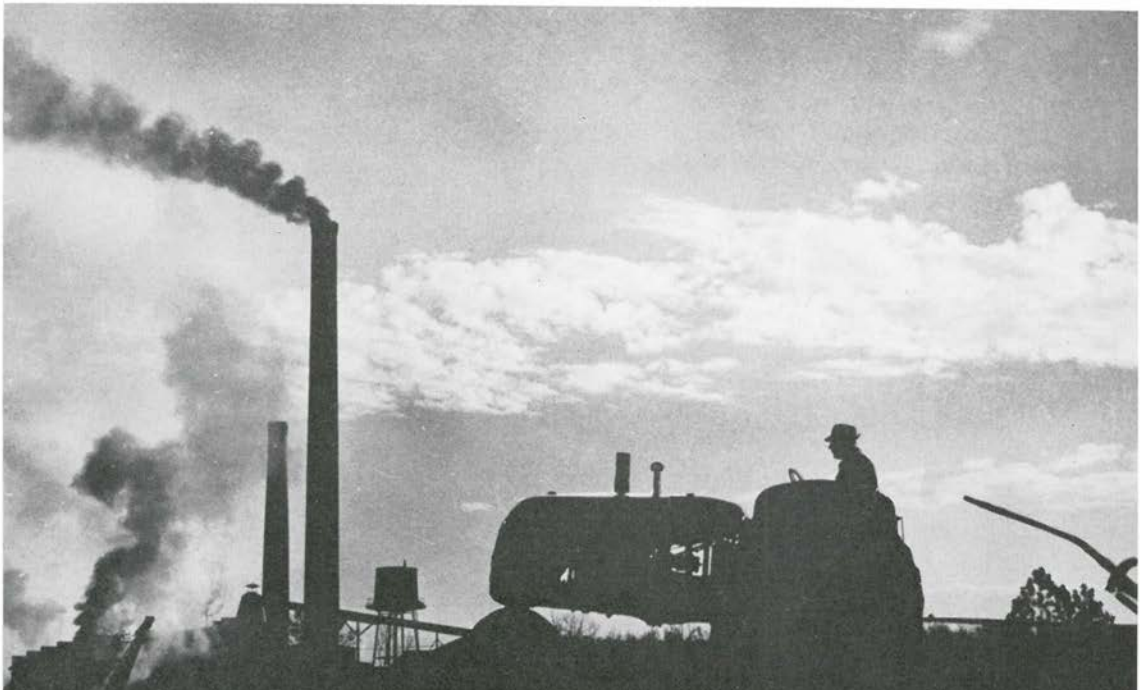
Better Crops

WITH PLANT FOOD

September-October 1963

20 Cents



AGRICULTURE

A declining INDUSTRY??

Who SAYS So?!

SEE PAGE 24

Better Crops
WITH PLANT FOOD

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

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CONTENTS

ON THE COVER

. . . an important question is raised. Is agriculture a declining industry? The background picture is a Ralph Mills creation from N. C. State College—a combination of the man on the farm and the industry behind him. Agriculture is more than farming. It is a multi-segment industry. Turn to page 24 for the answer to those who say agriculture is a declining industry.

Scientists Can Be Press Agents— TOO!

From A Presentation
by Joe D. Boyd
Associate Editor
Farm Journal Magazine

At The Southern
Agricultural Workers
Association Meeting

In Memphis, Tennessee

Today when change is so fast, and the struggle for sheer business survival is so keen, farmers as never before need every tool they can lay their hands on.

They don't want to wait a year or even a month for it. They want it *now*. And the publication that can bring useful news to them fast is the one they'll likely pay attention to.

WHY BOTHER?

What's the percentage in a research scientist working closely with *any* portion of the farm news complex? More simply: Why bother?

Madison Avenue might point to such obvious advantages as favorable "exposure" in building a "public image" for an institution, a single department or even an individual scientist. Just as obviously, this works 2 ways. In other words, there's a reputation advantage to the publication that's trusted to report useful news from an institution.

But, all this is far and away secondary to the topmost answer, which is simply: To help farmers get the fruits of research with a minimum of delay. Let's hope that today's modern agriculture has or soon will completely eliminate the old "waiting period" between the technical journal and the farmer press—a practice which has sometimes withheld information for months from farmers whose very livelihood depended on it and for whom the research was financed in the first place.

THE RIGHT TO KNOW

A few scientists have defended

this by saying "*a little information* in the hands of farmers can be dangerous, even react unfavorably on all concerned." Well, you and I know some of the reasoning behind such talk.

But, *does* a researcher—or *anyone* spending public funds—have the right to *withhold* information from farmers? True, it should be put in the proper perspective—in the case of preliminary research should include a warning that the idea isn't yet *proven.*

But farmers are smart enough to understand this and they definitely want to know what's going on at their research stations. Further, as a newsman, I'm convinced they have a *right* to know and that researchers have a responsibility to *tell* them. Who among us, for instance, is capable of telling farmers what information they *should* or should *not* have?

Are we to follow a policy of "managed news?"

You may remember the farmer on a special agricultural workers program who said, "I always read the state's research publication because I want *all* the facts—what does *not* work as well as what *does* —before I make decisions."

In terms of capital investment, know-how, and management, that particular farmer is above average. But his wish—rather his *demand*—for fast and accurate reporting is typical of today's top farmers.

A DRAIN ON RESEARCH

If possible, farmers want new information from the men who *did* the research. And if that isn't possible, they want it from the *next* closest man. In some states, scientists say they can hardly get to their research work because so many farmers come to the station to talk business or because of the heavy demand for researchers to appear at farmer meetings.

One department head estimates that his research staff spends one third of its time doing such. "Which would be OK with me," he says. "But it doesn't leave enough time for the primary job of research."

Today's forward-looking business farmer is intelligent enough to make his *own* decisions—*if* we give him all the facts.

This calls for a closer gearing of research, extension, and the commercial press. Farmers are demanding the very *latest* information—in detail. Scientists simply don't have time to conduct research and personally distribute the resulting information, too. So, I maintain that those researchers who use the commercial press to full advantage, make the best use of their time.

Assume for a minute that I'm a reporter talking to a research scientist at any Land Grant College. He has just asked for my opinion on how to deal with reporters. I'll attempt to answer him with these suggestions:

1 Share Your Professional Knowledge.

Help reporters become "temporary experts" on the subject matter they choose to report from your station. Most usually ask for no more time than you'd spend with a farmer who comes to visit—and a *single* reporter may pass your message on to *millions* of farmers who read and have faith in his publication. Besides, reporters want and need the stimulation that comes

with full understanding of the technical news they report.

In a nutshell: Help an editor get the idea firmly in *mind—then* in his publication.

2 Reward Initiative.

When a reporter shows resourcefulness by coming to *you* and digging extra hard, give him the necessary encouragement and cooperation that often make the difference between mediocre and superior articles—and don't worry about favoritism.

Even though reporting is somewhat competitive, no fair-minded commercial editor begrudges your cooperating fully with such a visitor. Rather, he respects that part of your job as a public official which calls upon you to make such information available.

Recently, a researcher told one of our editors: "After 3 years of testing, I have some results that farmers would be glad to get. Two magazines have already asked me for it, but how can I give it to *one* without offending the *other*? How can I give it to either or even both without making still others mad?"

Actually, this "problem" doesn't seem at all complicated to me.

One of his first considerations might be: In which magazine will it best fit? If the information is limited to only one state, maybe it should go to a state publication. If it's regional, maybe it should go to a regional magazine or to a national magazine with a regional edition.

If this doesn't settle it, why not give the material to the first editor who asked if you consider him reliable. Or, to the first reliable editor who does ask. On the other hand, if you've discussed it with *so many editors* that you feel obligated to *all*, why not prepare a short release and send it to everyone. Then the editors who are really interested will come to you for details.

3 Release News When It's Timely and in Season.

Recently, one of our editors visited a couple of private organizations which get nearly 100% of their releases printed. He asked for an explanation of their success. The answer: *Timing.*

They even have a "timing expert" who determines what should be released, how, and when. He makes these timing decisions quite objectively, basing them entirely on his news and subject matter training. In short, these organizations regard timing as important as the idea itself and they give a man the authority to exploit it.

They don't sit back and wait for the scientist (who may be tops in his field but completely inexperienced in communication) to decide when he wants to release something. Too often, that's either when it's convenient, next winter sometime, or after it's appeared in some technical journal six months hence.

For an extreme example, imagine today's competitive, free enterprise farm press operating in the days of Gregor Mendel. What revolutionary strides might have been realized by now if Mendel's work had been publicized sometime during the 50-odd years that it lay buried in scientific chambers?

Interestingly, I borrowed that particular thought *not* from a reporter but from an experiment station superintendent at a past meeting.

Agricultural researchers enjoy an

enviable position these days, compared to some public official. They don't have to spend time *selling* their product or service to farmers. Ag publications can get a researcher's "light from under a bushel" as *nothing else can*—often on a national scale.

This is important from at least three standpoints: (1) the scientist's own self-improvement, (2) recognition for the institution and perhaps more legislative support, (3) prevention of a "me too" research station that "agrees" later with the "discoveries" announced by other stations—often *made* no sooner than its own, just *released faster.*

All this reminds me of a very detailed study in Oregon where Experiment Station releases were used by the commercial press more often than any other type sent out by the state's Land Grant College system. So, the effort is usually well-spent.

Monthly magazines do need a little extra time to get an even break with the newspapers and weeklies, of course. What's more, a story that's good by one magazine's standards frequently isn't even acceptable by another because of differences in "editorial formula." More obviously, some news that's fine for *one* medium—say television—isn't always grist for *another* —say magazines.

4 Trust a Farm Reporter

Once he's proven himself reliable, there's a lot to say for taking a farm reporter into your confidence *before* release date—giving him time to check other sources that may extend an article's regionality and often its share of space in the magazine. This is especially true of publications with national circulation and a staff of reporter-editors distributed throughout the nation.

For example, if an idea works in the Coastal Plain of *Georgia,* Farm Journal's first question is: Will it also work in the Coastal Plain of the *Carolinas?* And, someone on our staff would *immediately* put the question to scientists in those states.

Other stories might call for further research in Oregon, Pennsylvania, or Iowa to determine the amount of space and number of editions required for proper coverage.

