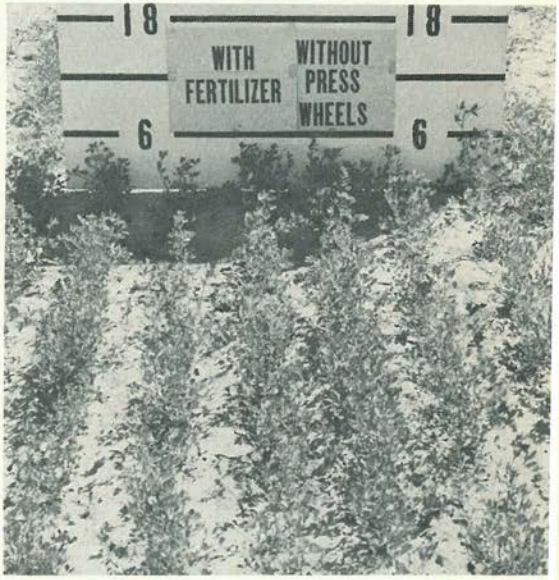
The contrast in discing and plowing shows what different seedbeds the two methods can provide—illustrated above and described below.

Above—Discing wheat stubble only twice produced an excellent seedbed. The surface is fine and compact. Soil moisture just beneath the surface is ready to start alfalfa seedlings. Grain stubble residues help prevent damage from siltation and crusting.

Above—Plowing at the same time left a rough seedbed. Discing 3 times plus cultipacking did not sufficiently reduce the size of clods. It is doubtful whether a good stand can be obtained in such a dry, loose, cloddy seedbed.

Although it was band seeded, a poor stand resulted without fertilizer or press wheels.

Without press wheels, germination was slow and irregular, even though seed was banded over fertilizer.



BAND SEEDING WITH FERTILIZER 1″ BELOW SEED CAN GIVE GOOD RESULTS

and firm, with the top two inches loose and free of clods.

Poor results or even complete failures often result when attempts are made to seed in cloddy soils.

To avoid these difficulties, it may be necessary to begin preparing the land several weeks or even months before planting in order to have it in good condition on time.

SEED INOCULATION IMPORTANT

Before planting, attention should be given to one other important step: Inoculation with nitrogen-fixing bacteria.

It is always good insurance to mix a commercial inoculum with the seed immediately before planting.

The seed should then be kept in a cool shady place until planting, since the bacteria may be killed if exposed to sunlight.

SEVERAL SEEDING METHODS

One of the oldest seeding methods involves the use of a *hand seeder.* While good stands are possible, other methods which provide more precise placement usually give better results.

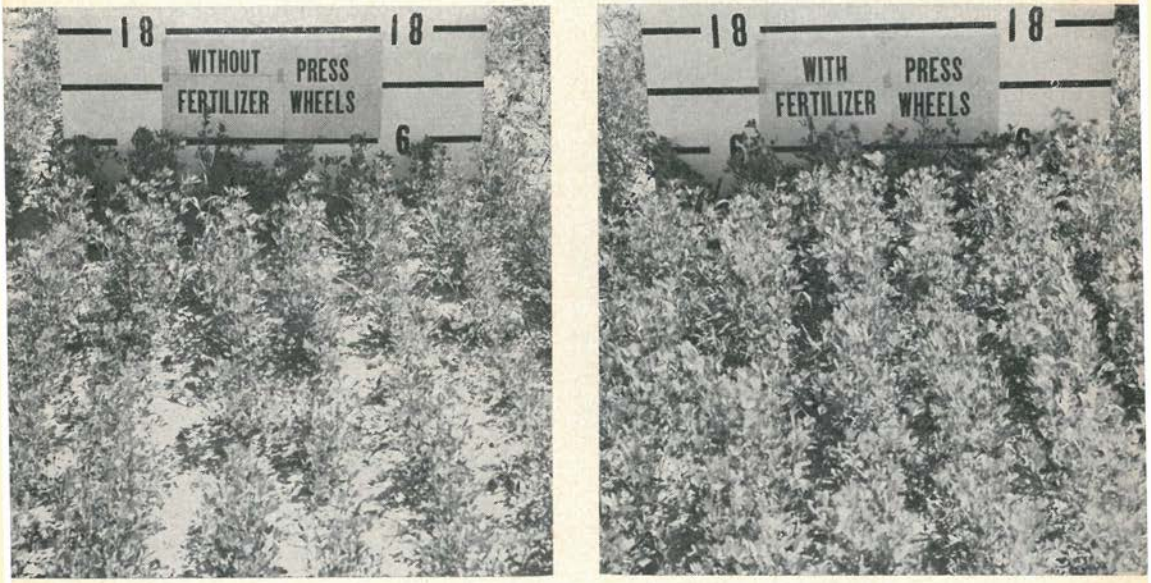
An ordinary grain drill with seeder attachment may be used or a piece of equipment which combines both a cultipacker and a seeder. This leaves a firm seedbed, favorable for good germination.

