Better Crops with PLANT FOOD

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HOUSE PLANTS, LIKE PEOPLE, REFLECT ENVIRONMENT

FERTILE FACTS

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ON THE COVER . . .

. . . We see an arrangement of healthy house plants—a Kalanchoe, bottom left; a spotted Dumb Cane, center; a Chrysanthemum, right—and some of the ingredients used to grow them successfully.

The balanced plant food, the watering and measuring equipment, the insecticide materials (surrounded by the plants) all symbolize the relation between care and results.

Home and office ornaments—from the flowering begonia to the elaborate wall of tropical foliage—have become big business in recent years.

And growing them successfully in the home or office depends on many things, especially the grower's judgment and consistent care. "Green thumbs" are not inherited—they are developed.

In his article, *Growing House Plants Successfully*, (page 8), E. H. Bailey of Starkville, Mississippi, carries the reader through a series of steps that should help anyone interested in developing—or improving—his "green thumb."

If the truth were known, we'd probably be amazed at the percentage of house plants that give up the ghost each year to poor care, inadequate know-how, and loss of interest.

Loss of interest, of course, is bred by disappointing results. When the plant doesn't flourish—in a way the grower can show it off with some pride—he begins to tend it less, study it less, and the vicious cycle starts.

Care, know-how, interest—these constitute the important influence called environment.

Among the major factors of environment, discussed by Bailey, are the container, the soil, the watering, the feeding, the lighting, the temperature and ventilation, and pest control.

Of these, feeding is essential to maintaining proper growth and leaf color. Plants growing in the confines of small containers rapidly use up soil nutrients. It pays to feed them regularly.

Better Crops with PLANT FOOD

The Whole Truth
Not Selected Truth

SANTFORD MARTIN, *Editor*

Editorial Office:
1102 16th Street, N. W.
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It's time to testify

ABOUT SCIENCE

Jeff McDermid

(ELWOOD R. MCINTYRE)

By unwittingly offending a prominent agricultural scientist, I learned to respect science in its true sense.

I began with the assumption that the chemical laboratory would be as equally anxious for sudden fame as some of my sports heroes. You see, I knew something about *pugilism*, but hardly anything about *metabolism*. So I invaded the realm of one who was later to become a godfather to the vitamin discovery and issued a premature news story, which suffered from a few slight inaccuracies.

In a special sequestered lecture course, he opened my eyes. He told me that scareheads are not so precious to the scientist as a lengthy bibliography; that an ephemeral news story lacks the charm of a research bulletin with footnotes, asterisks, daggers, and tabulations; that a select audience of fellow scientists is more to be coveted than a big circulation among ignoramuses.

I have long since come to understand that flippancy is much resented among scientists, although more of them in recent years have fed facts to skillful feature writers who "translate" the matter into easily read articles of help to the laity. Though science gets fretfully impatient at the clumsy efforts of well-meaning interpreters like myself, as a profession science needs patience above almost anything else.

If patience, devotion, and concentration did not inhabit the human spirit, the human race might still be gibbering in the jungles. The challenge of the puzzle appeals to mankind. From the nursery to the laboratory, the unsolved riddles of our life bring out all the patience, devotion, and deep concentration that is in us.

Science plays the game for the game's sake. The Curies, partners in poverty with crude apparatus, extracted from the despised pitchblende of France a substance now of incalculable value. Ben Franklin snatched the thunderbolt from the sky with a child's kite and a door key. M. Pasteur, in saving the life of a little Alsatian boy bitten by a rabid hound, evolved the great theory and practice of inoculation. Father Mendel—parish priest, humble gardener, and flower lover—set up a law which is fundamental in eugenics and biology. Justus von Liebig at Giessen and Sir John Lawes at Rothamsted founded the first experimental works in soil science. John Richardson Young, struggling Maryland chemist, began the first chapters of the American science of food and nutrition. Henry P. Armsby, young livestock feeding student, challenged the collegiate livestock professors with his basic studies and tables to create better rations.

Wonderful things developed by science are merely the product of the scientist's *ability to wonder.* Two words—"I wonder"—are the sparks that set the tinder of progress ablaze. Moreover, those who wonder over the secrets of unknown things are always those who have an inner simplicity of spirit. *Simplicity is the first great attribute of the pure scientist.*

FROM THE PATHWAY OF A SATELLITE . . .

I knew the late Dr. Stephen Moulton Babcock for many years. The thing that struck me about that beloved old gentleman (who invented the first successful butter fat test) was his *childlike simplicity* and the *gently inquisitive* way he went after facts.

The preservation and advancement of organized knowledge depend not alone on man's ability to wonder, but also on his power to question in the right way—and his capacity to apply what he has learned. Science is made of thinkers, workers, and practitioners.

But not all thinkers qualify as true scientists. Most of our everyday thinkers accept many things for granted. They seldom ask why or when. I pound on my typewriter without giving it much thought, until it sticks or sputters.

Back of that machine lies a vast amount of the science of physics and metallurgy, and possibly of chemistry. Its invention was a piece of sheer mechanical ingenuity, but science had to impart something to its makeup that was basic to all the rest.

The engineer knows *how,* but the scientist wants to know *why.* The builder is a *doer,* but the scientist is primarily a *dreamer.* The materialist deals in *fact,* but the scientist lives upon *faith.*

The Apostle Paul must have had something of the scientist in him, ancient alchemist or necromancer, but it is *the controlled fire of the calm zealot* bent upon charting all visible things—from the pathway of a satellite to the hatching of an egg.

It is just as somebody said: "Only genius can create science, but the humblest man can be taught its spirit and learn thereby to face the truth." This teaching of the spirit, this translation of the terms of science into those of the untaught commoner is what counts. For he may live to see this dream come true.

It is our job to burn away the barriers that exist between the laboratory and the people who do not know its language or realize its dominating place in the sun. Sometimes, unfortunately, the scientist himself makes our task a harder one.

For when he says *Agropyron repens*, I mean quack grass. When he claims it is *Medicago sativa*, I declare it is just alfalfa. When I catch a butterfly, he says it is one of the Lepidoptera. When I rhapsodize on my primrose by the river's brim, he scans his handy catalog and exclaims that it is *primula vulgaris*. He listens to the cadences of the *Ranis catesbiana*, but I hear only the croak of a bullfrog.

He wants strict adherence to scads of Latinized traditions. My aim is just to live and move and see the world. His desire is to fill libraries with research documents, while mine is to make some hay while the sun shines and get into the shade thereafter. Like the poles, we are far apart, but maybe the future of the cause we alike cherish lies

. . . TO THE HATCHING OF AN EGG

between us after all.

Though we do not grasp its methods well, we appreciate all that science has done for us. It has opened new stores of raw materials, has synthesized thousands of new compounds, found glory in dust and mold, supplied the working data to build complex machines and revolutionary processes to emancipate those who toil from drudgery and danger. It has provided more leisure for more people.

In the industrial laboratory, it has perfected tools of precision and the thinking apparatus which we know as "robots." In the realm of pain relief and lengthening of human life, science has led the van, making our poor world of suffering ten thousand times more livable and lovely.

A few centuries ago man measured his wonders and marvels by their size or grandeur, like pyramids, hanging gardens, great walls, and stupendous columns. In these happy times of ours, we see our desirable monuments through the eyepiece of the microscope. The molecule, the atom, the electron appear as mightier elements than tons of brick and mortar heaved into place by the blood and tears of slaves.

It's sadly true that we too often spend energy in training for war and making bigger and better guns—a misdirected use of science perhaps. But the science of war prevention and the formula for peace is looming up on the cloudy horizon, hand-in-hand with the final cure for cancer and international prejudice. In this process, the scientists of social and political forces will put in licks equal to those the physical scientists have already applied.

I want my brand of science to be militant, not cloistered. It must reach out in its wisdom and help guide the minds of those to whom we look for leadership. *Too often the pedagogue draws in his shell and lets the demagogue have his blustering way.* It should not be true that science often has knowledge without power, while politics has power without knowledge.

Here is the place, I believe, to quote from a former president of the Society of Chemical Engineers:

"If the heavens declare the glory of God, that glory is more manifest by telescope and spectroscope. If the whirling nebulae and the stars in their courses reveal the Omnipotence, so do the electrons in their orbits reveal His Presence. The laboratory may be a temple as well as the church. The laws of Nature are the Will of God. Their discovery is a revelation as valid as that of Mount Sinai, and by their observance only can man hope to come into himself and remain in harmony."

When beset with iconoclasts and atheists, I recall two mighty men of science in my college town. One is a chemist of national fame who leads a Bible class. The other is a biologist of note who often occupies the pulpit.

Like hundreds of other scientists, they have been drinking at the Pierian spring for many years. Yet the Niagara of knowledge rushes on unspent and furious. There will always be plenty of it left to drown out the doubters.

I began this by offending a scientist. I trust that I have not ended it by offending you! ◄ ◄ ◄

"IN PERFECT CONTENTMENT"

A dairyman told me the other day that in early September he was feeding his cows both roughage and grain just about as liberally as he would in the winter months.

We went out to see the cows, and it was true that they are getting practically no feed from the pasture.

A few miles away, on another farm, cows were lying down in the middle of the morning on a pasture of alfalfa and grass and chewing their cuds in perfect contentment. The owner of this herd was giving the cows very little hay and silage.

What made the difference?

The answer given by the owner of the second herd was *commercial fertilizer*.

For years he has been fertilizing pastures and meadows very heavily, *which he says encourages grass and legumes to grow even when it is dry*.

Hugh Cosline, Editor
American Agriculturist

WHAT IS A FARMER?

Well, that depends entirely on where you stand:

To his wife, he's a big eater, a heavy sleeper and a worry.

To his minister, he's a believer in God in nature, and nature in God.

To a politician, he's a someone you talk about during elections.

To a businessman, he's a customer.

To the banker, he's a depositor.

To his neighbors, he's a friend.

To his children, he's a man who always has a chore for them.

To his dog, he's a man with a quiet voice.

To the grocer, he's a God-send.

To the dairy operator, he's a name on a milk check.

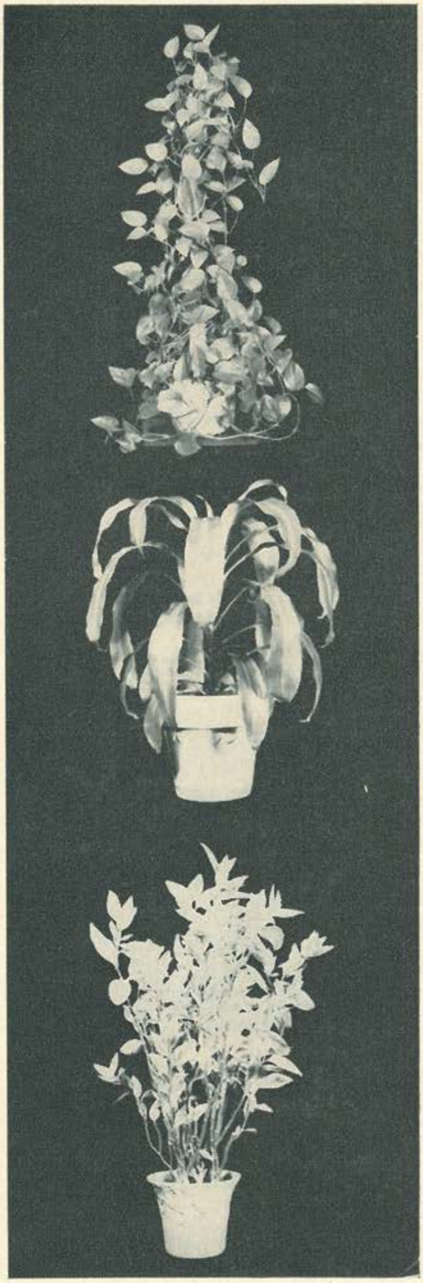
To the insurance agent, he's a big risk.

To the mechanic, he's a mechanical wizard who fixes things himself.

To the doctor, he's a physical wonder.

And to himself, well, only he can tell you that—but chances are, he won't.

This excellent analysis of "What Is A Farmer?" was part of an advertisement of Cargill, Inc.



A science and art . . .

Growing House Plants SUCCESSFULLY

By

Earl H. Bailey

Starkville, Mississippi

GROWING house plants is both a science and an art. To do it successfully calls for specific instructions in selecting plants, mixing soils, feeding the plants, and other factors, and for *good judgment in making decisions.* Excellent house plant specimens, like a farmer's fine crops, are grown by applying proven rules and good judgment.

Growing plants in your home is quite different from growing them in the greenhouse. Plants for the home must be selected to suit the existing environmental conditions. But in the greenhouse, the environment is created to suit the plants.