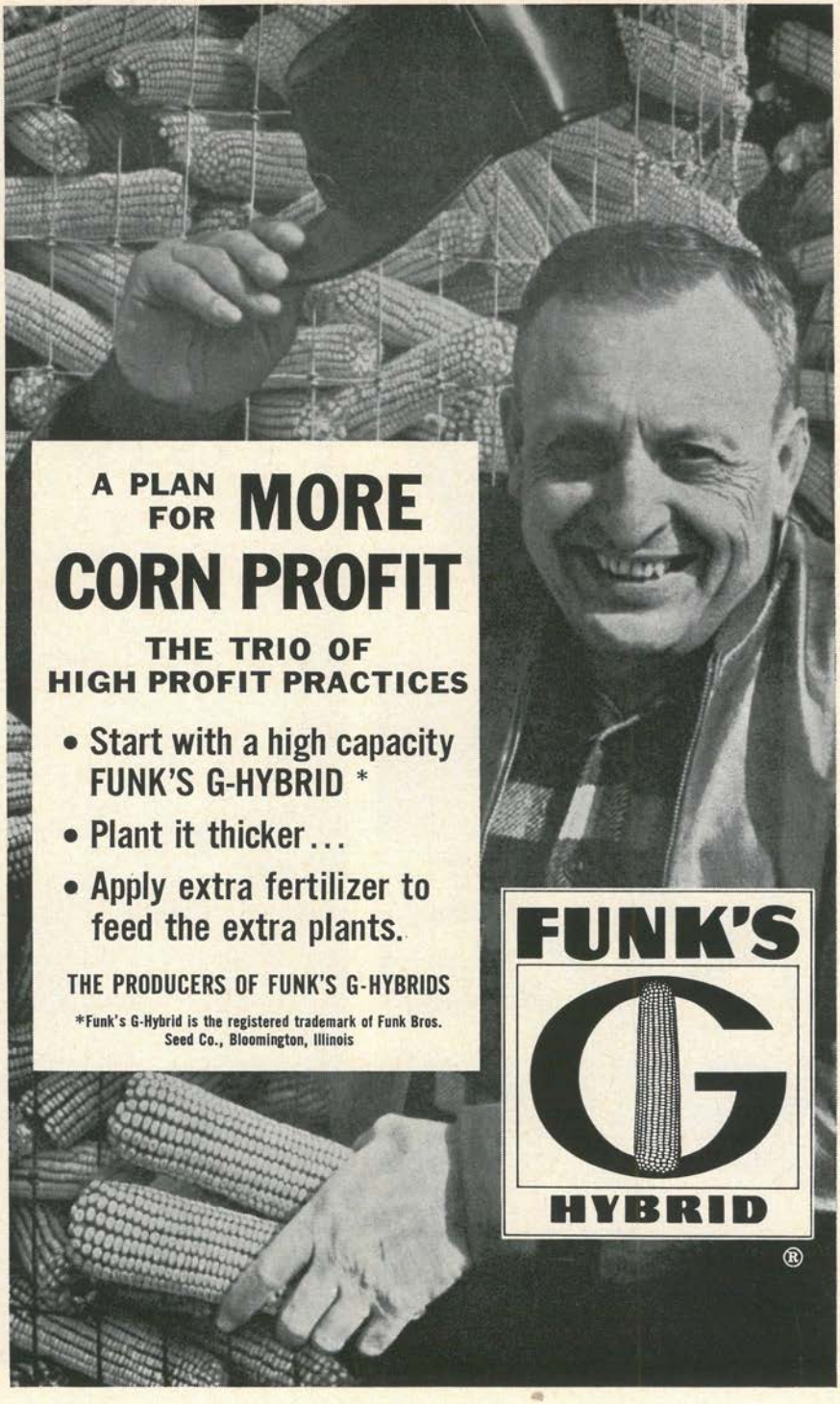
Finally, on this sensitive subject of trust, I might add that Farm Journal has for years followed a cardinal rule to insure accuracy by checking—*with the people involved* —final versions of all articles which quote scientists or interpret their work.

5 Help Reporters Arrange All News.

By arranging news, I mean in terms of a quick, easy, lively form. Farmers just don't have much reading time. When they do, they're usually tired. Therefore, reading shouldn't be just so much extra work.

It must, of course, be written in a functional, no-nonsense vein, be straight-forwardly worded and have plenty of gumption to it. None of this happens without a lot of editorial sweat, no small amount during the interview stage with the scientist.

THE END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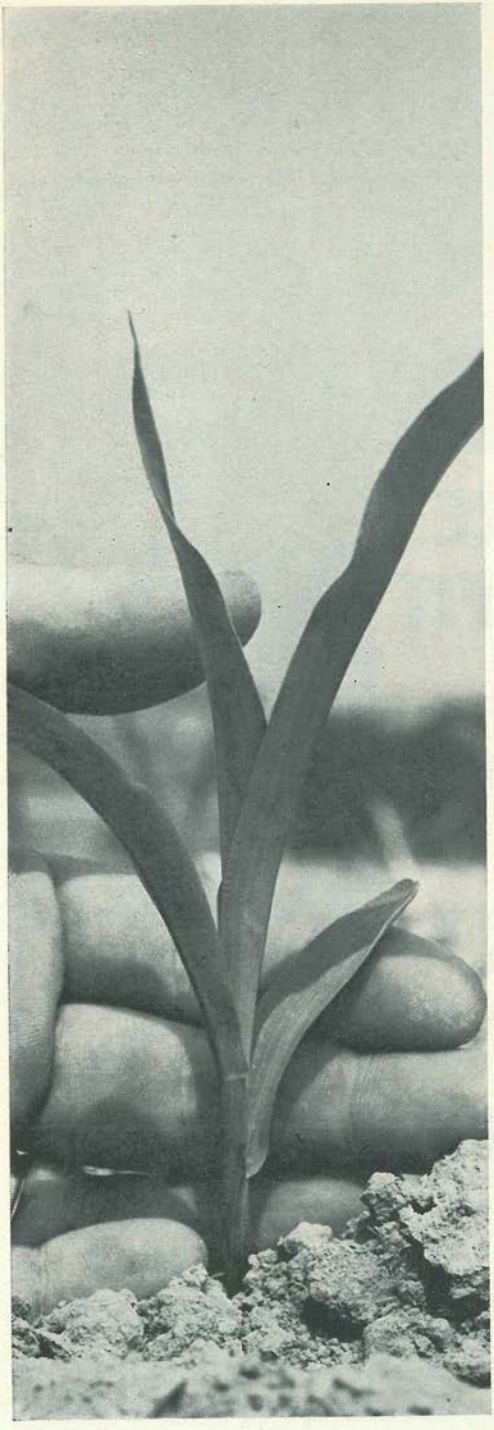

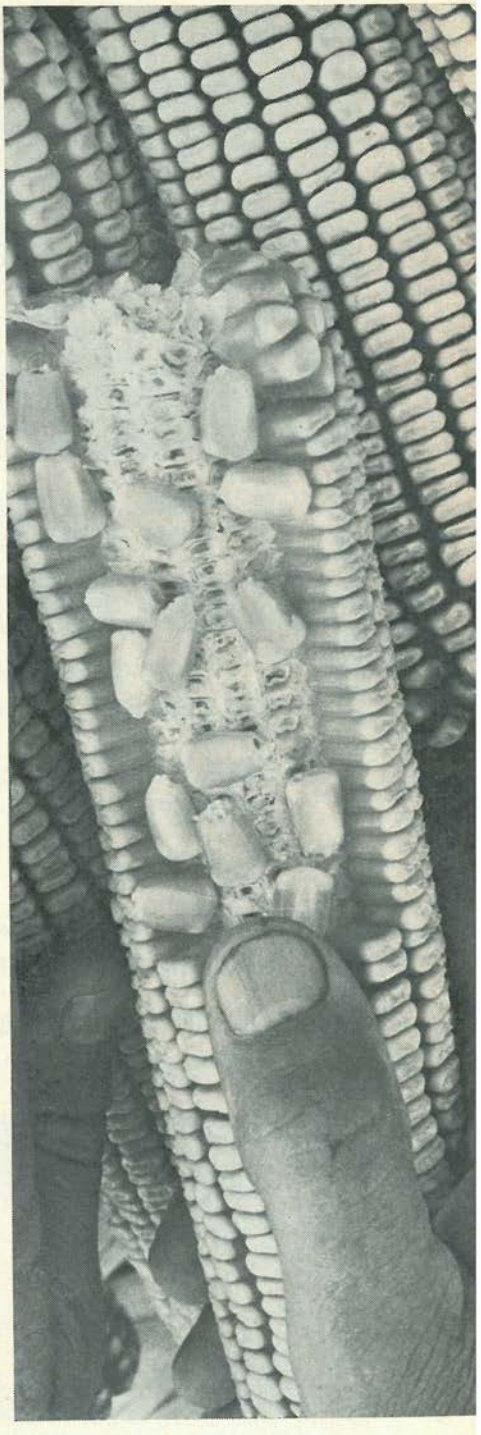

By A. J. Ohlrogge Purdue University

. . . challenging the experimentalist to look at himself as the professional oddsmaker—giving the odds and letting the user determine if he wants to play the long shot or the sure thing.

CORN YIELDS with PRECISION and EASE

Will you be checking corn fields this fall?

You may look forward to this job, or you may dread the thought of the pounds and pounds of corn that must be carried out of the field to be weighed. Not only that—but after all that hard work, you still may not have the precision you want.

There IS an easier way. It not only requires less work, but is also at least five times more precise per hour of time spent. The procedure is simple, tried, and true.

THE OLD WAY

First, let's look at the old method of checking yields in farmers' fields. Sample areas in the field are harvested. All ears are gathered in each sample area and are carried out to the edge of the fields for weighing. (Farmers detest piles of corn left on the ground scattered around the field.)

The number of samples harvested may be as little as two or three per field or as many as 10-15. Each sample should be randomly selected, but often this requirement is not fulfilled.

The sample area is usually between 1/100 and 1/1000 of an acre in size. The strength of one's back usually determines the size of the sample. After weighing, a moisture sample is taken. The calculations from this point on are routine.

THE OLD PROBLEM?

Corn yields are made up of two components: (1) Ear number per acre and (2) weight per ear.

It is easy to count ears—you can leave them on the stalk. It's also easy to sample a field for ear size. Only enough are harvested and carried off to determine precisely this component of yield.

The ratio between the number of ears that must be counted to the number of ears that must be harvested and weighed for ear size determination to give the same preciseness of measurement in each component will vary from field to field. It is, however, estimated that this ratio seldom if ever gets closer than 5 to 1, and usually would be about 25 to 1.

The old way—determining ear number and ear weight in one operation—demands much unnecessary work. More ears are weighed than necessary to get a good average ear weight, while insufficient ears are usually harvested to get a precise measure of the number of ears in the field.

THE NEW WAY

Equipment needed:

1. A flexible chain equipped with wire pegs at each end. We have used brass sash chains. A length of 26.4 feet —1/500 of an acre with 40" rows is convenient.
2. A milk scale.
3. Apple picking bag, or something similar to carry the ear sample around the field.
4. Moisture sample equipment.

Procedure:

1. After reaching field, survey it to decide on the boundaries

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RESEARCH Story of the Century:

Hybrid corn is undoubtedly the crop production story of the century. Simply by buying hybrid seed instead of the old open-pollinated varieties, American farmers now harvest at least a fourth more corn per acre.

The story of hybrid corn is a story of research that began about 100 years ago with Gregor Mendel, an Austrian monk, who cross-pollinated garden peas and observed the result. Although his published work gathered dust for a third of a century, it was discovered about 1900 and became the basis of our science of genetics.

After an announcement in 1908 of the possible advantages of hybrid vigor, much time and talent went into research on hybrid corn —by both public and private agencies. But not until 1917 was its real potential opened up by work that resulted in double crosses, the basis of our present hybrids.

And a decade passed before the public heard much about hybrid corn, though plant breeders were busily building inbred lines that

of the area to be sampled.

2 Decide on what is a harvestable ear. It might be well-filled ears, measuring at least a hand's span in length.

3 Decide on the number of sample areas to count. Usually there should not be less than 15. If 15 areas are used, collect 3 ears from each area. Decide before entering the field which numbered ears in the counted area will be chosen—for example, numbers 7-13-21.

4 Decide on a pattern for selecting at random the areas to be counted.

5 Enter field. On arrival at first sample site, push end peg into ground and count ears, as line is reeled out. Also harvest sample ears. In practice, it usually works best to peg down and reel out line, and count and harvest on the walk back. Record number of ears in each sample area. This will help you decide on number of areas that must be counted for various levels of confidence in the determined yield. A person with a little statistical training can quickly calculate the standard deviation for ear number.