With suitable machinery, bandseeding likewise gives good results, particularly on soils low in fertility. With this method, the fertilizer and seed are placed in bands with the fertilizer about one inch below the seed. Grain drills can be adapted to do a good job of bandseeding.

Many experiment stations have obtained better stands of more vigorous alfalfa with bandseeding than by

Without fertilizer, plants were short although there was a good stand.

A thick stand of vigorous plants came from band seeding with fertilizer and press wheels.



These 7-week-old alfalfa plants from 4 plots of a band seeding experiment in Ohio show how press wheels and fertilizer can be combined with band seeding to get vigorous growth.

broadcasting. In some areas, a small grain nurse crop is used with alfalfa seeded carefully with a drill.

To succeed, you should:

3 KNOW YOUR MANAGEMENT

After a good stand is established, its production and longevity depend upon how well it is managed.

The time at which alfalfa is cut or grazed has a tremendous influence upon the yield and quality of forage, as well as the length of the stand.

HOW THE PLANT GROWS

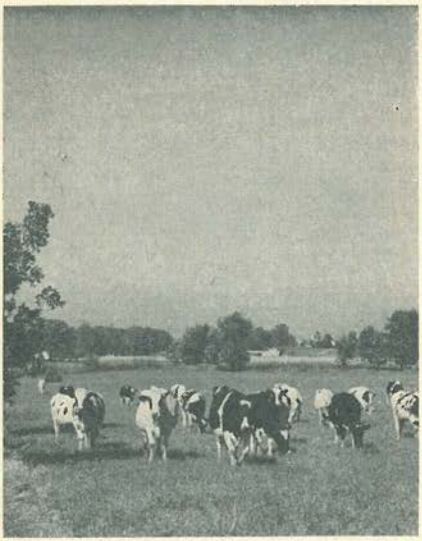
To appreciate the importance of proper cutting or grazing management, let's consider how an alfalfa plant grows.

When the seed is placed in the soil, it absorbs water, swells, and begins to germinate. The small amount of food reserves in the seed sustains the development of the plant until it emerges from the soil. Then it's on its own.

As a seedling, the plant absorbs carbon dioxide from the air, along with water and nutrients from the soil. Then, using energy from the sun, it manufactures food-starches and sugar.

In turn, the foods manufactured in the leaves provide the energy for the plant's development. As it grows, more leaves are formed, in turn manufacturing more food. During this early period, the plant may grow very rapidly, utilizing the food as fast as it's made. But, as the plant matures, the rate of growth slows down.

Meanwhile, since all of the food being manufactured in the leaves is not needed for further growth, it is stored in the roots and crown. After



WHEN TO GRAZE . . .

CRITICAL POINTS

IN

GOOD MANAGEMENT

. . . WHEN TO CUT

cutting, new shoots emerge from the crown or leaf axils.

If there are adequate food reserves in the roots, these new shoots will grow off rapidly, utilizing food stored in the roots by the previous crop.

For two or three weeks after cutting the previous crop, the new growth will continue to use and deplete these food reserves. Then, the plant will begin to replenish these reserves as the rate of food production exceeds the rate of its growth.

A CRUCIAL POINT

Now, we come to a crucial point: If cut early while still growing rapidly, using much of the food it manufactures, little food will be stored in the roots.

Because of this lack of food the next crop will grow very slowly. That means a reduced yield.

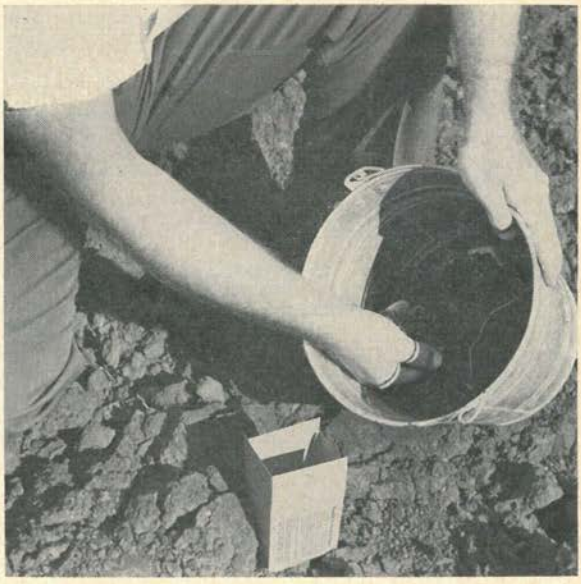
Furthermore, unless food reserves are built up during the summer and fall, many of the plants may fail to survive the winter. This means poor stands and weedy, unproductive fields the following spring.

Although early cutting may not be desirable from the standpoint of maintaining food reserves, we know that alfalfa has its highest feed value when harvested early.