Perhaps we can compromise some-

ENVIRONMENT

House plants are vitally affected by the environment in which they live—factors that include containers, soil, watering, feeding, lighting, temperature, and pest control. Many plants thrive under a wide range of conditions. The beginner should select such hardy plants—adding the rarer, more difficult plants to his collection as he gains experience.

Plants can be grown successfully in a variety of pots, but many people get best results from porous clay pots with a hole in bottom for drainage. Pots with side slits are for orchids. The glazed jardiniere, upper left, does not have an opening for drainage. A potted plant can be placed in the jardiniere if water is not allowed to stand in the bottom.

CONTAINERS

what by saying that environment in the home, too, may be altered to help adapt the house to the environmental requirements of the plant.

Success with house plants, therefore, depends on (1) the ability of the individual in working with plants and (2) the selection of plants adapted to the environment under which they are to be placed.

Such people—those who understand plant requirements and can decide accurately on environmental needs—are often known for their "green thumb."

Environment

Environment is the sum total of the surrounding conditions or forces which affect the plant.

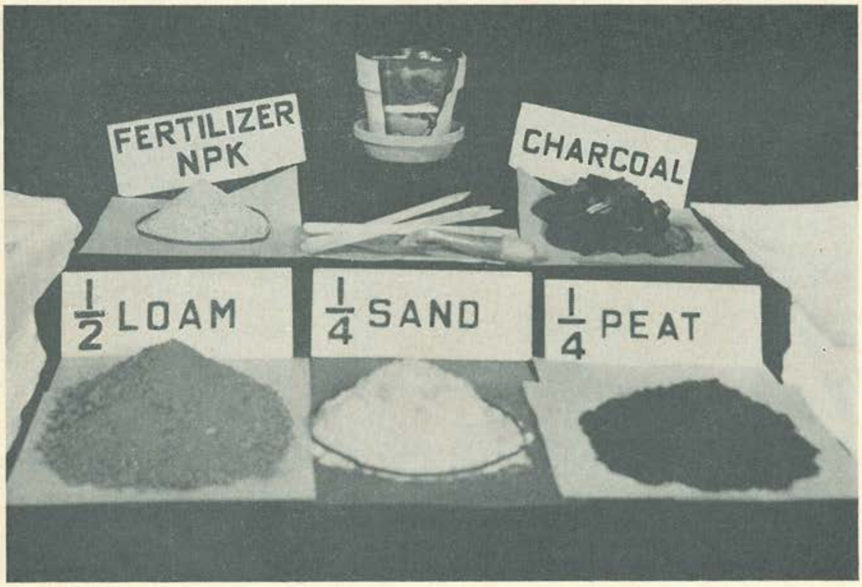
Plants are vitally affected by the external conditions in which they live. They are not able to move about the house from a sunny spot to a more favorable location.

Considering this fact, it is wise to study a plant as it occurs in its native habitat and then try to imitate these conditions in locating the plant in the house. Many plants, of course, thrive under a wide range of conditions, and *the beginner* should select the *hardy plants* of this type. Then, as he gains more experience, he may add some of the rarer or more difficult plants to his collection.

Many plants may be grown successfully in the modern dwelling or apartment, with some considered hardier than others. But even the so-called hardy plants require *proper environmental conditions and care* if prized specimens are to be produced.

Some of the rather hardy plants which may be grown in some spots in most any properly heated and ventilated home are *Dracaenas, Pandanus, Sansevierias, Pothos,* and many of the *Philodendrons.*

Many other plants could be added



THE SOIL

Volumes could be be written on soil requirements of different plants. A good general-purpose mixture can include the following ingredients: one-half garden or field loam, one-fourth clean sand, and one-fourth peat or well rotted manure. A small amount of cracked charcoal, in pieces the size of a a grain of corn and smaller, improve the soil mixture—and, of course, fertilizer.

to this list, but space will not permit.

The writer has grown Dracaenas of several species and varieties for many years and has found them to be interesting and attractive house plants.

Several plants of Dracaena fragrans massangeana and related species have been grown in the house for periods ranging from six to ten years. Good specimens of this type require well-lighted rooms without direct sunlight, plenty of water, and regular feeding with a good commercial fertilizer, *properly balanced with nitrogen, phosphorus, and potash.*

The young plants should be started in small pots and repotted in progressively larger pots during the first two or three years. The plant may then be transferred to a large pot in which it will remain as long as desired for the home.

The older plants, however, should receive plenty of water, to keep the soil wet, and regular feeding of balanced plant food. No damage will be done to the plant by regular watering *if the pot has good drainage.*

Dracaenas may be propagated by air layering and by planting sections of the mature stem.

The Ti Plant, *Cordyline terminalis,* is related to the Dracaenas and is equally as interesting as a house plant. But it is more selective in its requirements. The plants are slow-growing and contain beautiful foliage.

Space will not permit a detailed description on methods of growing the many different plants that may be grown in the home. However, many good books on house plants are found in stores handling plants and supplies for growing them.

Thomas H. Everett, Horticulturist of the New York Botanical Garden, gives specific instructions for growing plants in the home in his excellent

WATERING

After watering her Dumb-Cane plant (Dieffenbachia picta), this house plant grower is now sponging the leaves. Her home has year-round air conditioning, with the plant growing in this spot for many years. This is important for growing plants under air conditioning—to receive plenty of diffused or indirect lighting. In the winter, plants should be watered with lukewarm water to prevent temporary shock. This applies when putting on fertilizer, too.

book, "How to Grow Beautiful House Plants." There are many other good books on the growing of house plants.

Containers

Flower pots and other containers—in various sizes and shapes and in a variety of materials—are available for the house-plant grower. And plants may be grown successfully in most of them, *if they have an opening in the bottom for drainage.*

For best results, however, clay pots are still preferred by many growers because the porous nature of clay allows air to reach the plant roots. Even painting a flower pot is not recommended since paint clogs the pores. Old pots should be given a thorough scrubbing before they are used.

In potting a plant, we suggest certain steps:

(1) Check the drainage outlet to make sure that the opening is in order.

(2) Place pieces of broken clay pots, or coarse gravel, in the bottom of the pot.

(3) Cover the clay or gravel material with a layer of cracked charcoal to prevent souring, molding, or stagnating the soil water.

It is often good to place a layer of gravel, or similar material, in the container under the pot to allow better air circulation and drainage. This is very important for plants in big pots.

For most plants, however, water should not be allowed to stand in the container used under the bottom of

FEEDING

Healthy, vigorous house plants cannot be grown without liberal use of plant food. This house plant grower feeds her Norfolk Island Pine with 7-16-19 fertilizer dissolved in water. Some plants require feeding every week, others every two weeks. The spoon and measuring cup symbolize the importance of accurate measuring. The syringe or spray may be used for foliage feeding. Plant food is very important because most potting soils do not carry very much plant nutrient.

the flower pot. After watering the plant, any surplus water should be poured out. It is wise to use a rubber mat to protect the floor or stand on which the plant rests.

Space does not permit full discussion of pot sizes for different plants. Generally speaking, small plants do better when started out in small pots and changed to progressively larger pots as they grow older, or when they become rootbound, or when the need for repotting is apparent.

Some plants stop growing when they become rootbound, while others thrive in this condition. These details may be found in a good reference book on growing house plants.

The Soil

When preparing the soil mixture for house plants, carefully consider the physical condition.

The plant roots need air. To assure a constant air supply, the soil should be fairly coarse and one that will settle down firm but not pack too hard, or set up, after watering. Usually, a good field loam mixed with sand and organic material, such as peat or well-rotted manure, makes a good potting soil for many plants. The general purpose soil mixture is suited for the average plant grower. But many exceptions to this rule apply to specialized plant types.

A general purpose potting mixture used by some growers of house plants is composed of *one-half garden or field loam, one-fourth clean sand,* and *one-fourth peat or well rotted manure.* The addition of a small amount of

LIGHTING

Some plants prefer direct sunlight through the window—others only early morning sun, subdued sunlight, or no direct sunlight at all. Many flowering plants, such as petunias and begonias, do best in sunny windows. Some foliage plants, like Dracaenas, may blister in direct sunlight. It takes study and experimentation to determine the amount of light your plant needs. One rule is important—find a good location for your plant and let it remain there.

cracked charcoal and a small amount of *complete fertilizer* will also help to give the plant a good start.

About one-half teaspoon of fertilizer to a six inch pot of soil is usually sufficient.

Watering

Watering house plants is a subject that cannot be over emphasized, since the life and functions of the plant depend on water.

Water not only keeps the cooling system of the plant working but also dissolves and transports the plant food nutrients so vital to food manufacture and normal growth. Too little water causes the plant to wilt or die, too much prevents proper aeration which also may cause injury or death.

The right amount of water is determined by the individual growing plant. Some plants require fresh water every day while others need it only once or twice a week. This depends largely on the type plant grown and the surrounding conditions, such as light, humidity of the room atmosphere, and many other factors.

The important point to remember is that the soil in the pot should be *watered often enough to keep it moist and to maintain the plant in a vigorous growing condition.*

For some plants, such as Dracaenas, the soil should be kept wet with no surplus water left in the container under the pot, while other plants prefer a soil filled with moisture without being too wet.

As a general practice, when a plant

TEMPERATURE

Temperature and ventilation are important factors in successful house plant growing. This grower is setting the night temperature on 60 degrees—at bedtime. Not below 60 degrees—not over 75 degrees—is a good rule. Much depends on the care and location of the plant during high temperature periods. Plants need good air circulation, but not sudden drafts. Air conditioned houses don't hurt the plant if it can get some humidity occasionally.

is watered it should be watered thoroughly enough to wet the roots. Then, before it dries out completely and before it approaches wilting, the plant should be soaked again.

There are, of course, many exceptions to this rule.

In many cases, watering the plant at regular intervals as needed is *not enough*. It is also wise *to maintain a moist atmosphere*. This may be done by occasional spraying or syringing, washing the leaves with a sponge, or by placing pans of water in the room.

This practice is very important during the winter months when heating systems create a dry atmosphere or in climates where the air is naturally dry. Air conditioning may also dry the soils and room atmosphere necessitating more frequent waterings.

For general sanitation, it is advisable to wash the plant leaves occasionally with warm, soapy water.

Feeding

Water alone is not sufficient to grow beautiful house plant specimens. The plants need to be fed at regular intervals with *a good fertilizer properly balanced with nitrogen, phosphorus, and potash*. They need it in a form that will reach the roots.

In our plant growing, we have found that healthy, vigorous specimens cannot be grown without liberal use of plant food.

There are many fertilizers on the market especially recommended for house plants. Some are in solid form, some in liquids, and both require careful application. They should be used

INSECTS

Insects can become a problem when you accumulate a large number of plants in the same room. This grower removes mealybugs by hand and uses liberal amounts of soapsuds solution when washing her plants. She occasionally sprays with malathion or uses a nicotine sulphate solution. Many effective insecticides are on the market. Consult your official agricultural advisor, because special care should be taken in treating tender house plants for insects.

exactly as directed on the package.

The writer has experimented with fertilizers for house plants for many years and has found the *balanced NPK mixtures* that are dissolved in water and applied to be very satisfactory. Others apply the solid dry fertilizers with equally good results.

In either case, the plants should be watered two or three hours before applying the plant food.

Fertilizer mixture selected for house plants should contain the right proportions of nitrogen, phosphorus, and potash to keep the plant in a healthy condition without causing too rapid a growth.

Usually the plant's appearance indicates how often it should be fed. This means that in order to keep a plant healthy and green, it should be fed *once every two weeks and in many cases more often.* By using only half the recommended amount of fertilizer, the author has found, plants can be fed *once or twice each week* with satisfactory results—and still get their needed nutrients.

Some authorities on feeding plants prefer to use very small doses of plant food at each watering. In this way, danger of injuring the plant is eliminated while it is still kept supplied with adequate plant food nutrients.

Plant food is very important because potting soils recommended do not necessarily carry very much plant food. The soil mixtures are nothing more than media for holding plant nutrients.

Light

All plants need an abundance of

sunlight, either direct or indirect, but they vary considerably in the amount of direct sunlight required.

Many plants prefer an abundance of direct sunlight while others prefer only the early morning sun, subdued sunlight, or no direct sunlight at all. The amount of light needed can be determined by studying the light requirements of the particular plants you grow—or by experimentation.

Many of the flowering plants, such as petunias and begonias, do best in sunny windows.

Some of the foliage plants, like Dracaenas, Palms, Dumb Canes, and Philodendrons, thrive in subdued light or with no direct sunlight. In fact, some of the foliage plants like Dracaenas may blister when placed in direct sunlight other than perhaps the early morning sun.