6 Moisture sampling is always a sticky problem. Since the volume of corn is not large, the entire sample can be either shelled and sampled, or dried, shelled and sampled, with appropriate weighings for the necessary calculations. We usually do the latter.

HYBRID CORN

would combine well to create hybrids adapted to specific areas. To speed up progress, by 1925 12 States joined with the Department of Agriculture in a cooperative hybrid-corn breeding program.

In the early thirties, the research efforts began to pay off. Hybrids swept the corn belt like wildfire. Within ten years, 52 percent of the Nation's corn land was planted to hybrids. Since then it has continued to increase, and today hybrids occupy 95 percent of our corn acreage.

Between 1908 and 1948, in 4 decades, something less than $15 million was invested by Federal, State, and private research agencies in the development of commercial hybrids.

The increased yields from these hybrids amount to about 800 million bushels annually, worth about $900 million to farmers.

Thus, each dollar invested over a 30-year period in hybrid corn research is now returning $60 every year to farmers.

Special to Better Crops
From USDA News

EVALUATION OF METHOD

In 1956, this procedure was evaluated by Dr. Kehrberg of the Agricultural Economics Department and by the author.

Yields were obtained in over 100 farmers' fields. At least two and often four different areas within each field were sampled for yield. The method used was selected after a sampling study of two "typical" farm fields.

In both fields twenty 35-foot sample areas were completely harvested and weighed. Also four ears per area were selected at random. These were individually marked and weighed.

From these data, it was now possible to calculate yields based on whole sample harvest and also on the ear count ear weight method. The variance in yields based on various combinations of sample areas and sample ears per area could be calculated. The results obtained served as the basis of the above recommendations.

1962 STUDIES

Cliff Spies, Extension Agronomist, used the procedure in 1962 for checking corn yields on zinc and boron demonstrations on 20 farms. The press of time limited the number of areas checked per treatment to 15 each, 1/1000 of an acre in size.

From 10 of these areas, three ears were harvested for ear weight and other characteristics. The size of the area counted (15 x 1/1000) is smaller than I like, and the number of ears harvested is a minimum for most types of studies. The data from the 20 fields were then statistically considered as 20 replications. The results are shown in Table 1.

These results support the adequacy of the sample method. The high probability of shelling percentage and weight per ear suggest

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CORN KERNEL:

Next time you drive down a highway and see corn plants stretching acre after uniform acre, remember that the car you are driving, the road map guiding you, the clothes you are wearing and the dinner waiting for you just ahead depended in a variety of ways upon products from the golden corn kernel.

Supporting our multitude of playtime activities are versatile products from corn, adding much fun to the summer just passed and to the fall we're now in.

For example, corn is involved in sandpaper for the weekend hobbyist, paper plates for picnics, insecticides for camping trips, film for snapshots. Corn starch is used in all of these products.

It also is used in the manufacture of aluminum—aluminum canoes, sailboat masts, outboard engines and aluminum porch chairs.

Products from corn are used in scores of ways in the cars we drive. Corn dextrin helped process the leather in our golf bags and sandals

TABLE 1—RESULTS FROM TWENTY ZINC-BORON DEMONSTRATIONS ON CORN IN INDIANA

Factor	Average Increase for Zinc and Boron	Probability that Increase was due to Treatment
		Chances in 100
Shelling percentage	0.50 Percent	99.3
Weight of grain per ear	0.018 lb.	99.6
Weight of 1000 kernels	0.014 lb.	91.4
Yield per acre	6.45 bu.	97.6

the ear sample size was satisfactory.

The lower probability for yield per acre, in light of the weight per ear values, assuming treatments did not influence number of ears per acre, suggests that either more or larger areas need to be counted for equal precision on both components of yield.

The need and desirability for agronomists to present experimental results in the above statistical form is another story for a separate article.

Needless to say, the experimentalist should look at himself as the professional oddsmaker—giving the odds and letting the user determine if he wants to play the long shot or the sure thing.

THE END

Golden Source Of Many Products

and was used as a binder in charcoal briquettes.

Cosmetic products, such as the lotions we use to prevent sunburn, frequently contain corn starch. The making of our light cotton or rayon clothing required starch, as did our comfortable hammocks.

Try to imagine summer—or fall, for that matter—without soda, ice cream, beer, pie, candy, chewing gum, marshmallows, peanut butter and jelly, salad dressings, hot dogs, catsup, cookies and fruit cocktail.

Such foods, along with several hundred others, usually contain corn syrup or dextrose or oil or starch—and sometimes all four!

Corn also helps produce the poultry, meat, milk and eggs we need to give us strength for playing, for corn is a major feed of beef, pigs, cows, chickens and sheep.

Corn Industries Research Foundation

Nitrogen fertilizer can give a big increase in corn yields. And many Midwestern farmers have piled it on, often forgetting about phosphorus and potassium.

Nitrogen is important, but under the intensive cropping practices used in the Midwest, it's not enough. Such an incomplete fertility program soon results in unbalanced soil fertility.

Low soil potassium relative to nitrogen and phosphorus, is one such imbalance, according to John T. Murdock, soils specialist at the University of Wisconsin.

WHEN POTASH IS LIMITED

In general, low potassium levels will result in low yields. But a high amount of lodging may occur *even before low yields.*

Murdock found some very specific, noticeable symptoms with potassium the limiting element:

Some Pitfalls of INADEQUATE FERTILITY

1 Early in the season you can see a browning of the edges of the lower leaves, then a general bronzing of the plant as the season progresses.

2 Shortened internodes and low ear heights are evident.

3 If you split open the stem in late July, you'll see areas around the joints that are darkened in color. The darkened color is caused at least partially by accumulation of iron and manganese compounds.

4 By late August, plant tissue will begin to deteriorate—especially the pith at the base of the stalk and in the brace roots. The brace roots will be considerably reduced in size and number.

5 The stalks of potassium deficient plants often die before the ear is mature. This is premature aging since the ear normally matures on a relatively green stalk which still has some elasticity. It is out-

wardly evident through the tassels, which will break off shortly after pollination.

6 Premature aging of deficient stalks also shows up in their moisture content. The moisture content of deficient stalks will be low although the ears are still high in moisture.

7 Potassium deficient plants lack the support of a strong brace root system. The stalks deteriorate, and mature too rapidly. Consequently they are brittle, and easily broken by a good wind.

SOLUTION TO IMBALANCE

Murdock's solution to fertility imbalance re-echoes what soil specialists have been stressing for some time: *Follow a planned program of fertility.*

Test your soil periodically to be sure that nutrient supplies are in balance, then apply fertilizer according to the recommendations of your soil tester and the needs of the crop you're raising.

Wisconsin News

POTASSIUM Use on TURF

. . . some basic principles

By Werner L. Nelson American Potash Institute

Before The Midwest Regional Turf Conference, Purdue

Supplying adequate K is only one part of a top turf management program. In fact, compared to other limiting factors, K needs can be met rather easily when diagnostic tools are used.

WHAT IS THE SOIL SITUATION?

A recent summary of soil tests by W. H. Daniel shows the following:

	PERCENT TESTING MEDIUM OR LESS	EXCESS
	Putting Greens	
PHOSPHORUS	4%	87%
POTASSIUM	80%	—
	Fairways	
PHOSPHORUS	47%	28%
POTASSIUM	66%	—
	Lawns to be Planted	
PHOSPHORUS	68%	5%
POTASSIUM	93%	—
	Established lawns	
PHOSPHORUS	21%	27%
POTASSIUM	64%	—

. . . in a day when all lawns are deficient in nitrogen, a few are deficient in phosphorus, and most are deficient in potassium, according to official reports.

POTASSIUM use on TURF

"All lawn soils are deficient in N, a few are deficient in P, and most are deficient in K," Purdue Extension Circular 438 reports.

WHY LOW N IN THE SOIL?

1 High Leaching Loss.

In 1940, Scarseth emphasized the K loss from greens by leaching. The process is simple. Frequent use of ammoniacal N in the form of ammonium sulfate or urea replaces the K from the soil colloid. Watering then leaches the K out of the root zone.

The very same principle is used in quantitative determination of exchangeable K in soils in the laboratory. The soil is leached with a salt solution such as NH_4 acetate. The amount of K in the beaker is then determined. Hard water containing CA and Mg also helps leach K.

Good greens demand frequent N and water. Such conditions can cause much K leaching, requiring careful attention to your K supply.

The same principle applies to lawns that are irrigated or located in heavy rainfall areas but less so to unirrigated lawns. Heavier and heavier N rates are being applied, making the condition more critical each year.

2 High Removal.

Frequent clipping and removal of clippings drain nutrients away. The average annual removal in fertilized greens is about 5.2 lbs. N, 1.6 lbs. P_2O_5, 3.3 lbs. K_2O per 1000 sq. ft. Noer estimates.

Roberts of Iowa has shown the ratio of $N:P_2O_5:K_2O$ to be 10:2:5 in Kentucky bluegrass foliage. Removal from lawns is obviously related to disposal of the clippings and intensity of fertilization and irrigation. Sod production results in considerable removal.

RECOGNIZING NEEDS

The important characteristic of a leader is his diagnostic approach.

DEFICIENCY SYMPTOMS. Clear-cut symptoms on turf grass are rare. Causes of leaf yellowing or browning are very difficult to pin down, especially on the very short leaves in greens.

HIDDEN HUNGER. Sometimes plants need more fertilizer before showing visible signs. Such hidden hunger is an insiduous thing, eventually leading to problems. Soil tests can help avoid it, while tissue tests can help identify it.

SOIL TESTS. Soil testing is based on the principle of determining general soil fertility level. Then an estimate is made of the fertility needed to supplement the soil supply and meet the plant's needs.

With the many new chemicals now being applied in turf and high pH conditions, much more research is needed to determine their influence on soil test accuracy.

TISSUE TESTS. Tests on the leaves of many crops have effectively determined general K level. But careful interpretation is important. With low N rates, K may accumulate in the plant and show a high K test.

With adequate N rates, the K in the plant may be used and show a low test. Tissue tests are very important in July and August when the turf is under more stress from heat, disease, and nutrient depletion.

BALANCED FERTILIZATION

Of course, there is no such thing as a balanced fertilizer. Balanced fertilization refers to fertilization *according to soil and crop needs.* For example, a soil low in available K requires a high-K fertilizer, while a soil high in available K can use a low-K fertilizer. Though much different in analysis, such fertilizers would be "balanced" to *meet soil and plant needs.*

The balance between N and K is becoming increasingly important. Adequate N is important in turf management and K must be increased accordingly on many soils.

Another problem relates to pH. With hard water used in irrigation, the pH of putting greens may increase so much that it is difficult for the plant to take up K. Iowa corn data illustrate this point:

MILLIEQUIVALENTS PER 100 GM. OF CORN PLANT

	K	Ca	Mg
High Lime Soil	23	55	101
Normal Soil	107	32	39

PLANT'S JOB: CAPTURE SUNSHINE

Basically the plant's job is to capture light energy and use it in photosynthesis to make sugars.

In most plants, an important job is to provide a maximum effective leaf surface. But continual clipping puts turf in a unique position, since the leaf surface is continually reduced.

So, it is doubly important to keep the best possible leaf surface, to avoid chlorosis from nutrient deficiencies, including K. The leaf must be highly functional at all times.