Early harvesting means the new growth will have a greater proportion of leaves to stems than older growth. And remember—there is approximately twice as much protein in the leaves as in the stems. Also, the leaves are higher in carotene content, in vitamin A, and in other important growth substances.

WHEN TO CUT—A COMPROMISE

When is the proper time to cut alfalfa? The answer must be a compromise. When cut early, we know that the crop is most palatable and nutritious. But, we also know that the yield and life of the stand may be increased if the plants are permitted to mature.



Good soil samples yield good tests and good recommendations which can make you money.

An alfalfa crop usually has stored adequate food reserves and has produced the maximum yield of protein per acre about the time the plants are in 1/10 to 1/2 bloom. Perhaps this is the most desirable time to cut.

However, latest research shows that alfalfa cut at the full bud stage may produce more milk per acre. The first or second growth may be cut at this stage without shortening the life of the stand if the plants emerge strong and vigorous in the spring.

But one of the later cuttings should then be delayed until the bloom stage to permit root reserves to be replenished. In areas where alfalfa does not bloom readily, the emergence of new shoots from the crown might aid in indicating when it should be cut.

When alfalfa is being grazed, it should be managed similarly to that cut for hay or silage. That is, it should be grazed down very quickly and given a long period to recover. This can be accomplished by the practice of "strip or rotation grazing", putting large numbers of animals on small areas so that they can graze the crop down in a very short time.

PEST CONTROL

Now, we come to another phase of management—pest control.

Alfalfa, like most plants, has its share of enemies—insects, diseases, and weeds. Unless effective control measures are used, they may take their toll in reducing the yield, quality and life of a stand.

Weeds—

One of alfalfa's characteristics is its ability to smother out weeds. But to do this, it must be properly fertilized and managed so its growth is vigorous.

When taken over by weeds or grass, the cause is too frequent cuttings, insects, diseases, or perhaps inadequate fertilization. However, certain winter annuals such as chickweed may be troublesome even with good management since they grow while the alfalfa is dormant.

If weeds are a problem, many types can be controlled by selective weed killers. In recent years, much progress has been made in the development of chemicals for alfalfa weed control. But, remember—chemicals

POTASH HUNGER ON ALFALFA

The first signs of potash deficiency on alfalfa appear as numerous small white or yellowish dots around the outer edges of the tips of leaflets. As the deficiency becomes greater, these edges begin to turn yellow and the chlorosis proceeds around the entire margin. This tissue then dies and becomes brown and dry. In the more advanced stages, the edges of the leaflets become broken and ragged.

Probably second only to having enough lime in the soil and subsoil, the most troublesome nutritional problem is that of keeping alfalfa properly supplied with potassium. Alfalfa is a greedy feeder on this plant-food element and may use more than it actually needs if an overabundant supply is available at any one time. This tendency to luxury consumption draws heavily on the soil's supply to the detriment of succeeding cuttings.

It is easily possible for one to make a heavy application of potash with the reasonable anticipation that he is supplying enough to last the crop for several years. Actually, however, if all of this potash is applied at one time, the first cutting or two is apt to be abnormally high in this nutrient and succeeding cuttings may suffer from a deficiency. Such a condition can shorten the life of the stand. In practice, it has been found that frequent lighter applications as topdressings will be more effective than heavy applications made at infrequent intervals.

only supplement, they do not replace other sound management practices.

Insects—

Among insects that damage alfalfa are leafhoppers, pea aphids, the meadow spittlebug, the alfalfa weevil, and the spotted alfalfa aphid.

Chemicals may be used to control most of these pests. The weevil can be effectively controlled here by chemicals. In addition, plant breeders are working toward the development of varieties that may have resistance to other of these pests such as the spotted alfalfa aphid.

Diseases—

Alfalfa can be afflicted by bacterial wilt, a disease prevalent in many sections of the country and often a major factor in the life of stands.

Plants afflicted with bacterial wilt are stunted in growth, green to yellow in color. When cut diagonally, the root will show a brownish-yellow ring under the bark.

Crown and root rot diseases usually show up wherever alfalfa is grown. And leafspot is another enemy. In fact, there are at least 75 diseases which attack this crop. But adapted varieties are more likely to resist many of these diseases when strengthened by proper nutrition and cutting management.

But the principal means of controlling these diseases lies in the development of resistant varieties. Most of today's improved varieties carry resistance to one or more of these serious organisms or pests.

For specific recommendations on varieties, fertilization and management practices, check with the agricultural college or experiment station nearest you or with your local agricultural leaders.

Then, constantly keep on the lookout for new developments. Federal, state, and provincial experiment stations are continuing to develop new "know-how" about the culture and management of alfalfa. **THE END**

Visual Education Service
American Potash Institute
1102 16th Street N.W.
Washington 6, D.C.

I would like to book your new movie, *Growing Alfalfa Successfully*, for showing on the date indicated below.