Plants which grow in windows, or near windows, should be turned occasionally so that all sides receive a share of the sunlight.

During the summer months, some plants should be moved from direct sunlight to cooler places in the room. Likewise, some plants that prefer no direct sunlight during the summer may benefit from sunshine during the winter months.

The beauty of the home may be greatly enhanced by the use of plant specimens. But this does not mean a plant should be moved from place to place to serve this purpose.

When a plant is doing well in one spot, *it should not be moved to a less favorable location for decorative purposes except possibly for brief periods.* Changing the location may shock the plant. Find a good location for your plant and let it remain there.

Ventilation

Plants need good air circulation, *but avoid sudden drafts.* Too little circulation is preferable to too much. Windows should be opened occasionally to let in fresh air and to let any stale air escape.

The warm air of summer, especially at night, is beneficial to plants if allowed to circulate without undue drafts. This can usually be controlled by opening windows slightly and at the proper locations.

When many plants are grown in the same room, they tend to complement each other by creating a humid atmosphere beneficial to growth. This means, of course, that any outside air brought into the room should be controlled and admitted only when needed.

An occasional spraying of the leaves and the sponging of leaves may also help in creating the desired atmosphere.

Temperature

Many plants adapted to growing in the house thrive best at temperatures *from 60 to 70 degrees* but may do fairly well, or hold their own, during periods when the temperature range is from 65 to 75 degrees or even higher.

Much depends on the care the plants receive and the location in the room during the high temperature periods. The higher temperatures, however, should be avoided as much as possible.

Air conditioning in the home does not seem to harm many house plants if the system is cut off occasionally to allow humidity to increase. The cooler temperature helps to compensate, to some extent, for the moisture removed from the pots and air.

However, under such conditions, it is wise to open the windows at night or whenever the air conditioning system is cut off to allow circulation of fresh air. More water is required to replace that removed.

The house temperature during winter should not drop below 60 degrees, although some plants will stand lower temperatures.

Insect Pests

Insect pests are not serious on house

plants when you grow only a few plants. But when you accumulate a large number of plants in the same room, creating a moist atmosphere, insects may become serious—especially mealybugs.

Other insects, such as scale, spider mites, and plant lice or aphids, may also appear. In such cases, control measures are necessary. No one remedy is effective against all these insects, and when control measures become necessary, *consult your local agricultural advisor.*

A moist atmosphere is important to growing plants, but it also favors mealybugs. The important thing is not to bring a mealybug-infested plant into the collection.

The most troublesome of the house plant pests, mealybugs may be controlled by using a soapsuds bath, or nicotine sulphate (black leaf 40), 1½ teaspoonfuls to 1 gallon of water and soap solution, followed by removing the insects with a soft brush.

The treatment may be repeated to keep the insects under control. An occasional spraying with malathion is also an effective control measure for mealybugs.

Another excellent remedy for mealybugs is to remove the bugs with a cotton swab soaked in rubbing alcohol. Remove the bugs with an alcohol swab and a few minutes later spray the plant with a fine spray of water to wash off the alcohol (such as a windex spray) to prevent damage to the tender plant tissue. Alcohol is death to mealybugs.

Scale insects may be removed with a dull knife blade, or controlled by the same treatment recommended for mealybugs. The solution may be sprayed on or used as a wash.

The aphid may be controlled or kept in check by spraying the plants with a solution of nicotine sulphate at the rate of one teaspoonful to a gallon of water. Other remedies are also effective in controlling aphids.

Spider mites (red spiders) are sometimes difficult to eradicate but can often be checked by soapsuds bath. If this does not work, parathion dust is often effective. Nicotine sulphate (black leaf 40) at the rate of 1½ teaspoonfuls to a gallon of warm water with two teaspoonfuls of soap flakes makes an effective spray.

Many effective insecticides are on the market for controlling insects on house plants. Instructions for their use should be obtained from your State Agricultural Experiment Station, or from your local county agricultural advisor.

Whether your problem—of environment—is containers, soil, watering, feeding, lighting, temperature and ventilation, or insects, you will always be wise to consult your official agricultural advisor. He has the facts—often in attractive booklets—that will guide your "green thumb." Call him when you need him. ◄◄◄

THE ESSENTIAL MAN

"Don't call the Canadian farmer a yokel, hick, or bumpkin. He's the captain of the good earth. The farmer is the one essential man without whom no city dweller can long survive. He gets no paid vacation, no 40-hour week, no pension scheme and no paid time off for illness. No Canadian has more built-in integrity and self-respect than the farmer, but he gets the worst of the deal of any citizen in this rich land."—Gordon Sinclair in *Liberty* magazine.

BALANCED SOIL FERTILITY

LESS PLANT PESTS AND DISEASE

RECENT SOILS RESEARCH SUGGESTS THAT A MORE CAREFULLY BALANCED SOIL FERTILITY MAY REDUCE PLANT PEST AND DISEASE LOSSES

By William A. Albrecht • Department of Soils
University of Missouri

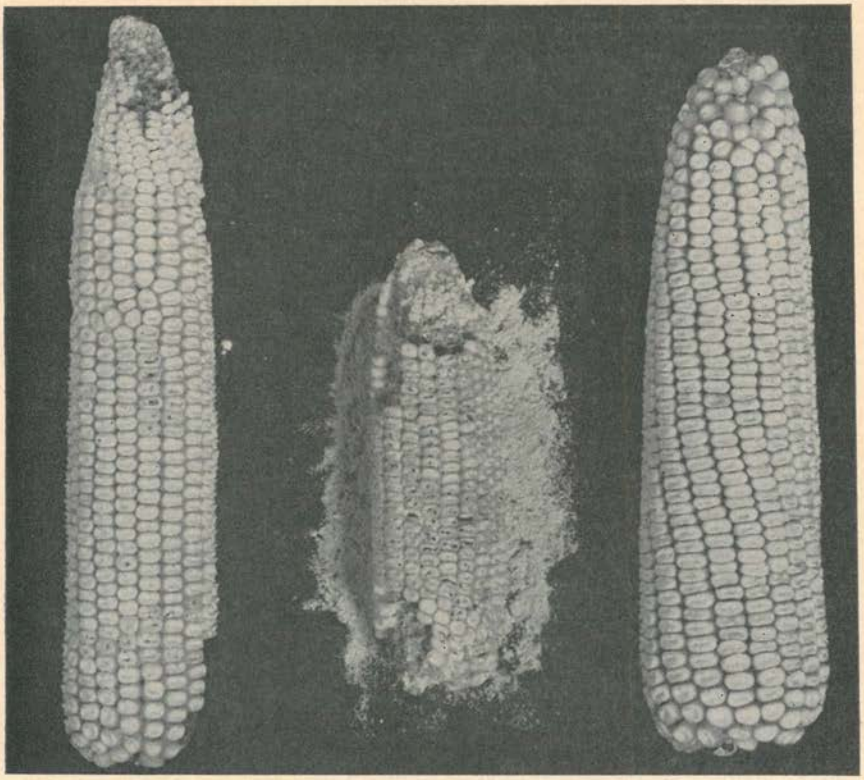
SOME modern soils research suggests that more carefully balanced soil fertility for better plant nutrition may reduce plant pests and disease losses.

We can now set up demonstrations —some with and some without the accidental incidence of plant diseases and insects—to learn how the biochemical behaviors of the clay, the organic matter, and the inorganic elements of the soil serve to feed our crops.

Dr. William A. Albrecht, Head of Soils at Missouri University, is a nationally known scientist whose lectures and writings have influenced the yield and quality of Midwestern crops. He earned 4 degrees and studied on 3 continents.

Modern soil research suggests that the responsibility for disease and pest control, in many instances, should be placed with persons managing crops and their nutrition—and not with the chemist synthesizing more poisonous drugs to fight vermin and disease.

Nature grew most of our crops in healthy conditions before we took them over. When we found wild plants growing in excellent condition, or in what the ecologist calls "an ecological climax," *(a) they were in a pure stand, i.e. there were no contaminating weed crops, (b) they had been growing as the same crop in succession in the same location for many years, (c) they had accumulated much of their own residues as organic matter on and within the soil, and (d) they were free from diseases and*



Corn grown on soil with a low fertility level is more subject to insect damage while in storage than corn grown on more fertile soil, reports W. A. Albrecht in this article. Here we see a small infested ear of corn that was grown on a low fertility soil. It was an easy mark for the grain borer. The ear at the left was grown on the same soil but with added nutrients. It was undamaged except for a few borer holes where the two ears were in direct contact for a period of time. The open-pollinated ear at the right was in contact with the infested one five months but showed only one sign of borer injury. (Fig. 3)

pests.

These facts present a distinct paradox when in an extensive reference work, published no later than 1954, there appears the following statement: "It would be impossible to over-emphasize the importance of crop rotations to control diseases, maintain fertility, prevent erosion, and maintain soil structure."

Such contradiction between the crop management by nature-giving healthy crops without rotations of them, and man's claims for rotations in respect to plant health, suggests that much is yet to be learned by us about nature's success in growing crops with their healthy survival and without chemical wars on diseases and pests.

When plants in nature reach their climax where no soil fertility (neither inorganic nor organic) is removed and when our agricultural management removes these far in excess of their return, might we not theorize that depleted soils and accompanying poor plant nutrition result in plant diseases and insect attacks?

On the converse, then, we might theorize that properly balanced fertility levels would prevent these troubles and yield healthier plants.

An affirmative answer was given in some delicately controlled studies of legume-plant nutrition. In tests with fungus diseases of soybeans, research clearly demonstrated that attacks were highest on soils with low calcium levels. (Fig. 1). These attacks were prevented by higher levels of exchangeable calcium in the soil. This was the demonstration when all the soils were decidedly acid with a pH of 4.4.

Were this a case with no additional tests to expose soil fertility characters more clearly, we might have drawn the once common conclusion that the soils were all too acid to grow legumes. But as the sandy soils contained more of the same supply of acid clay and delivered more calcium to the legume plants, their growth varied from the miserable with severe fungus attacks to the excellent with no fungus.

This fact exhibited itself six times by six replications of the test.

Leaf-eating Insects

Recent research methods indicate the presence or absence of the leaf-eating insect (Heliothrips haemorrhoidalis) varied with the levels of nitrogen and exchangeable calcium (Fig. 2). When the soil supplied ten milligram-equivalents, or less, of nitrogen per plant, the thrips made their attacks. When the soil offered twenty, there were no thrips. When nitrogen supplies were low but calcium was plentiful (increasing through 5, 10, 20, and 40 milligram-equivalents per plant) there were less thrips injuries as more calcium was available in the soil for plant nutrition.

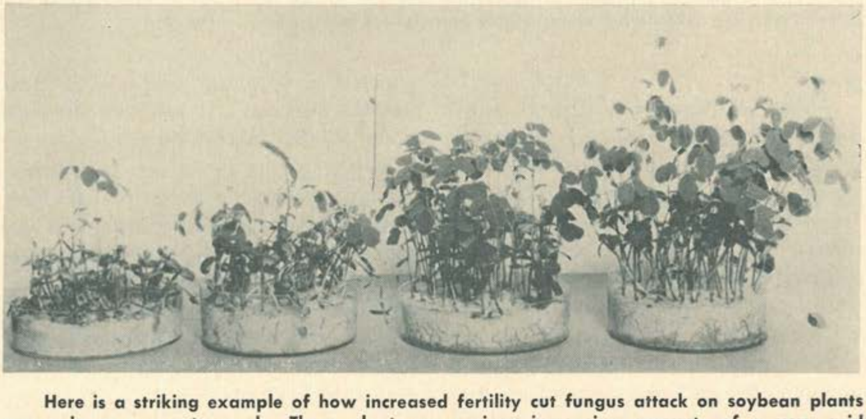
These facts were demonstrated when plants were all in close proximity and the test design included ten replications to give ten repititions of the demonstration.