POTASSIUM'S BIG JOBS

Though potassium has many functions, space permits only a few here:

1 Helps Move Carbohydrates From Leaves to Roots.

Leaves and roots are connected by vascular bundles, the so-called "pipelines." In plants starved for K, the pipelines become badly plugged and roots starve.

On K-deficient plants, roots are limited. Plants have little capacity to take in other nutrients and to resist pests and other growth hazards.

2 Helps Resist Drouth.

Plants well supplied with K have a lower transpiration rate than soft lush plants low in K. This, combined with more extensive root system, gives the plant greater drouth resistance.

Root zones are often low in oxygen because of many reasons, including heavy watering, traffic, etc. This reduces K uptake and increases the need for higher rates to insure adequate plant growth.

3 Helps Retard Disease.

It is generally accepted that K-deficient plants are more subject to certain diseases.

For example, a leaf spot disease, Helminthosporium, is more prevalent on Coastal Bermuda or corn low in K.

Part of this effect may be due to the accumulation of such compounds on sugars and nitrates to make conditions more favorable for the development of fungus diseases once the plant is infected.

This does not mean K fertilization will eliminate the need for controlling diseases, but such outbreaks will be less disastrous and more easily controlled when K supply is adequate.

The grass will be "tougher" in the important July and August period, avoiding soft lush growth from N alone.

Continuous clipping prevents the plant from maturing, making it continually susceptible to disease attack. So, any practice that encourages vigor will help condition the plant against disease. Rhode Island work shows these hardier plants are also better able to resist hard frosts.

4 Turf Density.

A common problem with some grasses is maintenance of stands. Much stand loss is due to winterkilling. But it is often emphasized that more plants starve out than are killed out. Research has shown the importance of additional nutrients (including K) on low fertility soils to induce root branching and turf density.

The KEY to Success

Potassium fertilization is apparently the key to successful alfalfa production in northeastern Minnesota.

But to give good results, potassium, in K_2O form, must be applied at about 200 pounds per acre, according to uptake studies.

University soil scientist John Grava reports potassium fertilization rates below 200 pounds did affect the potassium content of alfalfa leaf tissues.

Plots getting 200 pounds potassium fertilizer showed marked uptake of potassium compared to plots getting no potassium.

Higher rates did increase the leaf tissue content of potassium, but by smaller quantities for each pound of potassium fertilizer than at 200 pounds.

High potassium treatments have also helped reduce winter kill of alfalfa in this region.

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5 Protein Formation.

Potassium helps convert nitrogen compounds to complete protein.

Teel at Purdue has shown that orchard grass low in K accumulates certain free amino acids and intermediate nitrogen compounds. Just what effect this has on turf vigor is not clear.

HOW MUCH NEEDED?

In Midwest Turf News and Research No. 16, W. H. Daniel suggests the following annual ranges:

	POUNDS PER 1,000 SQ. FT.					
	HEAVY FEEDING			AVERAGE FEEDING		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Established putting greens	10	2	5	8	2	4
New putting greens	8	2	4	6	2	3
Irrigated lawns, tees, and fairways	6	2	4	3	1	2
Unirrigated lawns	4	1	2	2	1	1

The need for adequate N on turf has been well recognized for many years. In the past, fertilizers have tended to be high in P_2O_5 compared to K_2O. N:2:1 is an example. In recent years, grades have moved to the N:2:2 ratio.

From the soil test summary data and recommendations above, it seems future fertilizers should be higher in K_2O than in P_2O_5 to meet many turf situations. N:2:4 is an example. Of course, N:2:2 can be used with an occasional supplement of KCl.

Soil tests and tissue tests should be used to help determine specific needs.

THE END

Years of research have shown potassium is the most essential element for good alfalfa yields on soils in northeastern Minnesota. And raising good forage such as alfalfa is critical to agriculture, especially dairying, in this area where the growing season does not favor corn.

The results reported by Grava were from a potassium-magnesium-calcium study supervised by A. C. Caldwell, University soil scientist.

Minnesota News

Teaching and

Service Aids

for

Winter Meetings

Pages 45-48

"CINDERELLA CROP" Goes for POTASH

By Donald Adams
Soils Specialist
University of Arkansas

In the history of farming in Arkansas, no crop has gained prominence as rapidly as soybeans. Today soybeans are not a stepchild, but a real member of the family. Since soybeans are now considered as a cash crop, emphasis is being placed on higher yields.

Medium to high fertility soils are required for highest yields. On low fertility soils the addition of fertilizer can help increase yields. Forty bushels of soybeans removes 140 pounds of nitrogen, 33 pounds of phosphate, and 54 pounds of potash from the soil.

Phosphorus where needed gives soybeans a faster start and helps them get ahead of weeds. Phosporus is needed early in order to produce high yields. Phosphorus starvation is not readily seen, but shows as stunted growth.

Soybeans like other legume seeds remove large amounts of potash. Potash deficiency up to the time of bloom is shown by yellowing on the edges and cupping of the leaves. Later symptoms may be shown by late maturity, slow defoliation, small seeds, and low yields.

Phosphate and potash fertilizer can increase soybean yields two to ten bushels per acre. Whether or not this can be done on your farm depends on the phosphate and potash content of the soil.

In an experiment by the Arkansas Agricultural Experiment Station, soybean yield was increased eight bushels per acre on a low fertility soil by using 200 pounds of 0-20-20.

You may need to apply only phosphate or potash. Or you may need both. On some fields lime may be needed more than fertilizer. Like all other crops, soybeans must have adequate amounts of lime and all plant food nutrients present and in the proper balance to produce high yields.

The importance of proper balance of phosphate and potash is pointed out in the results of an experiment on a low fertility silt loam soil. No phosphate and potash resulted in a yield of only 31 bushels. Forty pounds of phosphate gave a yield of 32 bushels, 40 pounds of potash gave a yield of 35 bushels, and the addition of 40 pounds of phosphate and potash increased yields to 39 bushels. From this it is evident that phosphate and potash

Where 60 pounds of potash on right "balanced" fertility of the soil for increased soybean yields, inspected by Arkansas farmer John Barnhill and Associate County Agent John Carter of Lawrence County.

should be balanced for maximum soybean yields.

In general soybeans do not require fertilizer nitrogen when properly inoculated and grown with adequate amounts of other plant food nutrients.

Even though soybeans remove a lot of nitrogen, under favorable soil conditions the bacteria living on the roots fix a sufficient amount of nitrogen for the crop.

Where soybeans follow a crop which was fertilized—cotton, corn, small grain—they can usually feed on the fertilizer which was left over from the other crop. In some cases this fertility is sufficient for high soybean yields.

This emphasizes the need for soil tests.

Placement of fertilizer is very important in getting the fertilizer used efficiently by soybean plants. A good method is to apply fertilizer in a band and bed on it. This places the fertilizer about four inches below the seed. This way the fertilizer is available to young plants. If the fertilizer is near the

seed it may cause seedling damage.

Don't let plant food shortage hold down your soybean yields. But don't guess. Test your soil and apply the recommended plant food.

Arkansas Farmer

MORE Profits from LESS Production

Figures on returns per money spent on fertilizer frequently are used to show that fertilizer is a good investment.

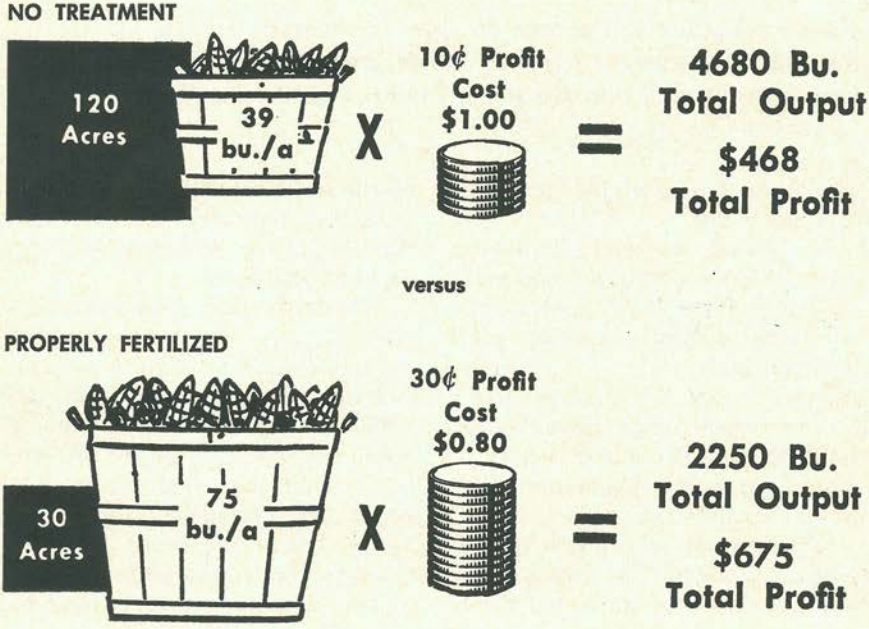
But these figures can be misleading! Chances are that returns on fertilizer will be highest for the first handful of fertilizer applied and will decrease steadily as rate of application approaches the point of maximum profits. The chart illustrates this principle—More Profits from Less Production.

One farmer produces corn at a cost of 80 cents per bushel. It costs his neighbor $1.00 per bushel to produce corn. They both sell at $1.10 per bushel. Thus, net profit per bushel of one farmer is threefold that of his neighbor.

To make as much total profit as his neighbor, the first farmer will need to market only half as many bushels of corn. What's more, because his yield per acre will be higher, the first farmer could equal his neighbor's corn income on one fourth the total acreage.

This means that by farming more efficiently—by using fertilizer properly along with other good farming practices—a farmer actually can realize greater income from a small total output without having contributed to surpluses when a crop is in oversupply.

Esso Cultivator



1 ton = 25 Acres

CONSOLIDATION of acreage into fewer and larger farms is one means of increasing agricultural efficiency, says the California Fertilizer Association.

Another method within reach of all farm operators is to increase the *production efficiency* of each acre, no matter how few may be involved, the Association continues.

You do not necessarily have to be a big operator to make farming pay good dividends, and you certainly don't have to get more acreage or get out, either.

The quickest, surest way for the little fellow to get bigger while staying the same size (acre-wise) is to use all the fertilizer he needs, as indicated by official recommendations.

Over a period of years, USDA studies showed that each ton of plant nutrients added (actual plant food—for example, 100 pounds 6-8-4 = 18 pounds) increased crop yields as much as would be produced on 25 *additional acres.*

Plant nutrients were figured to cost $175 a ton. Thus, increasing size by adding fertilizer was the equivalent of renting land for $7 an acre.

As an investment, study after study has shown fertilizer added as needed to return from *$4 to $10 for each $1 spent.*

CFA News

Improve Growth EFFICIENCY

Potassium and lysine improved growth and feed efficiency at lower protein levels in rations fed to 272 baby pigs at Iowa State University.

Greatest gains and feed efficiency were obtained from supplementing an 8 percent protein diet with 1 to 2 percent levels of potassium acetate.

There was no increase in performance noted from supplementing a corn-soybean meal diet containing 24 percent protein.

Wallace's Farmer

$140 Per Acre MORE

Fertilizer on alfalfa returned $140 more per acre above fertilizer costs over a 4-year test period in Tennessee than did unfertilized check plots.