Date . . . . . **Alternate** . . . . .

Name . . . . . **Organization** . . . . .

City . . . . . **State** . . . . .

Signed . . . . .

CUT ON DOTTED LINE—YOUR MAGAZINE WILL NOT BE HARMED
SEE BACK SIDE (PAGE 32) FOR USEFUL SLIDE SETS

In a night club one evening, a very pretty girl was wearing around her neck a thin chain, from which hung a tiny golden airplane. One of the young men in the party stared at it so that the girl finally asked, "Do you like my little airplane?"

"As a matter of fact," he replied, "I wasn't looking at it. I was really admiring the landing field."

"Wife: "The maid quit. She said you spoke to her insultingly over the phone."

Hubby: "Ye gods! I thought I was talking to you."

The following correction appeared in a small town paper: "Our paper carried the notice last week that Mr. John Jones is a defective in the police force. This was a typographical error. Mr. Jones is really a detective in the police farce."

"You should advertise!" the canvasser told the proprietor of a small neighborhood store.

"No, sir! I'm agin it," was the emphatic answer.

"But why?"

"Advertising don't leave a man no time," the man replied. "I tried it once last year and I was so doggone rushed I couldn't get in no fishin' all summer."

An insurance company refused to pay cash to a farmer for his burned barn, but offered to replace it instead. So the farmer immediately cancelled his insurance policy on his wife.

AMERICAN POTASH INSTITUTE (DEPT. BC)
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PLEASE SEND ME YOUR SLIDE SET "POTASSIUM HUNGER SIGNS" FOR SHOWING ON THE DATE INDICATED BELOW.

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PLEASE SEND ME YOUR SLIDE SET "FERTILIZER PLACEMENT" FOR SHOWING ON THE DATE INDICATED BELOW.

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ORDER SLIDE SETS

THIS EASY WAY

- **Potassium Hunger Signs ($2.20) 22 Slides and Script**

Shows typical potash hunger signs in field crops, vegetables, fruits, forage crops, and some ornamentals. Such common potash hunger signs as poor growth, leaf scorch, poor root development, weak and lodged plants, poor seed and fruit quality. Can supplement local slides.

- **Soil Fertility and Soybeans ($4.20) 42 Slides and Script**

Assembled in cooperation with the National Soybean Crop Improvement Council. Covers nutrition, including liming, direct fertilization, rotational fertilization, and placement, as well as other factors in production. Tells a rather complete story—and can readily supplement local slides.

- **Successful Alfalfa ($4.00) 40 Slides and Script**

Shows the value and use of alfalfa in modern farming. Gives 10 steps in successful production, including liming, fertilization, and management. While it tells a rather complete story, it is designed so you can use it to supplement local slides.

- **Safe, Efficient Fertilizer Placement ($4.00) 40 Slides and Script**

Illustrates proper placement methods on *row crops, forages,* and *small grain*—and what happens when fertilizer is wrongly placed. Shows how band placement pays, how band seeding improves legume and grass stands. With sharp color and vivid illustrations for classroom showings, meetings, short courses, etc. Can supplement local slides.

KEY MAN . . .

These county agents:
What manner of men are they?

I was with County Agent Bob Bailey of Richland at the end of May. His secretary records his office calls. On several days they ran over 100. They pertained to all manner of insect and disease problems of crops, orchards, gardens, lawns, ornamentals, and forests. Problems of soil and fertility too, nematodes, wilts, molds, household insects, soil tests, minor elements, and lime. Also feeding, care and breeding of all sorts of livestock and poultry. Community development and angles of youth work through 4-H came up too. Farm building plans, and there were various others. But all together, a truly bewildering array that called for prodigious knowledge to handle.

And on top of that he had already been on television and radio early every weekday morning and was out several nights addressing various groups.

Yes, that's your county agent of today. Truly a many-sided man!

He first came about 50 years ago as our "Demonstration Agent." The boll weevil instigated it. He started in Texas to "demonstrate" new crops and better methods to bolster the agriculture that had been staggered there by this insect. The thing worked and spread across the country.

At first his going was rough, and most farmers thought of him as a "book farmer". But no more. And the urbanization of our population has not lessened his load. It has increased it. For those folks are taxpayers too, and they have problems of home, lawn, garden, and tree that need his expert touch. And they get it.

And through radio, television, and the press he is greatly extending his reach. He is as near to you as your phone too, and his office door is wide open.

J. M. Eleazar
Clemson Information Specialist

. . . ON DEMONSTRATIONS

THE county agent is the key man in his county.

Farmers look to him for advice and guidance, yet every specialist in the college, (and there are some 100 of us in the various departments at the University of Wisconsin) is bidding against the others for part of the county agent's time and attention.