Grain-eating Insects

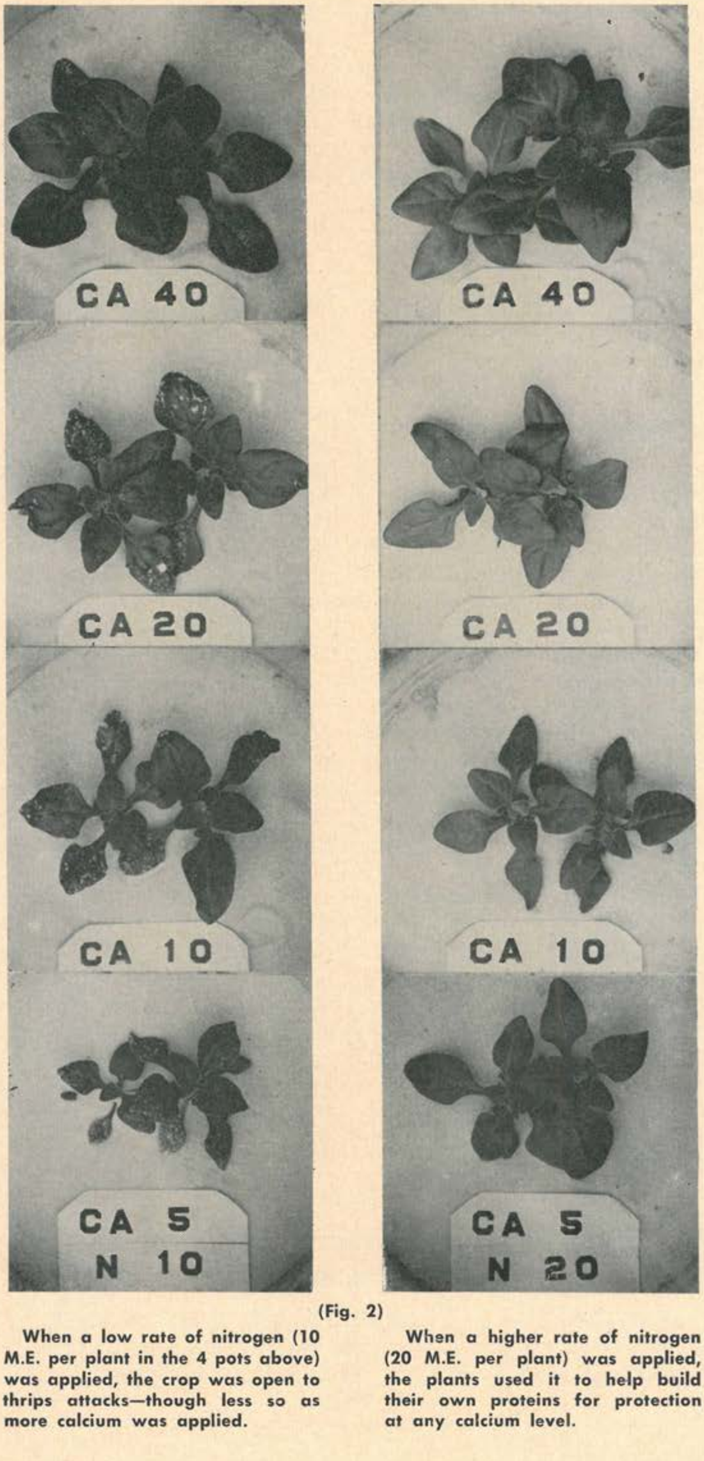
In still more recent work, corn grown on soils with high fertility levels was better able to withstand grain borer attacks in storage than corn grown on poorer soils (Fig. 3). The ear with the severe infestation represented the size common from the plot fertilized with nitrogen only.

The larger ear to its left, with the few borer holes where the two ears were in contact, was grown on the adjoining plot which was given phosphorus fertilizer as well as nitrogen for the soil treatment.

This yield difference occurred *even when the soil test in advance of the*



Here is a striking example of how increased fertility cut fungus attack on soybean plants grown in pure quartz sand. These plants were given increasing amounts of a very acid collodial clay (pH 4.4 saturated about 25% by calcium). As more of the clay representing more exchangeable calcium is put into the sand (visible from left to right in the clear glass containers), the plants prospered and showed less and less signs of attack by fungus—suggesting "damping off." (Fig. 1)



(Fig. 2)

When a low rate of nitrogen (10 M.E. per plant in the 4 pots above) was applied, the crop was open to thrips attacks—though less so as more calcium was applied.

When a higher rate of nitrogen (20 M.E. per plant) was applied, the plants used it to help build their own proteins for protection at any calcium level.

soil treatments did not indicate any serious fertility shortages.

Ear samples from these two soil treatments were under observation for a 3-year period following their harvest. Note the progressive destruction by the lesser grain borer of the hybrid corn fertilized with nitrogen only. There has been little destruction of the same hybrid fertilized *with both nitrogen and phosphorus.*

The open-pollinated ear (right) in contact with the infested one for five months showed but one visible boring by the insect pest. (*See* Fig. 3.)

"To Be Well-fed Is To Be Healthy"

Less pests and diseases resulted from balanced soil fertility in these observations:

(1) A legume crop growing its self-protection against fungus by the help of more calcium, the commonly deficient fertility element in humid soils, and the one regularly associated with plants producing more protein.

(2) A non-legume in which nitrogen helped the plant protect itself against an insect pest, but better so when that nitrogen was balanced with calcium and with possibly other untested elements which calcium mobilizes into the plant.

(3) The grain with its extensive destruction by a grain-eating pest when grown with nitrogen fertilizer only, but grain with an ingrown protection (resistance, immunity, antibiotics, or what have you?) against those insects when phosphorus combined with nitrogen was the added fertility growing the plants.

There is the forceful suggestion that not one element of fertility, but all of them *in balance and integration of their separate functions* are required to grow plants healthy enough to ward off these diseases and pests. There is the additional suggestion that any other element as the limiting factor, or in major deficiency, might show up under test as the "cure" or the preventive in similar tests or demonstrations.

Here the observations cited, first, the calcium, then nitrogen, then phosphorus in a readily anticipated order when we grant that calcium is the major nutrient in the soil.

Following in common order, the use of *potassium* would come next in line as help for the plant's growing its own protection. Then others would fall in line, too, based on the way they become limiting elements in the plant's processes of growing whatever organic compounds through which it protects itself.

Such evidence indicates nature was able to produce crops without destruction from diseases and pests. It also suggests that while we may manage soils to give bigger crop yields, we have much to learn about soil management that nourishes plants well enough for them to protect themselves from diseases and pests without our poisons or medications.

It raises the question, also, of whether crops too deficient in their nutrition to grow their own antibiotics for self-defense would contain enough nutrients to produce healthful livestock.

Soil research faces a serious challenge to formulate balanced fertility as guarantee of less plant diseases and fewer crop pests, as well as a means of producing more vegetative bulk per acre. ◄◄◄

WHAT A FEAST!

It is said that the average American reaching 70 has consumed during his lifetime 150 head of cattle, 225 lambs, 26 sheep, 310 swine, 2,400 chickens, 26 acres of grain, and 50 acres of fruits, vegetables, and potatoes.

(*Spuditems*)

API

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The following picture services are available for loan from the American Potash Institute in Washington. Please write well in advance of the date the film is needed—giving your group's name, date of exhibition, and period of loan.

FILMS—16MM

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Featuring location, formation of American potash deposits . . . Mining and refining potash in California and New Mexico.

SAVE THAT SOIL (25 min.)

Depicting early South, showing results of one-crop-system . . . reclamation and conservation of southern soils through legumes . . . and modern soil management.

THE PLANT SPEAKS (Series of 4 films)

Through Deficiency Symptoms—showing soil depletion, erosion, results of plant food losses . . . deficiency symptoms in field and orchard crops. (25 min.)

Through Soil Tests—showing where, how to take soil samples, on the farm . . . value of soil tests when interpreted by experienced soil chemists. (10 min.)

Through Tissue Tests—showing value of tissue testing . . . procedure for testing corn tissues in field with Purdue field test kit. (14 min.)

Through Leaf Analysis—showing use of leaf analysis in determining the fertilizer crops need . . . how leaves are sampled and analyzed. (18 min.)

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California desert scenes where borax is produced . . . showing importance of borax in agriculture . . . with boron deficiency symptoms in olives, celery, cauliflower, crimson clover, alfalfa, sweet potatoes, table beets, radishes, apples.

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Deficiency symptoms on our major crops and effects of potassium hunger. ($2.20)

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Potash and the leach

The Forgotten Forest Industry

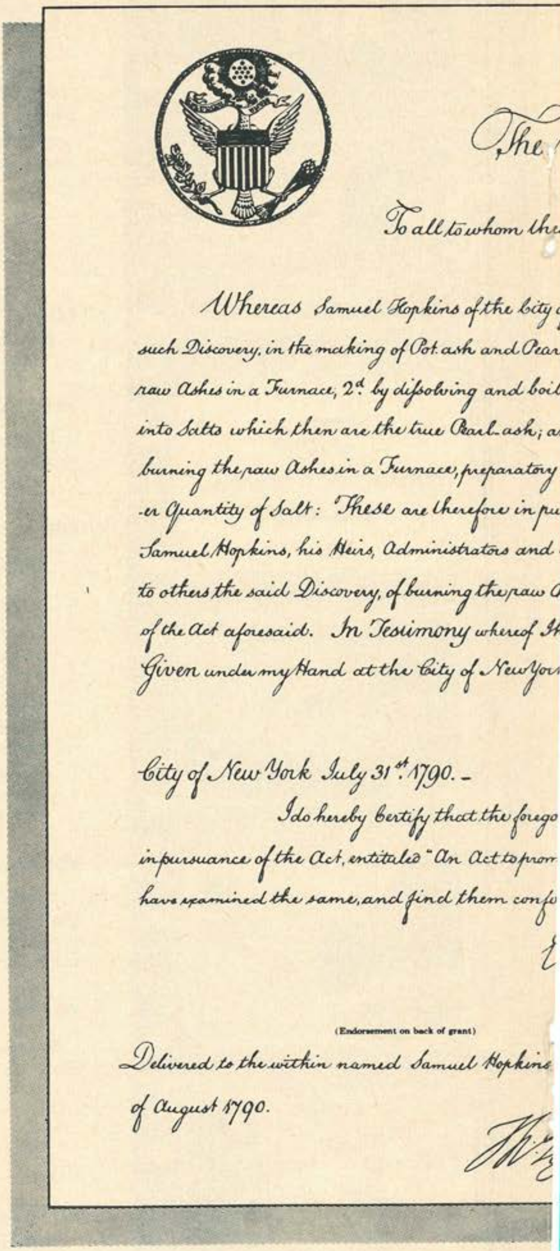
By Archer P. Whallon
Stockbridge, Michigan

FEW, if any, of today's American farmers, as they go about their winter's work of wood cutting or sap gathering in our surviving sugar bushes, remember a pioneer timberland industry that often solved the financial emergencies of the eastern states, as well as the Canadian and midwestern homesteaders.

This was the cutting and burning of timber, *largely big oaks and maples*, to get ashes for potash making. It is well, we now realize, that this primitive chemical industry was not permitted to continue. It would have depleted our original forest resources even more than has occurred. Certainly, it is fortunate it passed out long before the chain saw came along.

Timber burning as a source of potash never attained the status in the United States that it did in eastern Canada. But for some years, it was the first financial aid for the settlers from New England to lower Michigan.

(Continued on page 26)


The
To all to whom thes
Whereas Samuel Hopkins of the City of
such Discovery, in the making of Pot ash and Pear
raw Ashes in a Furnace, 2d. by dissolving and boil
into Salts which then are the true Pearl-ash; an
burning the raw Ashes in a Furnace, preparatory
-er Quantity of Salt: These are therefore in pu
Samuel Hopkins, his Heirs, Administrators and
to others the said Discovery, of burning the raw
of the Act aforesaid. In Testimony whereof I h
Given under my Hand at the City of New York

City of New York July 31st. 1790. –
I do hereby Certify that the forego
in pursuance of the Act, entitled "An Act to prom
have examined the same, and find them confo

(Endorsement on back of grant)

Delivered to the within named Samuel Hopkins
of August 1790.

FIRST

The first patent issued by the United States Government
of potash or pearl-ash, as it was then called, from woo
had to use 400 to 500 tons of wood to produce *one ton* o

United States.

e Presents shall come. Greeting.

Philadelphia and State of Pensylvania hath discovered an Improvement, not known or used before
ash by a new Apparatus and Process; that is to say, in the making of Pearl ash 1st by burning the
ng them when so burnt in Water, 3rd by drawing off and settling the Ley, and 4th by boiling the Ley
d also in the making of Pot ash by fluxing the Pearl ash so made as aforesaid; which Operation of
to their Dissolution and boiling in Water, is new, leaves little Residuum, and produces a much great
suance of the Act, entituled "An Act to promote the Progress of useful Arts", to grant to the said
ssigns, for the Term of fourteen Years, the sole and exclusive Right and Liberty of using, and vending
shes previous to their being dissolved and boiled in Water, according to the true Intent and Meaning
ave caused these Letters to be made patent, and the Seal of the United States to be hereunto affixed
this thirty first Day of July in the Year of our Lord one thousand seven hundred & Ninety.