When adequate phosphate was used with no potash, yield was 2.61 tons of hay. When adequate potash but no phosphate was applied, yields averaged 3.27 tons.

With adequate amounts of both, the hay averaged 4.16 tons compared with 2.29 tons on unfertilized plots.

Wallace's Farmer

PROCESSING OF AGRICULTURAL PRODUCTS

3 MILLION EMPLOYEES

14 BILLION DOLLAR ANNUAL PAYROLL

26,000 ESTABLISHMENTS

30 BILLION DOLLARS VALUE ADDED ANNUALLY

WHOLESALING AGRI

NEARLY 1,000,00

NEARLY 4 BILLION DOLLAR

87,966 ESTAB

NEARLY 105 BILLION DOL

FARM PRODUCTION SUPPLY AND SERVICE

5,600,000 EMPLOYEES

$24,080,000,000 ANNUAL PAYROLL

FARM PRODUCTION

3,703,642 FARMERS

38 BILLION DOLLARS ANNUAL GROSS INCOME

25 BILLION DOLLARS ANNUAL PRODUCTION EXPENSES

AGRICULT

A

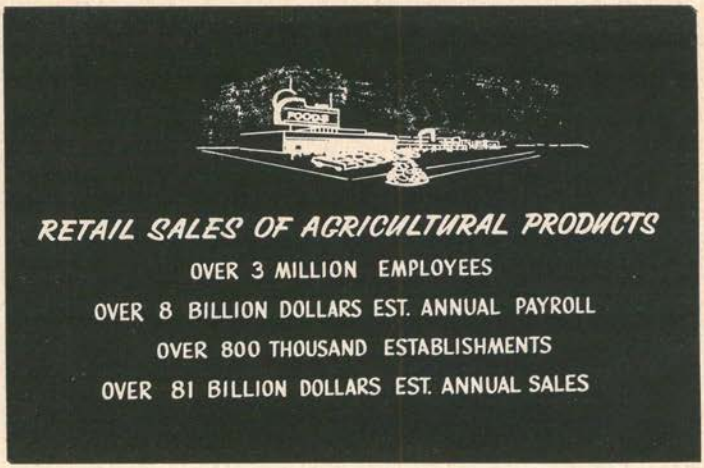
Anyone suffering from the declining industry, with of today, might get a lesso gigantic seconds in the U. S Washington.

The clock has a simple r growth of population is five 300 each hour, 7,200 each d

Before these increasing v new automobiles or refriger ing machines, they must bu and fiber to cover themselv

In the face of such a spi including some well-meanir reer-planning youngsters, nearly as important as it or

Such delusion may seem ing, ironically in a day whe



'URE: an industry alive with FUTURE!

A Better Crops review of a speech, "As I See It," by gricultural Dean Roy M. Kottman of Ohio State University

delusion that agriculture is a limited future for the youth n from a clock ticking away S. Commerce Department at

nessage: that America's net human beings each minute, ay.

vaves of humanity can buy ators or TV sets or calculat- y food to sustain themselves s.

aling market, many groups, g parents advising their ca- till say agriculture is not ce was in their region.

incredible. But it is happen- n American citizens can buy adequate food for their families with a smaller portion of their paycheck than ever before.

Before the American Farm Research Association, Dr. Roy Kottman, Dean of Ohio State University College of Agriculture and Experiment Station, recently answered the belittlers of agriculture with a success story anyone can understand.

Dr. Kottman explained that much misunderstanding stems from too many people defining agriculture in terms of 100 years ago—that is, in terms of *farming* alone.

"Perhaps they compare the 7.4 million people employed in farming today with the 7.4 million people employed in farming in 1860," he said, "and conclude American agriculture can't be very important anymore because it's about the same size it was 100 years ago."

They forget, or have never really understood, that farming and agriculture are no longer synonymous, the Dean emphasized. Farming today is just one phase of agriculture.

Modern agriculture, as interpreted by Dr. Kottman, consists of a great 5-member team: the farmer or producer, the farm production supply and service firms, the processors of agricultural products, the wholesalers, and the retailers.

This team employs 24 percent of the nation's total labor force, he reported, a far cry from the 10 percent figure of farm workers alone, usually found in the urban mind's idea of agriculture.

"In the midst of much uncertainty about future opportunities for young people in agriculture, I find myself optimistic about the future," Dr. Kottman declared. "We have a great story to tell, a thrilling success story which we can back up with facts."

While studying Dean Kottman's speech for this review in Better Crops, four questions kept returning to mind. It finally seemed logical to base the review around those questions.

How can anyone say agriculture is a declining industry? . . .

. . . when some 16,000,000 people are involved in getting to our tables the three daily meals that most Americans enjoy and much of the fiber and materials that clothe and shelter us.

As the first five illustrations of Dean Kottman's report show, the five great members of the agricultural team funnel billions of dollars into the national economy via annual gross income, production expenses, payrolls, and sales.

These five segments of modern agriculture are interdependent, Dr. Kottman emphasized. How interdependent can be understood by indicating what would happen to the farmer or producer without just one other member of the team, the off-farm supply and service firms, not to

Why the DIFFERENCE?

Russian agriculture is roughly 50 years behind American agriculture. Poor management and lack of mechanization are the biggest Soviet weaknesses, according to Dr. Kenneth R. Keller, tobacco research head at North Carolina State College, who visited Russia and Eastern Europe.

Dr. Keller was among the first group of American tobacco officials to visit Russia as part of a U.S.-Soviet exchange program. A Russian delegation returned the visit.

Dr. Keller stressed that he does not claim to be an expert on Russia after such a brief visit. But he did make some interesting observations.

At the New Life Collective Farm near Kishinev, about 3,000 farm workers were needed to manage the 21,250-acre farm, with only 17,500 acres under cultivation.

At another collective farm visited

NATIONAL INCREASES IN FARM PRODUCTION, 1940-1960

	Millions	Percent		Millions	Percent
Milk (lbs.)	15,000	14	Eggs (doz.)	2,000	63
Pork (lbs.)	3,000	16	Corn (bu.)	1,400	59
Beef and Veal (lbs.)	15,000	90	Soybeans (bu.)	400	489
Lamb (lbs.)	1,000	96	Wheat (bu.)	300	149
Chicken (lbs.)	5,000	1200	Grain Sorghum (bu.)	450	865
Turkey (lbs.)	1,000	186	Hay (tons)	24	29

mention the processing and marketing firms that take agricultural products from the farm gate and transform them into food for human consumption.

"Without the off-farm supply and service establishments, today's farmer could barely produce enough food to feed his own family," the Dean pointed out. "In most instances he would have no source of power. The only things he could produce would be what he could manage with a hoe and a shovel in a family garden. Think of that!"

The scientist said modern farming is no longer merely a way of life, but a "rapidly changing, highly capitalized, complex business enterprise, a vital partner on the 'agribusiness' team."

How vital is indicated by the 3,703,000 farmers who gross over $38 billion in annual sales and then pump $25 billion back into the economy as outlay for their annual production expenses.

. . . Research and Incentive

in the state of Georgia—Stalin's birthplace—630 workers were needed to cultivate 3,125 acres. This is roughly one worker for each five acres.

Keller described much of the tillage as "primitive." Men and women cut hay with a scythe. Some crawler tractors are used, along with many oxen and horses.

"As we traveled to the collective farms I was impressed by the vast areas of potentially productive soils and magnitude of the fields," Keller said.

"Since the government owns all the farms, they are operated from a central headquarters or village. At the head of each farm is a chairman appointed by the state. Serving with him are nine councilmen elected by the farm workers. Production plans are reportedly submitted to Moscow for approval.

How can anyone dampen young people's interest in agricultural careers? . . .

. . . when just one state (Ohio, for example) has 125,000 off-farm agribusiness establishments working alongside its 140,000 farmers.

"You would be impressed by the comparable figures of your own state," Dean Kottman contended.

In just three segments of agribusiness—the processors, wholesalers, retailers—there are more than 913,000 known establishments utilizing the talents of over 7,000,000 people, not to mention the 5,600,000 people demanded by the farm production supply and service firms serving the nation's farm managers.

He said not one of the five segments of agribusiness could survive, let alone prosper, without the continuous flow of improved know-how and trained manpower provided by our American system of agricultural research and education—know-how and manpower not only for the advisory agencies serving the farm managers, but also for the thousands of off-farm business establishments, from supermarkets and elevators to milk plants and chemical plant food firms.

"I know you must get as weary as I do by people telling you agriculture is not as important as it used to be," he said. "Such folks usually point to the 40,000 or 100,000 or however many less farms in their state today than 10 years ago.

"But the thing they won't tell you, because they don't know it, is that we're producing 15 billion more pounds of milk each year than we produced in this country 20 years ago—3 billion pounds more pork, 15 billion pounds more beef and veal, nearly a billion pounds more lamb meat, 5 billion pounds more chicken meat, a billion pounds more turkey meat, and 24 billion more dozen eggs.

WHY THE DIFFERENCE?

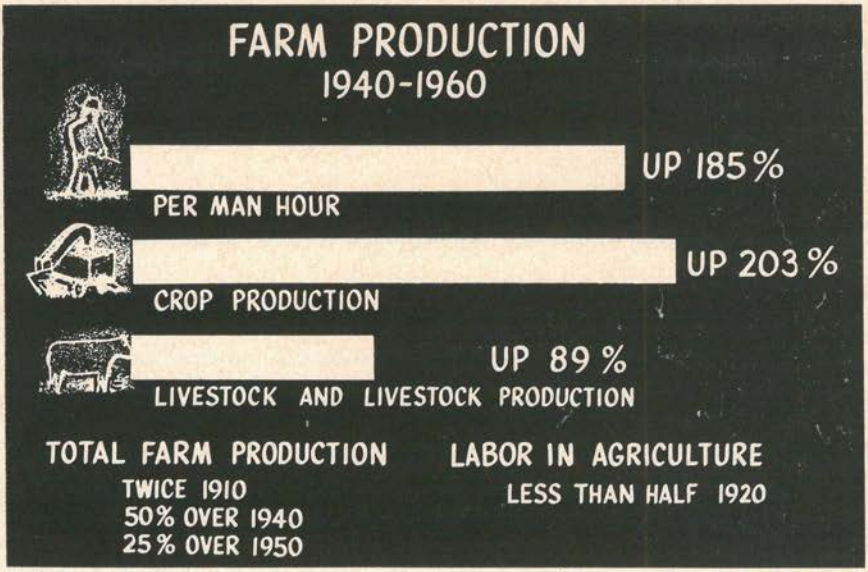
"Buildings in the villages are drab, plain and of seemingly poor construction," Keller explained.

"Houses are located close together and in most cases surrounded by a fence. Within the confines of an individual domicile one notes a small garden, a few chickens, ducks and geese, and on occasion a small patch of tobacco and fruit trees. We assumed the produce from these few square feet is property of the family."

Each collectivized farm worker produces enough food for himself and three to four other people, Keller said. *Each American farmer produces enough to feed himself and 26 others.*

For a closer look at collective agriculture, Dr. Keller obtained these production figures from the New Life Farm:

Total farm population is 8,000, about 3,000 of whom work on the farm. Pay scales ranged from $1.11



"We harvested 50 percent more corn in 1960 than in 1940—1.4 billion bushels more—400 million bushels more soybeans, 300 million bushels more wheat, 450 million bushels more grain sorghum, and 24 million tons more hay."

And these figures apply only to the farming segment of agriculture, Dean Kottman emphasized.