Our program of fertilizer demonstrations carried out through the office of the county agent (the county agent actually does the work of supervising and helps in the physical job of setting up and harvesting these demonstration plots) has held his interest in soil fertility work at a high level.

I consider the demonstration one of the most effective means of keeping the county agent's interest alive on soil fertility problems.

The demonstration does several things:

FOUR POSSIBLE TYPES OF FERTILIZER DEMONSTRATIONS

I FERTILIZED VS UNFERTILIZED	1. NO FERTILIZER VS 2. FULL TREATMENT ACCORDING TO SOIL TESTS		OR	1. NO FERTILIZER VS 2. RATE+GRADE, SUCH AS 600 lbs 0–10–30B
II EXTRA FERTILIZER TRIALS	1. REGULAR TREATMENT VS 2. REGULAR+EXTRA FERTILIZER, SUCH AS ADDITIONAL 100 lbs 0–0–60 BROADCAST, TOPDRESSED, OR SIDEDRESSED.		OR	2. DOUBLE RATE OF REGULAR TREATMENT
III RATE-PER-ACRE FERTILIZER TRIALS	1. BASIC TREATMENT	2. BASIC + 100 lbs 0–0–60	3. BASIC + 200 lbs 0–0–60	4. BASIC + 400 lbs 0–0–60 OR SEVERAL RATES OF CERTAIN GRADE OR SINGLE NUTRIENT MATERIAL
IV DETERMINING EFFECTS OF SEVERAL NUTRIENTS	1. NONE	2. NITROGEN PHOSPHATE POTASH	3. PHOSPHATE POTASH	4. NITROGEN POTASH 5. NITROGEN PHOSPHATE

From Midwest Potash News Letter No. 99

1 It ties and links the county agent's interest in the field of fertilizer usage with the fertilizer industry. It answers questions for him as to: How much? What kind? Will it pay?

What about heavier rates of application of high potash mixtures on grain and legume seedings?

What about top-dressing old alfalfa fields with high potash mixtures with or without borax?

What about extra nitrogen for corn? What about 10-10-10 or similar mixtures for direct fertilization of pastures?

2 The demonstration serves not only to "sell" the individual farmer on whose place the demonstration is set up, but when used for field day meetings or as Result Demonstration Stops or tours conducted within the county, multiplies its value and effectiveness.

3 The demonstration supplies the county agent with some actual, factual yield data.

When all results of demonstrations carried out in the state are brought together in our all-state report, they are a valuable source of information not only to the county agent himself but to various other educational agencies, including the Vo.-Ag. teachers, Vet-trainers, and the local S.C.S. personnel.

This report also supplies the local fertilizer dealer, the fertilizer salesman, and the industry with year-to-year yield data along with our latest recommendations.

4 The demonstration furnishes subjects for pictures of good contrasts of the "with" and "without," used by all of us in the preparation of news releases and farm magazine press articles.