G° Washington

ing Letters patent were delivered to me
ote the Progress of useful Arts"; that I
mable to the said Act.

Edm Randolph Attorney General for the United States.

this fourth day

Jefferson

First United States Patent Grant
July 31, 1790
(Reproduced from the original in the collection of the Chicago Historical Society)

PATENT GRANTED BY THE UNITED STATES

was for the production d ashes. Mr. Hopkins *f his potash.*

Today, with its great mines and processing plants, the potash industry has become one of America's basic industries. No longer do we have to import this vital commodity to help produce the food and fiber our nation must have.

The money they received from the sale of wood ashes was often the first cash made from their land.

To the pioneers of the central west, the vast forest seemed inexhaustible. They had no idea the timber stand could be seriously depleted. Conservation of wild life—from buffaloes to trees—was a word unknown to their vocabulary. They thought the country had more of these things than could ever be used.

While forest conservation was unknown in America, Europeans had long opposed the wasteful timber burning for potash making. But they did not know how to avoid it. Potash from wood ashes was essential to the manufacture of soap, glass, gunpowder. In fact, it was an essential war material. So the Europeans were quite willing to import their necessary potash from their American colonies, rather than burn the trees of their homelands.

In 1674 Jean Talon, intendant of New France, conceded to Nicholas Follin the exclusive right to export potash to France. After the English conquest of Canada in 1760, the wood-ash potash industry rapidly increased, stirred by events following the American Revolution.

The first United States patent was issued April 10, 1790 to Samuel Hopkins of Pittsford, Vermont, then living in Philadelphia, for an improvement in "the making of Pot ash and Pearl ash by a new Apparatus and Process." This was signed by President George Washington, Attorney General Edmund Randolph, and Secretary of State Thomas Jefferson.

From about 1780 and the years immediately following, timber burning for potash making was the first way to get money to the Tory or loyalist refugees who fled to Canada where they were given land grants by the British government. These were the displaced persons of their day.

And incidentally, in proportion to population, as many folks wanted to get out of these United States in the days of George Washington as ever wanted to escape the Soviet Union in the days of Joe Stalin.

There was one difference—no border guards to stop their going. The American government did nothing to prevent this emigration, with loyalist departures often hastened in more or less pleasant ways by their republican neighbors.

Although many were of the wealthier class—the large farmers and merchants of New England—they suffered what was little more than confiscation of their property.

They were usually forced to sell out at whatever low price was offered them—by tar and feather threats, by "Indian" scalpings, by mysterious shooting of their livestock, by burning of their ripened grain fields and stacks. And often they were glad to escape over the Canadian border impoverished.

There their first source of income was the ashes from the big oaks and hard maples of southern Ontario and Quebec.

This was the beginning of the Canadian potash industry that was to continue for a century, making Canada the world's largest potash producer in the 19th century. By 1871, there were 500 "cendriers"—primitive chemical works for converting ashes to potash—annually exporting eight to twelve thousand tons of potash.

Judged by today's standards of chemical commerce, these figures may seem small, but to get such a production caused appalling waste of timber. *To produce 8,000 tons of potash, they burned 4,000,000 tons of wood.* Production of 1871 marked the peak of Canada's wood potash industry.

In 1870 the German Stassfurt potash mines had begun to operate, and by 1891 only 128 of the Canadian "cendriers" were running. Before the first World War, Canadian commercial potash production had entirely ceased.

Later discovery and operation of potash deposits in the Carlsbad area of New Mexico, with more recent discoveries in Saskatchewan, have made North America entirely independent of an overseas potash supply.

And the ancient industry of wood ash potash making that at one time threatened our forest resources seems now to be a thing of the past.

It is something of a digression, but not without interest, that this primitive fertilizer industry, from the standpoint of actual value and utility to the living, was really more injurious and wasteful than the curious commerce in another fertilizer material with which it was contemporary.

This was the British bone phosphorus industry, of which the materials were not all animal bones by any means, but human bones from the systematic excavations of British and Continental battlefields. Though there are big monuments on the grounds of Waterloo and other European battlefields, many of the unknown soldiers the stones are supposed to honor have long been removed.

In the latter part of the nineteenth century, the German chemist, Liebeg, accused England of importing annually from European battlefields, catacombs, and other sources the manurial equivalent of three and a half million men.

Obviously some of our ancestors were not too sentimental about men or trees, and had few scruples about desecrating graves or despoiling nature, if an immediate profit could be gained.

But in the latter respect, they simply lacked foresight.

Timber burning for potash production in the United States was really a sideline or byproduct activity associated with the land clearing operations of pioneers in the north central states. But for many settlers in lower Michigan, it was a vital source of revenue in the first few years of homesteading.

The settlers had to clear their land before crops could be planted. Since they had to cut and burn the trees anyway, they could make a little side money in the process, they figured. Certainly it was a little money for a lot of hard work, but often the only source of ready cash.

The primeval forests seemed so vast that they never imagined the timber resources of the country could be dangerously depleted. Huge stands of first class saw timber, *big red and white oaks, white ash, hard maple, even black walnut were cut and the logs drawn together in big piles for burning.*

The pioneers cooperated in community "log rolling," a term that survives to this day in some political arenas. In spring, the itinerant ash buyer would appear with his wagon and for a few dollars buy the ashes of these log heaps that had accumulated, together with those of the home fireplace.

The "pearl ash" buyer disappeared from the American scene over 100 years ago, but for many years afterward there survived a vestige of the primitive potash industry. This was the leach, once regarded as a necessary adjunct of every well equipped farmstead.

Few farmers today would recognize the leach for what it really was. Most of them would mistake it for a sheep self-feeder. They might be puzzled by its location, not near the barn, but back of the house close to the smokehouse and that small architectural masterpiece poetically described by the late J. W. Riley.

The leach was a big wooden hopper or V-shaped trough, usually about 4-feet across the top and 6-feet long, supported by four posts. It tapered to a point or wedge edge at the bottom under which there was a shallow pan or trough. This hopper served as a recepticle for wood ashes that were kept wet, with a milky solution dripping into the bottom trough. This evaporated, leaving a white deposit—the lye used in home soap making.

Although many leaches were still standing 60 years ago, nearly all were abandoned and falling apart, with most young folks not even knowing their use.

I remember seeing but one in actual use. This was behind the home of an old couple who planted corn with a hoe. And as long as they could get it, they bought green coffee, roasted it in the cookstove oven, and ground it in a small mill attached to the kitchen wall.

Incidentally, there are a few leaches left in eastern Canada, and there are in New York City importers of German and Hungarian wares who sell stove-top coffee roasters with a long line of wooden kitchen utensils. Most of the purchasers of these things are not antique collectors but "old country" people who use them daily.

Though few members of this automatic age realize it, by shopping around the world one could outfit a farm home—indeed, the whole farm—with tools and equipment of substantially the same designs as those used during the Civil War—and have all new equipment. Much of it is made here in the United States.

In some isolated rural communities of North America, people live very much like their ancestors of 100 and more years ago.

And if the big trees of the primeval forest and "log rollings" and the "pearl ash" buyer are things of the past, the wood stove is still their only heating appliance—from which they still throw ashes into the leach. ◄◄◄

SMALL GRAINS?

DISK, DRILL, OR TOPDRESS . . .

When is the best time to apply fertilizer to small grains, and what is the best way to apply it?

J. A. Lutz, assistant agronomist at the Virginia Agricultural Experiment Station, has some reports on VPI tests which may help to answer that question.

In one test, spring-seeded oats were fertilized with an equivalent of 200 pounds per acre of 20% superphosphate from a 10-20-20 fertilizer.

Three different times and methods of application were tried:

(1) Disked into the soil before seeding;

(2) Drilled with the seed; and

(3) Applied as topdressing just after seeding.

Oat forage yields at an early stage of growth were 567 pounds per acre when the fertilizer was disked in, 1,222 pounds per acre when drilled with the seed, and 479 pounds per acre when the phosphate was applied as topdressing.

At a later stage of growth, oat forage yields were 2,433 pounds per acre when the fertilizer was disked in, 2,909 pounds when drilled with the seed, and 1,106 pounds when applied as topdressing.

The same relationship between treatments was reflected in grain yields. Oat yields when the fertilizer was disked in were 53 bushels per acre, when drilled in were 60 bushels per acre, and when applied as topdressing were only 43 bushels per acre.

In another test with wheat, results again showed that forage yields from two clippings were highest when the fertilizer was drilled with the seed, next highest when all fertilizer was disked into the soil.

Applying the fertilizer as topdressing just after seeding the wheat gave the lowest yields.

Avoiding Fertilizer Injury . . .

Nitrogen and potassium salts in fertilizers are soluble. If large amounts are placed with or very close to the seed of young plants, delay in growth or loss of stand may result. The salts dissolve in the soil water and the plant may suffer from reduced moisture availability. Water with salts dissolved in it has an increased "osmotic pressure" and plants cannot absorb the water readily. Too, a high salt content actually may be toxic to the roots.

The solution of salts will move upward when the soil dries out. If fertilizers high in soluble salts are placed directly below the seed, upward movement of the salt will bring heavy concentrations into the area where the seed is germinating or the young plant is developing. Likewise, if fertilizer is placed above the seed, light rains will wash the salts down around the germinating seed. Of course with plenty of rainfall after planting, little difficulty will be experienced.

By Right Fertilizer Usage . . .

Placing the fertilizer, particularly the phosphorus, close to or on the soil surface causes less efficient use by the young corn or soybeans. Their roots grow downward. And since phosphorus in the soil moves very slowly, if at all, the phosphorus along with the nitrogen and potassium should be placed in a zone to the side of and below the seed. Here it will intercept a portion of the young root system. Too, in dry seasons nutrients placed near the surface are more likely to be in dry soil than if placed deeper. Fertilizer in dry soil is less efficient since plant roots do not function effectively.

Some soils may fix phosphorus and potassium into less available forms. Concentrating and planting fertilizer in a narrow band reduces the contact of the phosphorus and potassium with the soil and reduces the amount of fixation.

LOOKING AT YOUR SOIL

By L. A. Alban **Soil Testing Laboratory**

THE growth of any crop depends on the interaction of several factors, including soil and climate. Though it is difficult to regulate weather conditions, the available plant food content of soils *can be regulated*—can be increased and balanced.

Soil tests, together with information of past soil management practices and future crop plans, enables one to make the best possible recommendations for the particular crop to be grown on a soil.

Soil testing is big business. It runs from a few hundred soil samples a year in some states to a hundred thousand a year in others.

Research programs depend upon them, County Extension Agents make recommendations from them, fertilizer dealers sell by them, growers buy their fertilizer and lime according to them.

What is it then that we, who are testing soils, see when we look at your soil in a test tube?

Dr. L. A. Alban is in charge of the Soil Testing Laboratory at Oregon State College. He earned his B.S. and M.S. at Washington State, his Ph.D. from Oregon State. He is a member and past chairman of the Soil and Tissue Testing Work Group of the Western Soil and Water Research Committee.

The first thing we note as we look into the test tube is that the soil is *either acid or alkaline*. We call this characteristic of the soil "soil reaction" and refer to it as *soil pH*. The soil pH is a measure of the active hydrogen cations in the soil solution and indicates the degree of acidity or alkalinity.

At pH 7.0, a soil is neither acid nor alkaline, but neutral. As values decrease from pH 7.0, soil acidity increases. As values rise above pH 7.0 soil alkalinity increases.

Soils with a pH of 5.5 or lower are strongly acid while those with a pH of 8.0 or higher are distinctly alkaline.

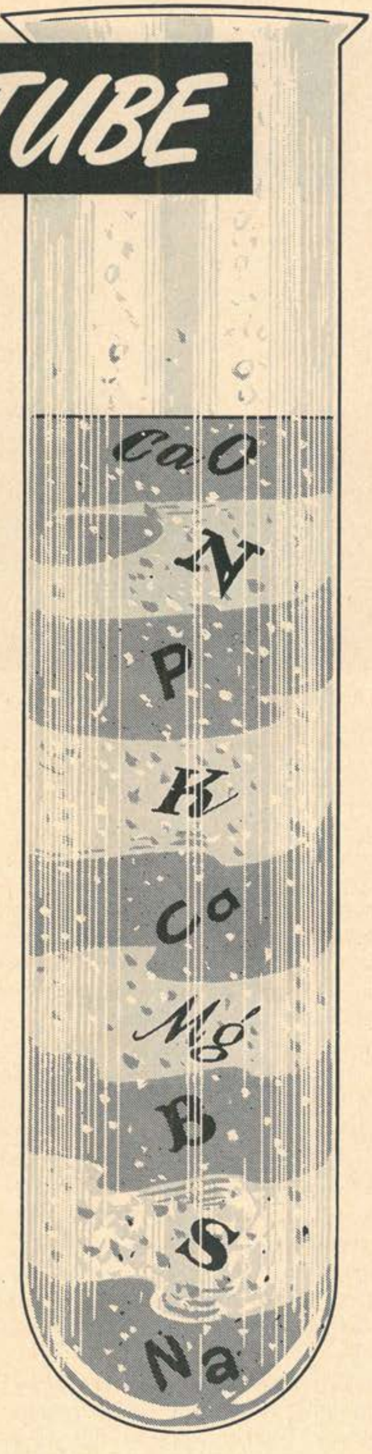
Changes in the acidity of soils may change the availability to plants of different nutrients in different ways.