Similar growth has occurred in the off-farm segments of agricultural business: commercial feed business up nearly 400 percent in 20 years, purchased seed up 173 percent, fertilizer and lime up nearly 400 percent!

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to $2.75 for daily work quotas that may take more or less than a day to perform.

Of the farm's 21,250 acres, 17,500 are under cultivation with the remainder devoted to open land grazing and buildings. Cattle number about 2,700 head, hogs about 4,000 head.

Corn, wheat, soybeans, and sunflowers are the principal crops, accounting for 13,750 acres. About 1,300 acres are in fruit trees and another 2,000 acres in a grape vineyard.

Tobacco, which totals only 500 acres, will account for an estimated 40 per cent of the farm's projected 1962 income of about $2 million.

Food shortages prevent much increase in tobacco acreage, although the crop is extremely profitable by Russian standards—about $880 per acre.

"Everywhere we went," Keller said, "the people were gracious, hospitable, and appreciative of our visit. We were given a welcome beyond our expectation."

The visiting Americans also

As he expressed it, we could go on and on with figures on what has happened to our nation's agricultural production in just 20 years—the 350 percent increase in value of horticultural specialties, the two and one-half time increase in value of fruit and nut sales, the 3 billion cubic feet more lumber in 1960 than in 1940 (a 36 percent increase in timber production in just 20 years).

How can anyone overlook agriculture's role in the local economy?. . .

. . . when each dollar of new wealth produced on our farms means three to five dollars worth of new business occurring on the Main Street.

"It can be shown," Dr. Kottman reported, "that for every four cows producing 10,000 pounds each, that are put into production, there will be $3,000 to $5,000 *additional* business on the Main Streets in the surrounding towns and cities."

The same thing can be said for every 10 brood sows and every 50 steers that are fed, according to the Dean, and for every 21 beef cows producing calves and every 600 laying hens.

But the most spectacular part of the agricultural success story is neither the scope of the industry nor the production by it, but the growth in its efficiency.

"Yes, we do have fewer farms than 20 years ago," Dr. Kottman admitted, "but it is also true that fewer cows are producing our tremendously increased milk supply and fewer hens laying our increased egg supplies.

"American agriculture reflects what the free enterprise system is supposed to reflect—increased efficiency."

WHY THE DIFFERENCE?

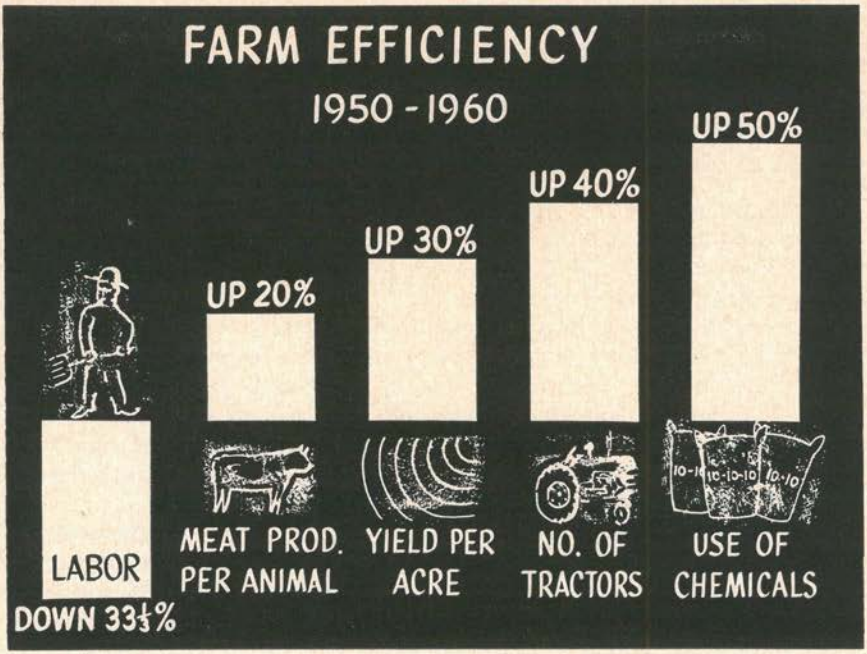
found much regimentation among collectivized farm workers.

Dr. Keller said the visit gave him a new appreciation for the efficiency of the American farmer.

"Shortcomings of Russian agriculture were evidenced by the dirty, dingy appearance of Moscow food markets," he said.

Russians must spend about 56 per cent of their family income for food, while American families spend about 20 per cent.

"Putting it another way," Keller continued, "the average American factory worker can pay for a pound of butter with 21 minutes of labor.



The last two illustrations of Dr. Kottman's report show what has happened to farm efficiency—the tremendous production increases per man hour, per animal, per crop acre over the past 20 years, as well as increases in use of tractors and chemicals in the past 10 years.

And although America has 39 percent fewer farms than it had just 20 years ago, there are five percent more acres in farms, the Dean emphasized, and the cropland harvested is down only 3.2 percent despite government programs to reduce acreages.

A Russian worker must work three hours and 13 minutes for the same product.

"If our farms were no more efficient than Soviet collectives, 20 to 25 million American industrial workers would have to quit their jobs and return to the farm to produce food for our population."

Dr. Keller said he found the Russians "a proud people . . . whose incentive is to make life better in the years ahead. We are ahead of them in agriculture now," he added. "But we must not become complacent, must not stop our research programs and efforts to become even more efficient. If we do, the future may be a different story."

N.C. State News

How can anyone advocate reducing agricultural research and education . . .

. . . when adequate food played such a major role in winning two World Wars and in serving U. S. foreign policy efforts to check the spread of communism since the last war.

Perhaps such folks do not recall America invested an estimated $150 million into *each day* of World War II, Dr. Kottman reminded his listeners, or an estimated $7 billion into our space program before getting the first American into orbit.

Besides these investments, as imperative as they were, he suggested the $171 million we invest for a whole year of tax-supported agricultural research is a modest sum for the results the people gain.

Yet, he admitted our American people have a hard time dealing with a problem no nation has ever faced before: the perennial ability to produce more food and fiber than its people can consume, or can export, or can give away!

"In one sense, we in agriculture are the victims of our own phenomenal success," Dean Kottman suggested. "We have used science to unlock the secrets of nature in our laboratories and demonstrational education to carry these 'secrets' to the people who have applied them to reap the greatest harvests mankind has yet achieved."

Yet, he emphasized, our agricultural scientists have not sat back on their laurels but continue to search, even in the face of those who would reduce scientific effort because we can produce more food and fiber than the market can accommodate.

Our automobile industry can produce more autos than the world market could ever purchase, Dr. Kottman contended, as can our industries producing airplanes, refrigerators, and calculators. Yet, we hear no one attempting to hold back research in mathematics, in physics and engineering or to reduce the support for the colleges or schools that teach these subjects.

In fact, the emphasis is toward more research to improve these products for more efficient, more enjoyable use.

NATIONAL NOURISHMENT

"Scholars have been studying the nourishment of the American economy and found, to their surprise, that it has been drawing a large share of its nourishment from an unsuspected source—education. We should have suspected that this was true, for that is how the founders of the country planned it, especially those who conceived the idea of the land-grant colleges and universities. These institutions are valuable both as centers of

"Why, then," Dr. Kottman asked, "is it not equally important to improve the efficiency of that part of our economy requiring $74 billion annually, about 20 percent of our total consumer income, *our food bill!*?"

He suggested that instead of reducing our agricultural research and education efforts because American farmers can produce surplus food and fiber at the moment, we had better search for ways to insure more equitable return for all members of our nation's agribusiness complex.

He then warned that hunger is still mankind's greatest enemy and Americans had better not forget it! In northeast Brazil alone, 23 million people live on the brink of starvation. In Hong Kong, hundreds of thousands of Chinese sleep on sidewalks or on rooftops or in squalid huts stuck to hillsides. Malnutrition affects to varying degrees nearly two-thirds of the world's 3 billion human beings.

Contrast this problem with our problem, he suggested, and you hear no one among those who would reduce agricultural research offer to swap the problem of abundance for the problem of hunger.

Forget the humanitarian side of the question for a minute. Take the recent rise in sugar prices. According to Dr. Kottman, it was not the fact of scarcity but merely the *anticipation* of scarcity that caused sugar costs to double.

"Just think what would happen to this nation's food bill if we had just one-half of one percent less food than needed to feed our people," Dr. Kottman advised. "The cost of that small fraction of scarcity would be fantastic compared to the $171 million we now put into agricultural research each year."

With that thought, we will conclude this review and on the way home linger a little longer over the well-stocked bins of our local supermarket, checking the grocery list the wife asked us to pick up, just some odds and ends she had overlooked, but readily available.

This time, however, we'll think over the abundance and the price—and wonder what it would be like if that was the last loaf of bread available in that store.

sm—reviewer

. . . a large share

teaching, research and adult education, and as the source of the educated manpower in which our nation is so rich. They have performed so well and so unobtrusively for so long that they are taken too much for granted.

Now, when they face unfriendly critics and those who would reduce and limit their effectiveness they are disappointed that so few rally to their defense, especially those who are the most direct beneficiaries of the services they provide. They are all the more disappointed and surprised because the great

Better PRACTICES Meet Tighter SQUEEZE

The nation's farmers, faced with higher costs for such production items as machinery, labor, insecticides, etc., are meeting the squeeze by more effective farming practices.

The year 1962 is probably a good example, according to the University of Kentucky Agricultural Economics Department.

In that year farm production expenses were 27.7 billion dollars, some 600 million dollars above 1961. But good farming practices in 1962 managed to keep farmers' net income in a reasonably satisfactory relationship to these increased costs.

This year, says Economist Wilson Hourigan, farm production expenses are expected to be up 500 million dollars from 1962. But again, good farming practices and an increase in gross farm income probably will keep net income about what it was in 1962.

Hourigan explained the jockeying between rising costs and production this way: As production item expenses increase gradually (labor, machinery, insecticides, etc.), farmers might do more mechanization, replacing slower, relatively less efficient, higher-cost hand labor with rapid machinery.

Farm wages in 1962 were 86 cents an hour average for the United States, he reported. And for the first quarter in 1963, farm wage rates are already up 3 percent over the first quarter of 1962 rates. He predicts a diminishing chance for steady employment for the farm-hired labor force in the future.

SOME COST ITEMS

1 Wholesale prices for farm machinery have risen 2 percent a year for the last three years—but contrast favorably with a 4 percent increase each year from 1947 to 1958. "The recent annual increase

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NATIONAL NOURISHMENT

American educational idea is being adopted by countries throughout the world, enemies and friends alike.

"If they have done so much for agriculture, for agribusiness and for the American people—and the greatness of their contribution can be proved—why must these colleges and universities now defend themselves and argue their case again?

"Why, if education returns

has been more moderate than formerly and tend to be more evenly distributed throughout the year."

5 Feed prices continue to vary, with generally an increasing trend.

6 Retail prices paid for seeds

. . . In Multi-Billion INDUSTRY

2 Spending of capital for new construction (barns, farrowing houses and similar improvements) exceeded 800 million dollars in 1962. For the last 12 years this figure has varied from about 780 millions to slightly more than *one billion dollars.*

3 Average costs per unit of plant nutrients declined in the last several years. Main factor responsible is the increasing use of high-analysis materials.

4 Use of fertilizer tends to expand. Farmers fertilized 48 percent of their cropland in 1959 compared to 30 percent in 1954.

was 6 percent higher in April 1963 than a year earlier, due to a decline in supply.