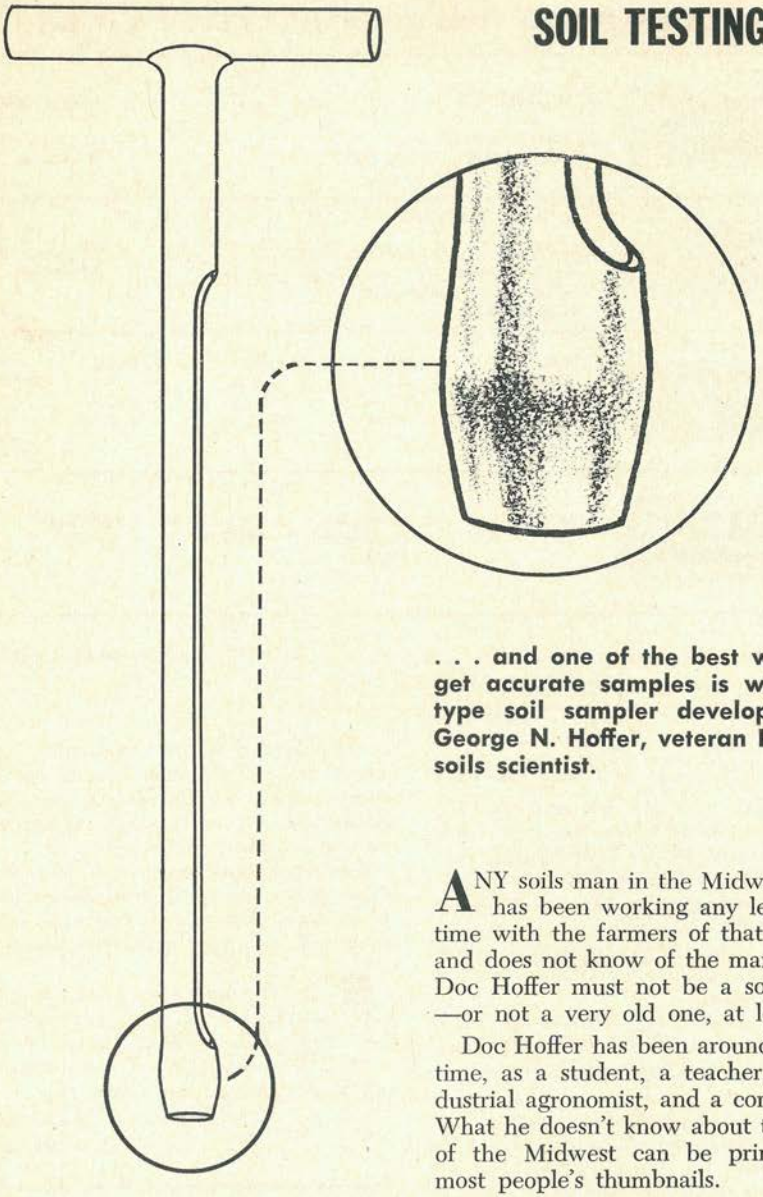
—From C. J. Chapman

THE END

LOOKING FOR COLOR PICTURES FOR A FUTURE PUBLICATION?

SEE PAGE 39

SOIL TESTING DEMANDS



. . . and one of the best ways to get accurate samples is with the type soil sampler developed by George N. Hoffer, veteran Indiana soils scientist.

ANY soils man in the Midwest who has been working any length of time with the farmers of that section and does not know of the man called Doc Hoffer must not be a soils man —or not a very old one, at least.

Doc Hoffer has been around a long time, as a student, a teacher, an industrial agronomist, and a consultant. What he doesn't know about the soils of the Midwest can be printed on most people's thumbnails.

That is why this magazine believes the soil sampler Doc Hoffer recently developed is worth reporting in some detail here. For many years Better Crops has kept its readers well posted on the latest developments in the soil testing field. We now believe the Hoffer soil sampler is another important step to report.

After years and years of working with the soil, G. N. Hoffer recently came up with a soil sampler that features a drawn probe cup which cuts a soil core slightly smaller than the diameter of the tube easily, without breakage, giving an accurate profile of the soil and providing samples from measurable levels for the entire depth of the cut.

TRUE SAMPLES

Whether you are going to test for tilth, fertility or alkalinity—whether you are interested in compacted layers, soil aggregates or chemical elements—you need a true profile sample from which you can make accurate tests at various levels.

Doc Hoffer's new sampler insures dependable samples, largely through two features:

(1) A new-style drawn probe cup that cuts a soil core slightly smaller than the diameter of the tube, enabling the core to rise in the tube without breaking up as the sampler is pushed slowly into the soil. This feature gives an accurate profile of the soil for the entire depth of the sample.

(2) Special polished, heat-treated, triple-plated surface to increase rigidity and strength, so the cutting edge does not bend when it strikes hard objects. The handle area remains ductile and will not break in the hands of the user.

Hoffer soil samplers secure accurate soil samples with undistorted core or column of soil. By pushing the Hoffer sampler straight into the soil without twisting or turning, and pulling it straight out again, the soil core rises in the tube with no disturbance to its surface but the light chaffing or smearing caused as the tube is pulled from the soil. This can easily be shaved gently from the bottom upward with a pocket knife, while holding the thumb at the top of the core to make sure it does not break.

Accurate soil samples taken like this give a true picture of the placement of compacted areas. The core provides samples of soil from various measurable levels which may be tested to determine acidity, localization of available phosphates in relation to the needs of the crops, also available potassium in the topsoil and subsoil.

Quick and accurate information on soil conditions below the plow layer can be obtained at any time during the growing season by careful examination and testing of the undisturbed section of soil obtained by Doc's sampler.

Unless a number of samples are taken there can be no certainty that the conditions are the same in other parts of the field, the farm or other area being studied.

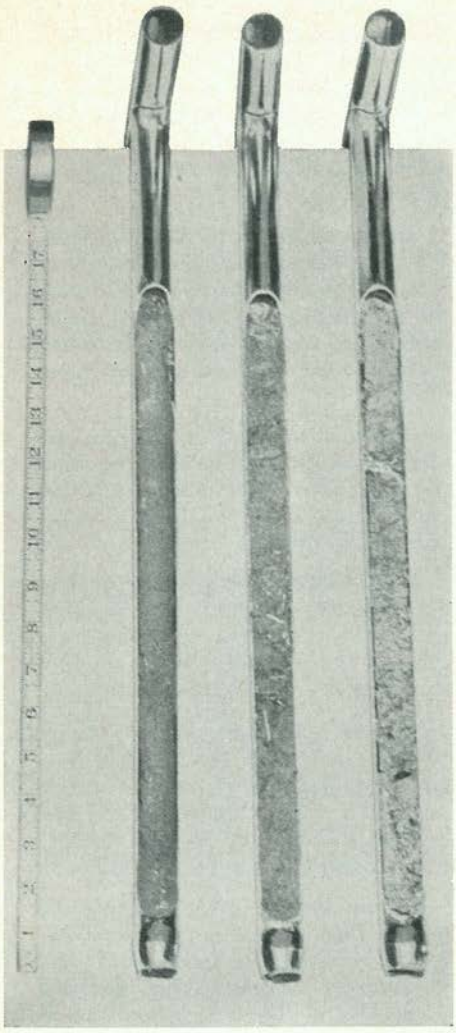
A good measure is to check at least one sampling point for each 4 acres, and compare with a control sample taken from a nearby fence row or similar spot of known good tilth.