In acid soils, such nutrient ions as aluminum, iron, manganese, copper, and zinc may be found in dissolved form in quantities sufficient to become toxic to plants. As the pH of the soil is increased by the addition of lime they become less soluble and the toxicity is corrected. As the pH of the soil is increased still further (above neutrality) the solubility of these ions becomes so low that deficiencies may occur.

Phosphate availability in many soils is highest when the soil is slightly acid to neutral and declines when the soil becomes strongly acid or alkaline. Boron deficiencies may occur when too much lime is added to a soil, while molybdenum is most deficient in acid

IN A *TEST TUBE*

Oregon State College



soils and becomes more available as the soil is limed.

Bacteria which fix nitrogen in soils in association with the roots of legumes are most active in neutral or slightly alkaline soils.

Soils with a pH of 8.5 or over indicate an excess of total salts or sodium which limits plant growth. On the other hand, some ornamentals grow better on acid soils and strawberry yields have been reduced from application of lime in western Oregon.

Lime Requirement

If your soil is acid, the next thing we see is the need for lime. Liming is necessary to reduce the acidity of a soil and to reduce the detrimental effects which are a result of soils being acid.

Acid soils may cause plants to be unable to obtain sufficient quantities of calcium and magnesium, supplied from lime.

Bacteria are not nearly so active in strongly acid soils causing a decrease in nitrogen fixation by legumes. Liming increases the availability of phosphorus and reduces the toxic effect of iron, aluminum, and manganese.

Lime requirement represents the amount of lime normally required to raise the soil pH to 6.5. This is done by replacing the hydrogen on the colloid with calcium, thus increasing the percent base saturation.

A pH of 6.5 represents approximately 90% base saturation. The

Soil Reaction (pH) is determined on all soil samples that come into a soil testing laboratory. Here an Oregon State technician runs a sample. Picture courtesy Oregon Agricultural Experiment Station.

Filtering is one of the steps necessary in testing soils. Here an Oregon State technician works on some samples. Picture courtesy Oregon Agricultural Experiment Station.

amount of lime actually recommended may depend on the type of soil in an area and the crop to be grown. For instance, less lime will have to be added to a soil of low exchange capacity (*like a sand*) to achieve the same degree of base saturation than will have to be added to a soil with higher exchange capacity (*like a clay*).

The effectiveness of liming depends on two properties of the liming material—its purity and fineness of grind. Some liming materials are more or less calcium carbonate while others are mixtures of calcium and magnesium carbonates. When magnesium is an ingredient of the liming materials, its effectiveness may be increased, especially if magnesium is deficient in the soil.

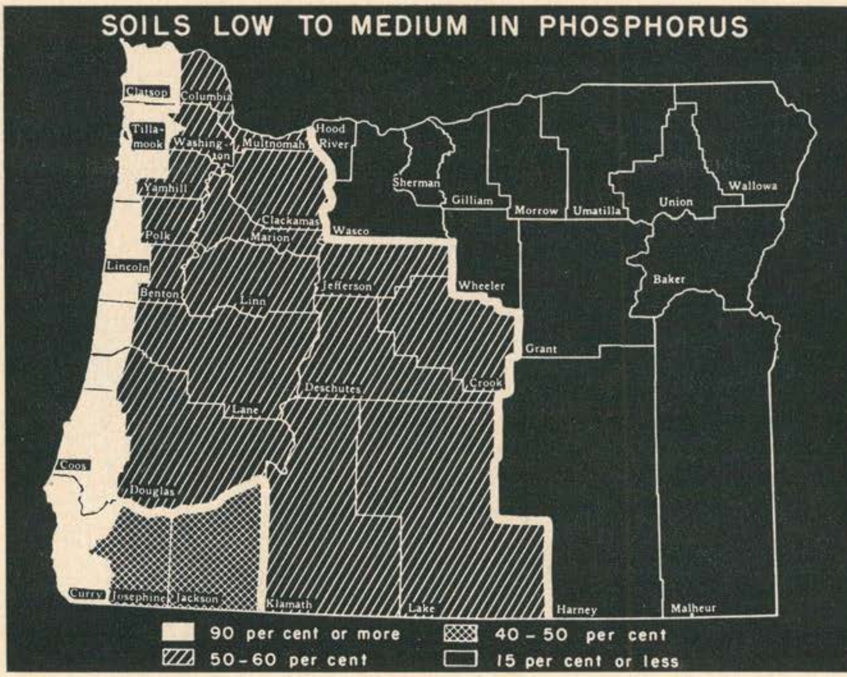
Still other limestones are of a low quality, containing other types of rocks. Many liming materials are made up of by-products from industry and are of different degrees of purity. The finer the materials, the quicker they will react in the soil.

Nitrogen

The need for nitrogen for practically all crops is evident, regardless of the soil. The greater portion of the nitrogen in the soil is a part of the soil organic matter. But while it is in this form, it cannot be utilized by the plant.

Soil organic matter is decomposed by the soil organisms releasing the nitrogen or ammonia, which in turn is oxidized to the nitrate form of nitrogen. This change from the organic form to the available forms of nitrogen depends on many factors, such as moisture, temperature, soil acidity, etc.

The amount of nitrate nitrogen in the soil varies greatly within relatively short periods. In irrigated or humid



More and more states are successfully using soil tests to survey their farm lands—to determine which areas are depleting their supplies of such basic plant foods as phosphorus, potash, and lime. This Oregon example shows soil areas that tested low to medium in phosphorus in that state.

regions, the amount of nitrate nitrogen available at any particular time may bear little relationship to the response to be expected from nitrogen fertilizers.

The need for nitrogen on most crops is well known. Recognizing the importance of nitrogen in crop production, Experiment Stations and Extension Services conduct many field experiments in which the effect of nitrogen on crop yields are studied.

However, the present methods for testing soils for nitrogen and predicting the amount of nitrogen needed by crops are either inadequate or have not been correlated with crop response to nitrogen fertilizers under most conditions.

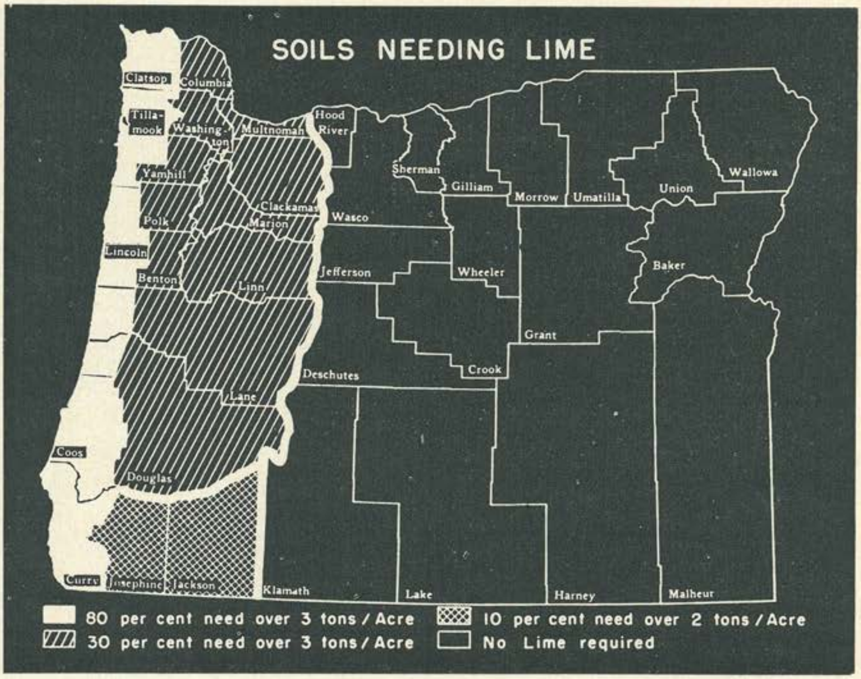
Until such tests are adequate, the amount of nitrogen to be recommended will be determined by crop response from field experiments. Few states recommend nitrogen on the basis of soil tests.

Phosphorus

Again looking into the test tube, we see the need for phosphorus on many soils. The amount of phosphorus reported from soil tests is not the total amount of phosphorus in the soil available for crop production, but it is *the amount of phosphorus removed by the particular extracting reagent used by the soil testing laboratory.*

Crop responses in the field have been and will be correlated with this soil test and all of the fertilizer recommendations for specific crops will be based upon it.

The response of crops to added phosphorus depends on their relative nutrient requirements. The relative nutrient requirement of any crop is considered the amount needed to produce maximum yield whether this is reflected in plant composition or total



Lime often plays an important role on how effective other plant foods work in a soil. Highly acid soil often limits or completely restricts the work of such a nutrient as phosphorus. This makes it important for soil surveys to test for acidity to determine which soils need lime—as this Oregon survey shows.

nutrient uptake.

With crop requirements for phosphorus differing greatly, it is impractical for the same soil test value to mean the same thing for all crops. For instance, a single value of phosphorus may be high for crops like grass seed, oats, or wheat; medium for such crops as alfalfa, barley, or hops; low for vegetable crops like beans, cauliflower, onions, or spinach.

Also the same soil test value may have a different meaning in various parts of the state due to differences in the forms of phosphorus in the soil, depending on whether the soil is acid, neutral, or basic.

Potassium

The need for potassium can be seen quite clearly in some soils. Here, again, the need for potassium depends almost entirely on the relative requirement of a crop for this element.

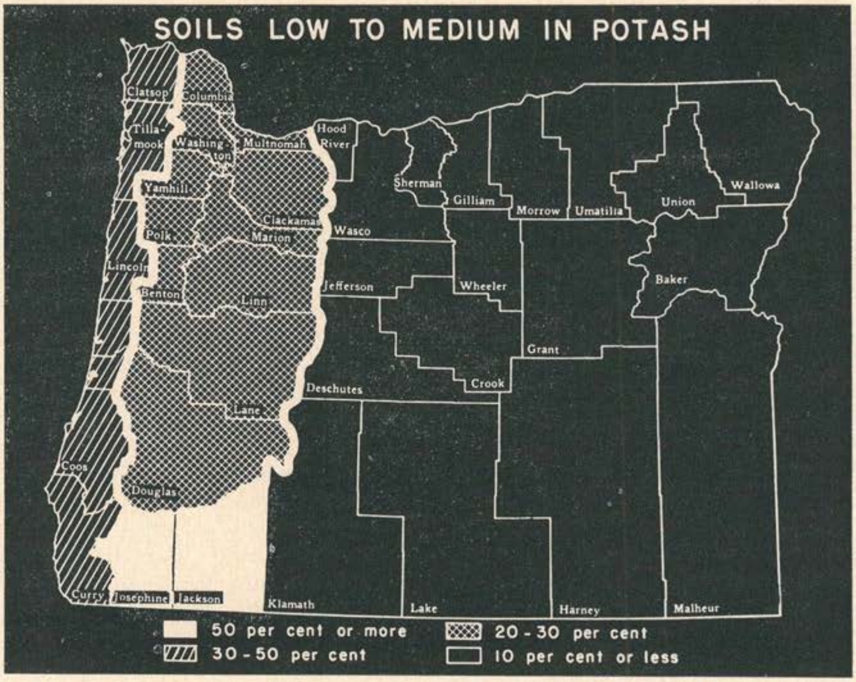
For example, an amount of potassium in the soil sufficient for the production of grasses or some cereals may be quite insufficient for alfalfa, broccoli, cucumbers, or strawberries.

An interesting observation concerning potassium is that the more soils we test, the larger percent of soils we find low in this nutrient.

Calcium and Magnesium

Calcium and magnesium are essential plant nutrients. Acid soils are generally low in these two basic elements, whereas they are relatively abundant in alkaline soils.