7 Interest rate charges on the total outstanding farm debt was only a little higher in 1962 than in 1961, but amount of credit used by farmers has shown a strong upward trend for several years.

8 Market price of farm real estate continued to advance in the year ending March 1, 1963, reaching a new record average of $130.50 an acre. This was 4.5 percent higher than a year earlier and 2 percent above the November 1962 figure.

Kentucky News

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enough on the investment to pay for itself many times over, why must they now plead for financial support?

"Why, if the American idea is good enough to be adopted by our enemies for use against us, should Americans now be indifferent or insensitive to its worth?

"These are the questions bothering the land-grant colleges and universities in 1962, a century after they were established."

President Hannah
Michigan State University

WHETHER **WET** SEASON . . .

. . . adequate fertilization can play an important role in helping a crop produce through an adverse season, as shown by these stands of Missouri corn in two types of seasons a few years ago.

. . . OR TOO **DRY** A SEASON

PROFITS from PLANT FOOD

. . . even in an adverse season, 1960, which started too dry and ended too wet.

Fertilizer is just as important in an adverse year as it is in a good year.

This was demonstrated during the Intensified Soil Fertility Program conducted in Wharton County on the Coast Prairie of Texas.

As part of their soil fertility program, County Agent Henry Smith and his committee established a large number of result demonstrations on fertilizer usage.

During the first season when the demonstrations were established, the season was unfavorable for crop production. The early part of the season was dry for about 2 months, the latter part plagued by too much rain.

During the second year the demonstrations were conducted, the growing season was good with generally adequate rainfall throughout the season.

All demonstrations were established on the basis of a soil test, with at least one rate being the soil test recommended rate.

The table compares profits from fertilizer use for the two years.

The return per dollar invested and net profit per acre were considerably higher in 1961 than in 1960 with one exception. *But note that returns and profits were still good in the "bad" year of 1960.*

The figures in the table are averages from the demonstrations conducted. The individual demonstrations tells a more complete story.

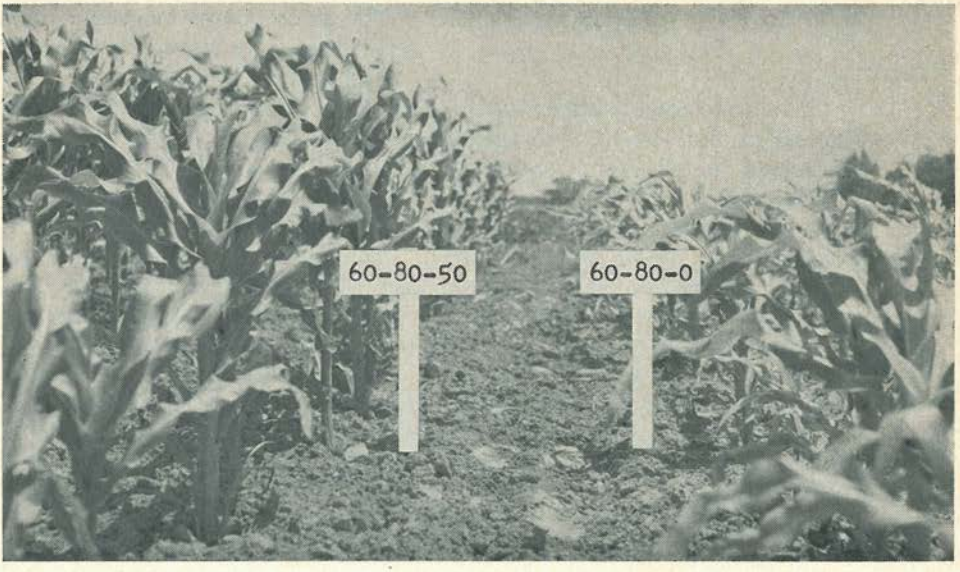
In 1960 out of the 17 demonstrations conducted on cotton, 12 showed a profit and 5 showed a loss. In 1961, all eight of the demonstrations gave a profitable response to fertilizer application.

This intensified result demonstration program has convinced many Wharton County farmers of the importance of fertilizer use. Soil tests were shown to be a good guide to fertilizer need.

COMPARISON OF PROFITS FROM FERTILIZER USE

Crop	No. of Demonstrations		Return per Dollar		Profit per Acre	
	'60	'61	'60	'61	'60	'61
Cotton	17	8	$3.00	$6.00	$17.52	$53.76
Corn	7	5	$1.53	$2.28	$12.79	$25.67
Maize	2	4	$1.95	$2.84	$16.03	$15.70
Rice	3	3	.60	$3.45	$ 6.32	$31.12

By William F. Bennett
Extension Soil Chemist
Texas A & M College



POTASH **NO POTASH**

90 BUSHELS

A recent fertility experiment conducted on a Hartsells soil at Tennessee's Plateau Experiment Station produced an average yield of 90 bushels of corn per acre per year on adequately fertilized plots over a 9-year period.

The corn was grown in a corn-wheat-red clover rotation, with corn following red clover in the rotation.

A split-plot experimental design was used, with four potassium levels being the main plots and two nitrogen levels being the split plots. The soil tested low in potassium, high in phosphate, and had a pH of 6.4 when the experiment began. The fertilizer treatments were added to each crop each year.

RESPONSE TO POTASSIUM

The mean corn yields produced each year at both nitrogen levels and the 9-year average yields are shown in Table 1.

A significant response to potassium fertilization occurred in 7 of the 9 years, and the 9-year average yields showed a significant response to potassium.

The average response to 50 pounds of K_2O per acre over the 9 years was 28.9 bushels per acre.

During the first 3 years of the experiment, moisture conditions limited yields and the average yield for all potassium treatments was about 46 bushels per acre. The average yield response to 50 pounds

By W. L. Parks & J. A. Odom

NO POTASH **POTASH**

Per Acre... Per Year... For 9 Consecutive Years

K_2O per acre was 6.8 bushels per acre.

During the last 6 years of the experiment, moisture conditions were more favorable for corn production and the yields of the potassium-treated plots were over 100 bushels per acre except in 1958.

The response to potassium averaged 25.6 bushels per acre during the second 3-year period and 54.5 bushels per acre during the third 3-year period.

This large response to potassium during the last 3-year period was due to a decrease in yield of the plots receiving no potassium and a further increase in yield of the potassium-treated plots.

The 9-year average yields show no significant difference among the potassium treatments, indicating that 50 pounds K_2O per acre per year was sufficient for corn grown in this kind of a rotation on Hartsells soil.

University of Tennessee

TABLE 1—CORN YIELDS AT FOUR POTASSIUM FERTILIZATION LEVELS FOR THE 9-YEAR PERIOD.

Lbs. K_2O/A	1954	1955	1956	1957	1958	1959	1960	1961	1962	9-yr. av.
0	24.0	48.8	44.4	101.1	50.2	74.0	37.5	77.4	69.8	58.6
50	20.8	57.4	59.4	111.2	65.3	125.6	119.4	121.8	107.0	87.5
100	19.5	62.2	58.8	107.8	69.8	139.8	130.4	126.0	110.4	91.6
200	16.6	64.2	60.1	105.3	69.4	138.3	126.9	129.3	111.9	91.3
L.S.D.										
.05	N.S.	5.2	3.4	N.S.	3.3	13.6	10.2	17.9	8.5	....
.01	N.S.	7.4	4.8	N.S.	4.7	19.5	14.6	25.8	12.2	....

TABLE 2—CORN YIELDS AT TWO NITROGEN FERTILIZATION LEVELS FOR THE 9-YEAR PERIOD.

Lbs. N/A	1954	1955	1956	1957	1958	1959	1960	1961	1962	9-yr. av.
60	20.3	57.4	55.2	107.1	63.1	118.3	98.7	117.8	101.4	82.1
120	20.3	58.9	56.1	105.6	64.3	120.6	108.4	109.4	98.2	82.4
L.S.D.										
.05	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	....

Potassium deficiency was observed for a number of years in the plots receiving no potassium, as shown in the two pictures.

RESPONSE TO NITROGEN

The corn yields produced at the two nitrogen levels are shown in Table 2. These data show no significant differences between yields of treatments receiving 60 and 120 pounds of nitrogen per acre during any year of the experiment or for the 9-year average.

This indicates the corn used some nitrogen supplied by the red clover in the rotation and an application of 60 pounds nitrogen per acre was enough for corn grown in this rotation.

SUMMARY AND CONCLUSIONS

Sixty pounds of nitrogen per acre and 50 pounds of potash per acre were enough to produce an average of about 90 bushels of corn per acre on a Hartsells soil adequately supplied with phosphate and lime in a corn-wheat-red clover rotation.

Assuming from other experiments that 50 pounds P_2O_5 per acre is adequate for good corn production on Hartsells soil, an average of 90 bushels of corn per acre was produced at an annual fertilizer cost of about $14.50 per acre—or about 16 cents per bushel based on present fertilizer costs. (Originally in *Tennessee Farm and Home Science.*)

THE END

The 4-H boys were visiting their state capital for their annual convention when a girl walked by. She was the finished product—high piled hair-do, blue-tinted eyelids, gaudy lipstick, and silvered nails. One boy stared after her for long minutes:

"Gosh, it looks like it must be mighty poor soil to need that much top-dressing."

Horace Greeley always insisted that the word "news" was plural. He once wired a reporter: "Are there any news?"

The reply came: "Not a new."

An efficiency expert died and was being given a fancy funeral. Six pallbearers were carrying the casket out of the church when suddenly the lid popped open and the efficiency expert sat bolt upright and shouted, "If you'd put this thing on wheels, you could lay off four men!"

Years ago, a farmer started to plow with a team of frisky mules. As was the custom, he tied the lines around his waist, leaving both hands free to handle the walking plow. Hours later, when he woke up in the county doctor's office, the farmer remarked: "I hadn't went 10 feet 'til ah realized mah mistake."

A friend is a person who says nice things about you to your face. A *loyal* friend is one who says them when you aren't present.

ONLY IN AMERICA

A Communist party organizer wrote this despairing note to his Kremlin bosses:

"It is becoming increasingly difficult to reach downtrodden American masses.

"In the spring, they are forever polishing their shiny new cars.

"In the summer, they take vacations.

"In the fall, they flock to baseball and football games.

"And in the winter, I can't get them to leave their warm, cozy homes and TV sets to hear my lectures.

"How can I make these slaves of Capitalism see how oppressed they are?"

Lawyer: "Now make it brief and to the point. How did the explosion occur?"

Witness: "The engineer was full and the boiler was empty."

THERE IS A BIGGER FOOL than the fellow who knows it all—it's the fellow who argues with him.

Developing fertilizer programs that satisfy TREE GROWTH DEMANDS at the times of greatest demands may mean the difference between profit and loss . . .

To Many Farmers With A Deciduous Decision To Make

C. T. Lichy, Agronomist of the California Chemical Company, explains in *The California Farmer* Magazine

Your decision on a fertilizer program can greatly influence your next year's production. This decision includes such fertilizer practices as timing, types, and rates.

Though it may seem complicated, recognition and evaluation of tree growth factors may mean the difference between profit and loss.

FOUR PERIODS

Deciduous trees have four rather distinct periods of growth, each with its nutrient requirements—dormancy, bloom, fruit growth, and fruit ripening.

In earlier varieties, there is also a period of time during the summer when the tree has no fruit load. The length of each period of growth depends on the variety, and vast differences exist among varieties.