Samples taken at regular intervals across a field and compared with a fence row sample and with each other, provide a wealth of interesting and helpful information on the present composition and condition of the soil.

Careful testing of such samples by qualified technicians can indicate what type of fertilizers are needed and serve as a guide in determining the best placement of future applications of fertilizer.

A soil sample that does not show exactly where plow soles, clay pans or other tight layers exist, cannot give the information you need to make plowing and cultivation easy and economical.

Comparative studies on the effects of various crop rotation practices on the tilth and structure of the soil, indicate the importance of rotating that is based on both the yields of forage and the tilth-building activity of legumes.



When some samples are placed side by side for comparative study of soil profiles taken from different areas of a field, the clean-cut cores obtained with the Hoffer soil sampler make detection of compactions a simple matter.

If you want to know more about Doc's soil sampler, just write him at Lafayette, Indiana. That will get him. Dr. George N. Hoffer, Lafayette, Indiana. They all know him there.

THE END

BOOK REVIEW

GRASSLANDS. Edited by Howard B. Sprague, Head, Department of Agronomy, Pennsylvania State University. Pub. 53 of the American Association for the Advancement of Science, 1959. 406 pp. 37 illus. The Horn-Shafer Co., Baltimore. Price, $9 ($8 to members of A.A.A.S.)

This volume contains the papers presented in a symposium on grasslands in Section "O" Meetings of the 1956 meetings of the American Association for the Advancement of Science. The 44 contributing authors have broad experience and a comprehensive knowledge of the various aspects of grasslands and are widely-known authorities in their respective fields.

The book is organized into eight sections: Sciences in Support of Grassland Research; Forage Production in Temperate Humid Regions; Engineering Aspects of Grassland Agriculture; Forage Utilization and Related Animal Nutrition Problems; Evaluation of the Nutritive Significance of Forages; Grassland Climatology; Ecology of Grasslands; and Range Management. Under each of these broad categories are included four or five papers.

The authors did an effective job of reviewing our knowledge relating to the various aspects of grasslands, with particular emphasis on recent developments. Although not all aspects of this important and broad subject are treated in detail, this symposium volume gives us the best review of present knowledge now available in one volume. More space is devoted to the utilization and nutritive value of forage and to grassland climatology and ecology than to some other phases.

Agronomists and livestock men, as well as others interested in our billion acres of grasslands, will find this a most useful source of information. It provides the opportunity to become acquainted with new developments in research and practice that are likely to influence the progress and direction of grassland activities.

SPECIAL 4-COLOR ENGRAVINGS

FOR YOUR FUTURE PUBLICATIONS SHOWING POTASH DEFICIENCY SYMPTOMS ON REPRESENTATIVE CROPS

If you are planning a publication in which you want to feature nutrient hunger signs in certain crops in their natural color, this offer is for you. The Potash Institute, for a number of years now, has run natural color pictures on the cover of this magazine showing potash deficiency symptoms on important crops. Four-color engraved plates (electrotypes) of these pictures can now be secured at cost ($34) for use in publications printed by letterpress process. Accompanying them will be a full-length legend, discussing the crop, its symptoms, and something of its origin and special nature. The plate sizes are 4¾″ x 5¾″.

Fill in and mail the coupon below to secure one or more from the following series of colored picture engravings:

		Check Here
Potatoes	leaves with clear symptoms	$34
Corn	corn ears and roots from healthy and from potash-deficient plots	$34
Corn	marginal leaf scorch, defective nodal tissues, undeveloped, chaffy ears	$34
Cotton	cotton rust, which is potash starvation	$34
Burley Tobacco	leaves with typical symptoms	$34
Soybeans	showing leaves and wrinkled, misshapen seeds	$34
Soybeans	typical influence of potash on soybeans on very low potash soils	$34
Alfalfa	clear signs on the leaves	$34
Grass	contrast between fertilizer practices involving normal potash applications vs. recommended with respect to potash	$34
Clover	effect of potash in maintaining stand of clover	$34
Hay	what happened when a mixed hay seeding was planted side by side on low and high potash soil conditions	$34
Peanuts	lush-growing peanuts against background of good corn, with inset close-up of healthy and potash-starved leaves	$34
Wheat	dependence of root growth as well as top growth on balanced nutrition	$34