Since most acid soils are limed, the amount of calcium needed for crop production is usually met in this way. Most liming materials contain from 2 to 6 percent magnesium carbonate, adequate for most crops. However, such crops as crucifers, requiring a large amount of magnesium, usually



Although much of the Pacific Coast has considered itself sufficiently supplied with natural potash in its soil, heavy croppings of recent years have eaten into the part of this natural supply that is available to plants—and soil tests are flashing a warning in some regions. This Oregon example shows soils testing low to medium in potash in that state.

need an additional application.

The total amounts of calcium and magnesium in the soil, the ratio of calcium to magnesium, the ratio of magnesium to potassium, and the total sum of basic nutrients (calcium, magnesium, potassium) in the soil in relation to the total amount required to neutralize the soil acidity are important in making lime and fertilizer recommendations.

Boron

Looking further into the test tube, we notice a minor element called boron. The supply of available boron on many soils has decreased through crop removal, leaching, and reversion to unavailable forms, plus higher boron requirements of better crop varieties and improved cultural practices.

Such losses, however, must be recognized and the boron so removed must be replenished eventually by the application of boron materials.

Soil moisture is one of the main factors affecting the availability of boron. *Drought or lack of moisture decreases the availability of boron to plants.* Boron deficiency in dry soil probably occurs because the supply of available boron has been reduced by the inability of the plant roots to feed in the dry area. Overliming may also reduce the availability of boron in the soil or fertilizer when liming extensively a soil which is fairly low in boron.

Sulfur

If we observe closely, we can make out sulfur in the soil. Sulfur is an essential element for the growth of plants. It is supplied to the plant from the soil, rain, irrigation water, fertilizers, and atmosphere.

Soils located near industrial plants where the rain brings down the sulfur exhausted into the atmosphere and soil irrigated with waters high in sulfates are usually well supplied with sulfur for crop production.

Also, fertilizers used most extensively carry adequate sulfur for most crops.

For example, normal superphosphate contains 11 percent sulfur while ammonium sulfate, ammonium phosphate (16-20), and potassium sulfate contain 24, 14, and 18 percent sulfur, respectively.

With the increased use of sulfur-free fertilizers—such as treble superphosphate, potassium chloride, ammonium nitrate, and aqua and anhydrous ammonia the additions of sulfur to soil is not keeping up with crop removal. Consequently, the level of sulfur in the soil will be decreasing.

Most sulfur in the soil is in organic form. Even sulfur added with fertilizers is soon converted to the organic form by soil microorganisms. Because most soil tests do not measure this form of sulfur, there is no soil test available yet to predict the amount of sulfur in the soil available to the plant.

However, we do know that certain crops, particularly legumes and crucifers, are heavy users of sulfur. Cereals have been known to respond in western Oregon if no sulfur-bearing fertilizer has been applied within two years.

Organic Matter

In every soil, we see some material which is not mineral but organic in nature. We call this "organic matter," composing a vital part of the soil structure and playing a major role in soil fertility.

Soil organic matter is an ever changing material as it passes through its various stages of decomposition. Yet, the quantity of organic matter in the soil remains fairly level due to constant additions of new organic materials.

Organic matter is formed from the biological decomposition of plant and animal residues. When the processes of decomposition are active, the original organic materials are converted fairly rapidly into carbon dioxide, water, mineral elements, and other organic compounds fairly resistant to further breakdown. This latter material is called the "active humus" of the soil.

When the process of decomposition is slow, there may be an accumulation of organic materials in the soil which are only partially broken down. In such case, there may be a small amount of "active humus," though the total amount of organic matter is high. This is true for soils where cool weather prevents maximum microbial activity.

On the other hand, in areas where the temperature is very warm and microbial activity is high, decomposition is more rapid than the rate of renewal, causing the total amount of organic matter as well as "active humus" to be low.

Since the amount of organic matter in the soil changes very slowly, there is little reason to make this determination on any field more often than *once every six or ten years.* Though many crops are grown on soils low in organic matter, we well know that the productivity of a soil can be increased by increasing the amount of organic matter.

An optimum amount of readily decomposable organic matter should be maintained in soils. This can be accomplished by wise management practices.

Salinity and Sodium

Looking into the test tube, so far, we have found the biggest percentage of our soils to be acid.

Some of them, however, are alkaline and, if so, we are immediately interested in the salt and sodium situation. Soluble salts adversely affect the productivity of soils in two principal ways:

(1) By increasing the salinity (total salts) of the soil solution.

(2) By increasing the content of

exchangeable (adsorbed) sodium.

The latter occurs when the ratio of sodium salts is relatively high in proportion to the other salts and produces in most soils an unfavorable physical condition along with various direct and indirect detrimental effects on plant growth.

Excess salinity of the soil solution can be corrected by leaching with water of good quality; whereas, the removal of excess exchangeable sodium requires, in addition, an application of such an amendment as gypsum.

In either case, drainage must be provided. Whenever the salinity or exchangeable sodium content exceeds the limits established for normal crop production, reclamation and special management practices are essential. These are special problem areas and should be treated as such.

Thus, we have taken a look at our soil in a test tube. From this type of observation will come a recommendation for the amount of lime and fertilizer you need to apply. But, more than lime and fertilizer are needed for plant growth.

• *Good management is needed to control such factors as disease, insects, moisture, plant stands, and soil physical conditions which are so important in crop production.*

• *Good cultivation practices, backed by the use of lime and fertilizer based on a soil test, can mean more dollars in your pocket.* (From a talk before the Oregon State Horticultural Society). ◄◄◄

SPRING DRESSING RECOMMENDED FOR ALFALFA

Recent results from experiments conducted on alfalfa fertilization indicate that this crop should be topdressed with liberal amounts of fertilizer in early spring. Fertilizers should be applied just before growth starts in the spring or immediately after the first cutting, is the advice of William D. Bishop, Univ. of Tenn. associate Extension agronomist.

Studies conducted at the Middle Tennessee Experiment Station indicated that slightly better results were obtained where the fertilizer was applied just before growth started. This would be about the last of February or the first of March.

Alfalfa is heavy user of potassium and boron, Bishop explains. The use of these materials should be based on recommendations from a soil test. In the absence of soil test, the following general recommendations should give good results: In the high phosphate soils, the use of 400 to 500 pounds of an 0-9-27 and 20 pounds of borax should give good results. In all other regions, the use of 500 to 600 pounds of an 0-10-20 and 20 pounds of borax is recommended.

With liberal water and 13-13-13

Fertilized-Irrigated Pasture

By C. J. Chapman, Soils Specialist
College of Agriculture, University of Wisconsin

THE most outstanding extension project in Wisconsin for 1957 was a fertilized pasture demonstration set up on the Wells-Johnson farm at Mauston.

This large-scale demonstration was sponsored by the Olin Mathieson Chemical Corporation in co-operation with the Juneau County Agricultural Extension and Soil Conservation Services and the Soils Department of the University of Wisconsin.

A 14-acre pasture with a creek running through the middle was selected for the demonstration. The field was divided nearly half and half, (the north half, not quite as good as the south half, was given an advantage of an extra two acres). An electric fence was set up to separate the two halves.

The south half (6 acres) was treated with 13-13-13 fertilizer at 650 pounds per acre early in April.

The entire herd of cattle, some 20 milk cows, 8 dry cows and heifers, and two horses were rotated back and forth from the fertilized to the unfertilized side over a period of 88 days (as of September 26).

Records were kept of the number of days and pounds of milk for the entire herd on each half of the pasture. The increase in the production of grass was thus measured in terms of milk

From this water hole, a 7-horse motor and pump delivered water to 16 sprinklers spraying the 6-acre demonstration pasture that became Wisconsin's outstanding extension project of 1957. The hole, 15 ft. deep and 30 ft. wide, was dug with an excavator and furnished abundant water.

...Pays Off

production *plus* the extra days of pasture for the dry cows, heifers, and horses.

As of July 2nd, another 300 pounds of 13-13-13 fertilizer was applied to the south 6 acres of pasture.

In addition to this liberal application of fertilizer, the south half was irrigated during the periods of dry weather. A total of about 6 inches of water was applied at intervals during the growing season.

Irrigation equipment for the project was furnished by the Olin Mathieson Chemical Corporation and set up by the Wisconsin Irrigation Company of Cambridge, Wisconsin.

On August 15, ammonium nitrate (dissolved in water) was applied at 200 pounds per acre through the irrigation system.

Water was supplied from a deep, spring-fed water hole dug with an excavator in mid-June. This pit, some 15 feet deep and 30 feet in diameter, supplied all the water that was needed for this 6 acres of pasture.

It also supplied water for an adjacent corn plot and for ten acres of alfalfa-brome which was used for supplemental pasture [see (2)] during the demonstration period.

Records for the period, May 9 (the day cattle were turned into the fertilized side) to September 26 are as follows:

	Fertilized	Unfertilized
Number of pasture days for entire herd	61	27
Pounds of milk produced	29,257	12,937
Value of milk at 3.38 per cwt.	$ 988.89	$437.26

Prof. C. J. Chapman, well known champion of efficient farming in the Midwest, talks to a group of fertilizer men and some farmers on a June tour of his project.

	Fertilized	Unfertilized
Value of pasture for 8 heifers & dry cows & 2 horses	$ 90.00	$ 45.00
Total returns from pasture	$1078.89	$482.26
Cost of fertilizer (65% of total cost)(1)	$ 200.00	....
Net returns from pasture	$ 878.89	$482.26
Difference in favor of fertilized pasture	$396.63	

The cost of 6 inches of water applied during the entire season (up to September 26) has been estimated as follows:

1. Gasoline for irrigation pump motor	$ 9.00
2. One-fifth of the interest at 5% on $1500 (cost of irrigation equipment)	15.00
3. Repairs and maintenance (20% of total cost)	5.00
4. One-fifth of amortization of initial cost of irrigation equipment (10-year basis)	30.00
Total cost of water	$ 59.00
Net profit over and above cost of fertilizer and water as of September 26	$337.63

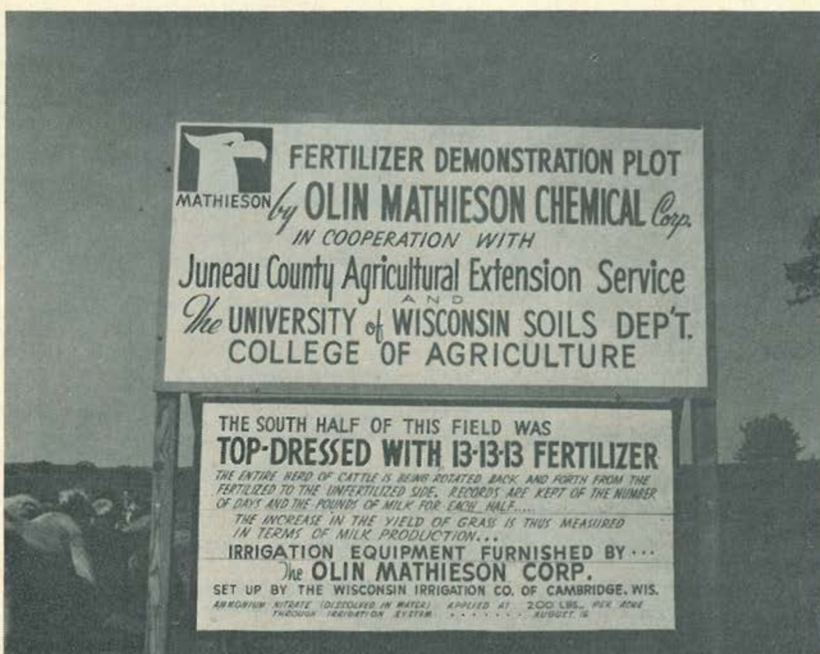
The fertilized pasture furnished extra feed for several days after September 26, in about the same ratio as records have shown for the period May 9 to September 26. The extra feed thus provided *added to the net profit.*

(1) We charged only 65% of the total cost of the fertilizer against the extra milk and feed (for dry cows, heifers, and horses) credited to the fertilized 6 acres in 1957. There will be at least a 50% residual carryover of the phosphate and potash contained in the 5600 lbs. of 13-13-13 applied to the treated 6 acres. Most all of the nitrogen, however, was used up in 1957.

(2) In addition to this 14 acres of permanent pasture, there was a 10-acre field of alfalfa-brome, used for extra feed, into which the entire herd was turned from time to time. Actually, this 10 acres furnished feed for a total of 52 days (as of September 26) and the total milk produced from this 10 acres of alfalfa-brome amounted to 26,402 lbs.

This 10-acre field of alfalfa-brome supplied more feed than was needed during the period of late June. It was mowed and some 5 tons of hay were harvested.