The dormant period is the storage time where nutrients are absorbed and preserved for spring growth.

The bloom period requires a good supply of nutrients for proper fruit set and rapid, early growth of leaves.

Since, in most deciduous trees, the bloom comes at a time when there is no leaf surface for photosynthesis, all of the growth during this period is dependent on stored food and nutrients taken up during the past.

EVEN GROWTH VITAL

For optimum fruit quality and size, it is necessary that the fruit have an even growth. Restriction of growth during the summer will result in reduced fruit size. The nutrients must thus be available

TABLE I—EFFECT OF POTASH ON FRUIT DROP—PEACHES.

Treatment	Number of Peaches on Ground Per Tree	Average Weight Of Peaches	Total Peaches Per Acre
Nitrogen Alone	248	4 ounces	6200 lbs.
Nitrogen-Potash	29	5 ounces	900 lbs.

TABLE II—EFFECT OF POTASH ON FRUIT SIZE

Treatment	Average Peach Weight	Average Peach Diameter	Calculated [1] Yield Per Acre
Nitrogen Alone	4.3 oz.	2½ in.	14.5 tons [2]
Nitrogen-Potash	5.1 oz.	2⅝ in.	17.2 tons

[1] Based on average weight of peach and average thinning level of 1,200 peaches per tree.

[2] The actual yield for orchard was 15 tons. The potash-treated trees were not picked separately.

TABLE III—THE EFFECT OF FERTILIZER PROGRAM ON THE YIELDS AND RETURN OF PLUMS.

High Yield Program		Comparison Program
14-14-14 fertilizer (700 lbs./A in Dec.) Calcium Ammonium Nitrate (15 gal./A in April)		Ammonium Sulfate Fertilizer (500 lbs./A in March)
Minor Element Nutrient Spray D		Nitrophos
Yield-Boxes/A	373.8	345.1
Gross Return*	$1644.72	$1518.44
Fertilizer Investment	$ 40.92	$ 17.35
Increased Investment	$ 23.57	——
Increased Profit/A	$ 126.28	——

*Based on $4.40 per box.

during the entire fruit growing period.

Potassium supply is critical during the fruit ripening period. The rapid accumulation of sugars requires large quantities of this nutrient.

Most potassium deficiencies appear during this time and may be manifested in leaf symptoms, excessive fruit drop (Table I), soft fruit, poor fruit color, or small fruit size (Table II).

With the earlier varieties, the post-harvest period is one of carbohydrate storage for next season.

Remember that the bloom and fruit set is accomplished entirely on stored food.

Bud differentiation imposes a critical need for nutritional adequacy and balance. By the time of full leaf development, the determination is made of next year's bud, whether it produces leaves or flowers.

This determination (called "differentiation" by the botanists) is primarily affected by the relative levels of carbohydrates and nitrogen. Proper fertilization and management help attain the ideal carbohydrate-nitrogen ratio.

PROOF IN PROFIT

Naturally, the proof of any fertilizer program is with the profit per acre. Let's examine a program with this in mind. The results are shown in Table III. A high yield program was designed to use a fertilizer containing nitrogen, phosphate, and potash applied in the winter for best results.

A supplemental application was made of nitrogen in the spring. A comparison program used nitrogen only as the fertilizer material. It was added in March. The high yield program required a higher fertilizer investment but returned about $5 for every extra dollar invested.

Using sound techniques, it is possible to develop fertilizer programs which satisfy tree requirements at times of greatest need. This includes the proper timing and rates of fertilization to allow for movement of plant nutrients into the root zone and their subsequent assimilation by the tree.

THE END

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AMOUNT

Showing . . .

. . . that fertilization can increase yield per inch of water used, whether rainfall or irrigation.

. . . that plant roots feeding in subsoil usually have access to half the potassium found in the surface soil.

. . . that improved fertility on claypan soils pays off in spite of critical periods of drouth or floods.

. . . that potassium increases the water-holding capacity of plant tissues.

. . . that few enterprises give as much return for time spent as soil sampling for available nutrient tests.

. . . that water use efficiency can be measured in terms of crop yield per unit of water used by the crops, lost by evaporation, and wasted during irrigation.

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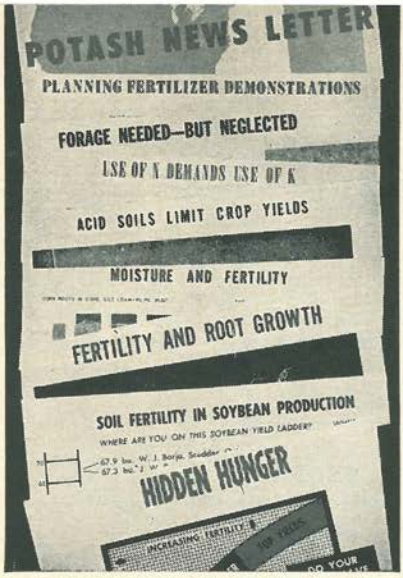

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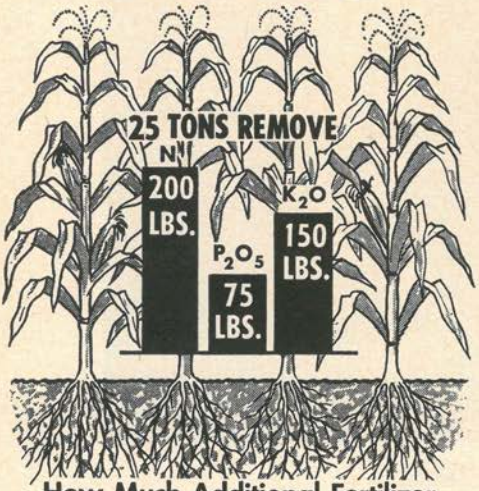
CORN SILAGE

How Much Plant Food?



How Much Additional Fertilizer Does Your Soil Need?

Talk over your program with us.

MAT A

ARE "LEFTOVERS" **ENOUGH ?**

Are you treating your soybeans like a red-headed stepchild—that is, "feeding them from the second table?".

When we first started growing soybeans, we thought they would do very well on "leftovers"—the residual fertility left over from the corn crop.

But as yields have climbed from 20 to 40 even to 50 bushels per acre, we have learned that soybeans respond to direct fertilization on many soils.

And the investment is worth it, when 1½ bushels of beans will more than pay for each 100 lbs. of 0-20-20 fertilizer you use.

Application of broadcast or side-band row fertilizer is a safe way to fertilize soybeans directly.

Have your soybean yields been as high as you would like? If so, forget this message. If not, come in and talk over your soybean production problems with us.

You might try our fertilizer recommendations on just part or all of your field. Your soybeans might well amaze you when they don't have to depend on "leftovers".

MAT B

KNOW YOUR **HAY–RITHMETIC**

Are you getting five tons of alfalfa? If not, then you may not be applying enough fertilizer.

ALFALFA IS A HEAVY EATER.

It has long reigned as "QUEEN" of hay crops because of its superior quality as a feed. It also has another distinction: Remover of more plant food from the soil than most field crops.

EACH TON of alfalfa hay takes up about 10 lbs. of phosphate (P_2O_5) and 45 lbs. of potash (K_2O).

HAY–RITHMETIC

A 5-ton crop removes 50 lbs. of P_2O_5 and 225 lbs. of K_2O.

Five tons = about 154 bales (65 lbs.)

If you want to move to this yield, and stay there, you must meet the fertility needs of your crop.

Convince yourself. Try our alfalfa fertilizer on all or just part of your field. Come in and discuss a complete program with us.

MAT C

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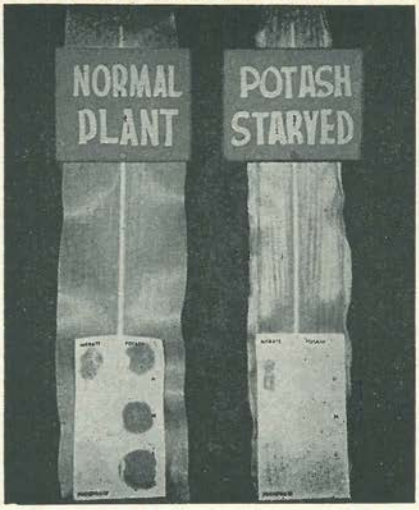

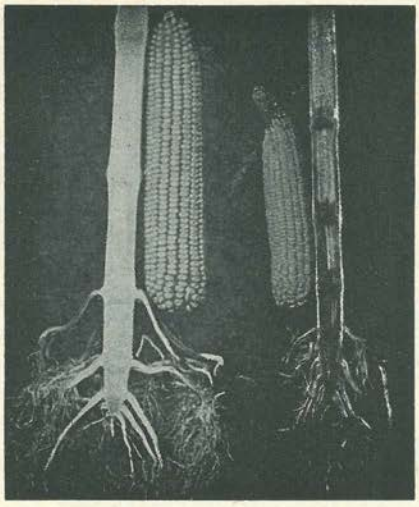

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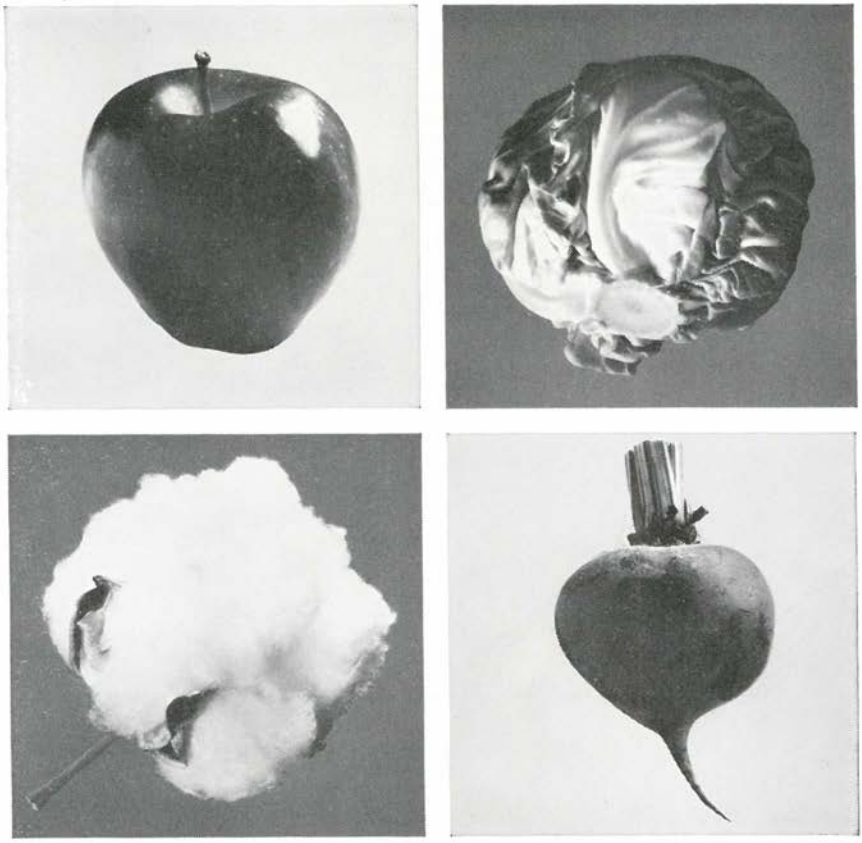

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*Mimeo Report, C.J. Chapman, Soils Dept., Univ. of Wisconsin

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