COUPON CONTINUED ON PAGE 40

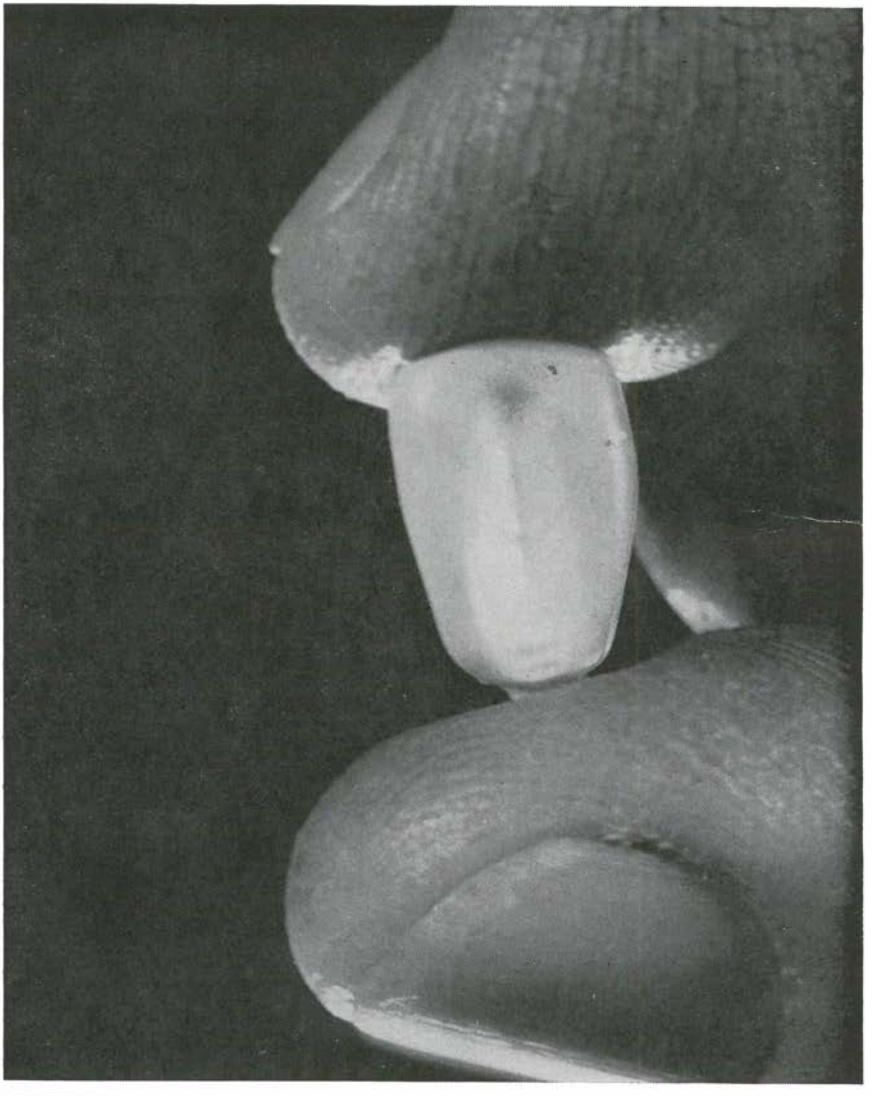
		Check Here
Tomatoes	normal vs. potash-starved tomato fruit and leaves	**$34**
Peas	inset of potash-hungry plant against field of well-fertilized peas	**$34**
Carrots	what happens when there is shortage of potash compared with enough potash	**$34**
Cabbage	early stage of potash deficiency, close-up	**$34**
Strawberries	leaves, petioles, and whole plants from a normal plot vs. same from extreme potash deficient plot	**$34**
Apples	well-managed block of McIntosh apple trees with insect contrasting good vs. poorly colored fruit influenced by management methods	**$34**
Cherries	types of leaf and twig growth from young cherry trees fertilized with potash and from potash-starved trees	**$34**
Prunes	leaves and fruit of the French prune—showing normal vs. potash-hungry leaves, also normal vs. potash-deficient fruit	**$34**
Apricot	striking potash-hunger signs on leaves of one limb vs. leaves from limb of healthy tree	**$34**
Pears	normal Bartlett spur leaves vs. potash deficient leaves, also contrasting fruit from normal and potash-hungry trees	**$34**
Peaches	potash-deficient peach leaves compared to normal leaf, also under-size potash-hungry fruit vs. normal fruit	**$34**
Spruce	potash-deficient symptoms on white spruce inset close-up compared to normal healthy white spruce branches	**$34**

Attached is $..... for ..... different sets of engravings of the potash deficiency pictures listed above.

Name..... **Position**.....

Address.....

Department B. C. American Potash Institute 1102 16th Street, N. W., Washington 6, D. C.



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