This demonstration was shown to a



This large sign was set up in the pasture near the highway—to let the people know what was going on. Viewers ranged from 45 press and radio people to 6,000 Farm Progress Day spectators.

group of about 100 men (mostly fertilizer people—some farmers) on June 18.

On August 30, the occasion of the Press and Radio Day Preview of Farm Progress Days demonstrations, this pasture project was shown to a group of some 45 men.

On September 24 and 25, Farm Progress Days, we estimated that at least 6,000 people "stopped" on the wagon route to "see and hear."

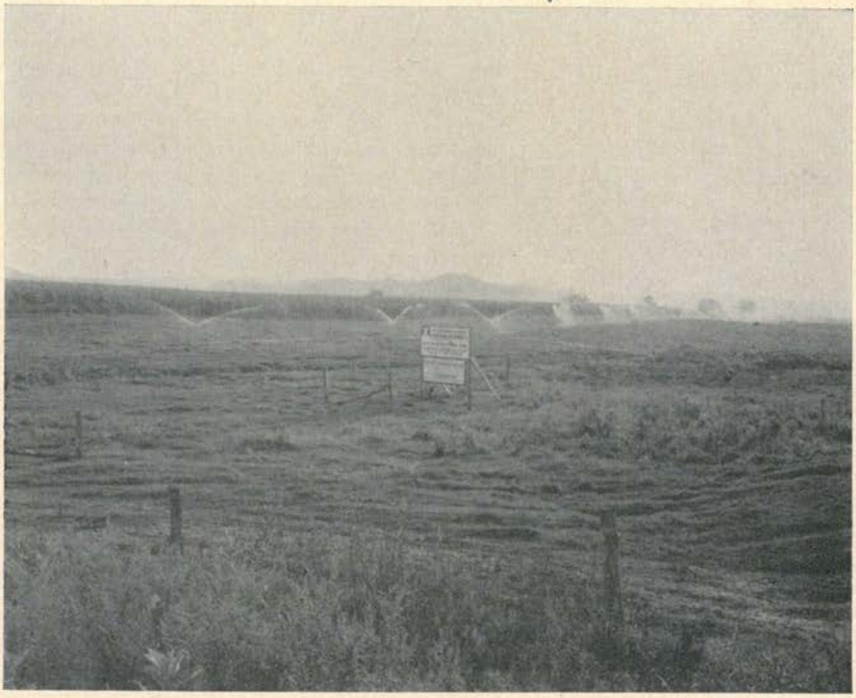
The fertilized half of this 14-acre field retained its dark green color during the entire grazing season. And on the demonstration days, we had the sprinkler system going giving the whole thing an air of the spectacular.

And what about the practicality of this project? Certainly there can be no question about the profitableness and practicality of a program of grass pasture improvement through the use of fertilizers.

Pasture irrigation is still in its early beginning stage—destined, in my opinion, to become a part of our intensified program of efficiency, not only on farms in the arid areas of the west and southwest, but right here in Wisconsin.

Water to make good *all those other factors of taxes and interest on our inflated land values, fertilizer—and in the case of our cultivated crops—labor, machinery, and seed costs.*

Irrigation of farm crops is sweeping in by leaps and bounds—and our first large scale demonstration on this Wells-Johnson pasture has had the effect of alerting a lot of people (farmers and others) to another great opportunity in a rapidly developing field of efficient farming. ◄◄◄



Water! Water! Water! From 16 sprinkler heads, there came enough water to keep the 6 acres of grass growing during dry weather—and to make a spectacular scene for interested viewers.

THE EDITORS TALK

✔ OF
Basic Research

IT'S good news to learn that the U. S. Department of Agriculture has created two new pioneering research laboratories to explore the unknown beyond our present horizons of scientific knowledge. They are the Pioneering Laboratory for Mineral Nutrition and the Pioneering Laboratory for Plant Physiology, both at the Beltsville Research Center.

Applied research is important—but couldn't exist if there weren't discoveries to apply. That's where basic research comes in—pure discovery—by such scientists as S. B. Hendricks, of the mineral nutrition world, and H. A. Borthwick, of the plant physiology world. Together they discovered that light-sensitive pigments control flowering, seed germination, and other behavior of many plants that exhibit the phenomenon known as photoperiodism.

Giving such minds the equipment, the atmosphere, and the *freedom* in which to search for new facts of life today could well mean the difference between plenty and famine 25 years from now.

✔ OF
Surpluses & Famine

"LET'S thank God for the farm surpluses instead of crying about them," says Dr. J. E. Adams of the University of Nevada. He emphasizes "The United States is one of the few, *and I mean very few*, nations in the world today that is not one step away from famine. We can't afford to drop behind in food and fiber any more than in guns and missiles."

Many of the nation's top agricultural scientists agree the day will come when surpluses will be a thing of the fondly-recalled past. By 1975, they contend, the U. S. will have a population of 220 million . . . needing 36 percent more cattle and calf production than now, 47 percent more chickens and eggs than now, 40 percent more truck crops, 34 percent more corn, even 12 percent more wheat. And these figures are *"barring wars and depressions."*

To meet this challenge, all Americans should become better acquainted with the research being conducted at their agricultural colleges. What an eye-opener it would be to thousands of people if they would plan part of their vacation route to take them by their state's agricultural college—to see firsthand what's being done to make sure their pantries don't go dry.

✔ OF The Country Home

DR. Seaman A. Knapp, father of the Cooperative Farm and Home Demonstration program, once said: "A country home, be it ever so plain, with a father and mother of sense and gentle culture, is nature's university, and is more richly endowed for the training of youth than Yale or Harvard."

Dr. Knapp, who died in 1911, said that nearly a half century ago. To us, it rings as clear today as it must have rung then—if anything, clearer, for today's country home has so many more advantages than the one of 50 years ago.

It has a wealth of services coming to it from its Agricultural Extension Service—4-H Club programs for its children, home demonstration clubs for its women, farmers' clubs for its men, tons of reading matter for the whole family, radio, and in some areas educational TV.

In fact, the line between the rural home and urban home, today, is so thin it takes a heap of looking in many places to see a difference. But there is a difference—two of them.

1. The country home has plenty of space and fresh air and character-building chores to do—that *have* to be done.

2. The country home, in most cases, is a closely knit business, a family business, independent and working toward the same goal, a good harvest and a decent price.

Dr. Knapp was right. America could possibly live without Harvard or Yale. But it would die—fast—without its country home, "be it ever so plain."

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February, 1958

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FERTILEGRAMS

Watermelon growers should plan to sidedress their crop, lay by their melons with high beds, avoid spreading gummy stem rot and downy mildew, and provide sufficient bees to pollinate their crops.

These suggestions are made by Hugh A. Bowers, Clemson extension truck crops specialist.

He says the total amount of fertilizer used should be at least 800 pounds per acre, preferably 1,000 pounds or more, of a *4-12-12 or 3-12-12 mixture.*

He says some growers apply 100 to 200 pounds per acre of 10-0-10 or 14-0-14 fertilizer in the middle of the alleys at lay-by time to help plants make their final growth and to keep the vines green longer.

It is important to use plenty of potash, he emphasizes, because it helps to improve the cutting quality of the melons.

~

Wheat yields could be increased at least 9½ bushels per acre by the use of nitrogen *plus needed phosphate and potash fertilizer,* reports Floyd W. Smith, Kansas State College agronomist, in citing records in his state.

Smith reports wheat responds more profitably to fertilizer use than any other crop. He points out that in some cases, an extra four bushels per acre can be added to the wheat yield by doubling the nitrogen application.

And he says fertilizer can increase wheat yields in dry years as well as wet ones.

Testing the response of southern pine to plant food is the object of a large scale forest fertilization program carried out on a Rayonier, Inc., Tree Farm in Florida.

According to James T. Sheehy, executive vice-president of Rayonier who announced the tests, it is hoped that the experiment with chemical fertilizers, to be measured in five-year periods, will result in improved tree quality and growth.

The test showed that no special or costly new equipment is needed for fertilizing tree plantations.

~

Winter cover crops are a big help in keeping soil loose and granular, just as crop residues and mulches do.

Repeated freezing and thawing may improve soil by breaking up clods, but under certain field conditions these forces frequently damage soil-aggregate structure (clustering of fine soil particles into "crumbs"). Soil-management specialists at USDA's Agricultural Research Center, Beltsville, Md., have found that cover crops planted early in the fall insulate the soil and reduce the amount of this damage. Rye and other cereals, ryegrass, annual bromegrass, vetch, and crimson clover helped preserve desirable amounts of soil aggregation.

Soil samples taken in the spring from plots drilled to rye in 7-inch rows the preceding fall showed much less breakdown of soil aggregates than adjoining plots without ground cover. Before growth stopped, the rye was 5

from Across the Land

FOR BETTER SOILS • FOR BETTER CROPS

inches high, covered half the ground, and gave the soil much protection.

To produce 100 bushels of corn, the soil needs to supply 160 pounds of nitrogen, 40 pounds of phosphoric acid and 100 pounds of potash, according to Purdue University agronomists.

Soil samples from farms along Oregon's coast are being moved into greenhouses at Oregon State College in a new type of research aimed at speeding work on soil fertility problems in that area.

OSC soil scientists are taking samples of 10 typical coastal soils from Coos Bay to Astoria. These samples are placed in plastic pots in agricultural experiment station greenhouses, given a wide range of soil fertility treatments, and then checked for possible plant food deficiencies.

In their greenhouse experiment, the soils men will divide each soil type into 100 pots of 5 pounds each. These will be given various lime and fertilizer treatments and planted with New Zealand white clover, a legume widely grown along the coast.

The scientists will then be able to check for possible lime, phosphorus, potassium, sulfur, boron, and molybdenum needs in the samples, and will also be able to explore results of varying calcium-magnesium ratios in the lime used.

Nitrogen was the key element in orchard-grass seed-production in trials conducted by the VPI Agricultural Experiment Station in the northern Piedmont section of Virginia.

Researchers say that highest yields were obtained where *both phosphorus and potash were used with nitrogen fertilizers, however. Potash is important in maintaining the stand.*

"A fertile farm provides a better living . . . limestone, phosphate, potash, and nitrogen mean fuller hay barns, bulging cribs, and fatter cattle . . . we fertilize for higher yields of pasture and grain," say agricultural scientists at the University of Illinois Dixon Springs Experiment Station.

"This tie-in between fertility and yield obscures a tie-in as real, but less recognized, between fertility and soil-saving.

"When you and I think of soil conservation, we visualize contours, strip crops, terraces, and broad grass waterways. Lee Gard, Station soils and water researcher, reminds us that we are forgetting the most important thing—soil fertility.

"High soil fertility nudges winter covers of small grains into leafier, denser blankets against heavy run-off. Pasture sods grow thicker, with more numerous, healthy roots to grasp the soil.

"Corn and grain produce thicker stalks and a greater mass of spongy stubble to mulch and protect the soil. Lee reminds us *that fertility is the primary and most important soil-saver*—basic to other good farming."

Forty years ago it took only 100 horsepower to keep a combat airplane in the air. Today it takes 250 horsepower just to carry a 117-pound female to the supermarket.

~

From the front page of the *Washington Post* comes *magic* in a world without men—in St. Albans, England, the production of the play, "World Without Men," was canceled by the local Women's Institute last night.

A spokesman explained every member of the cast—seven women and a cat—had become pregnant.

~

He: "I find your new gown rather confusing."

She: "How so?"

He: "Are you outside trying to get in, or inside trying to get out?"

~

Johnny: Mother, I've just knocked over the ladder in the garden.

Mother: Well. You'd better tell your father.

Johnny: He knows. He's hanging from the bedroom windowsill.

~

When writing love letters, it is well to begin with: "My Sweet Buttercup . . . and Gentlemen of the Jury."

~

A professor of English literature included in his examination questions the query: "What did Shakespeare do in his experimental period?"

He naturally expected the students to provide the titles of some of the great master's early plays, but one knowing young lady removed the curse of dullness from her paper by replying, "He married Anne Hathaway."

~

"Your honour, I was not intoxicated."

"But this officer says you were trying to climb a lamppost."

"I was, your honour. A couple of big crocodiles were following me, so who wouldn't under the circumstances?"

~

One difference between men and women is that women want a permanent wave, while men want permanent hair.

~

No less happy than the bride to be was her doting mother, as the two sat down for an intimate chat.

"Now, tell me, mother," the girl whispered, "what I ought to know before—"

"Of course, my dear," said the fond mother shyly lowering her eyes. "Well, to begin with, when your husband kisses you good night—"

"Oh, I know all about that, mother. I want to know how to cook his breakfast."

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