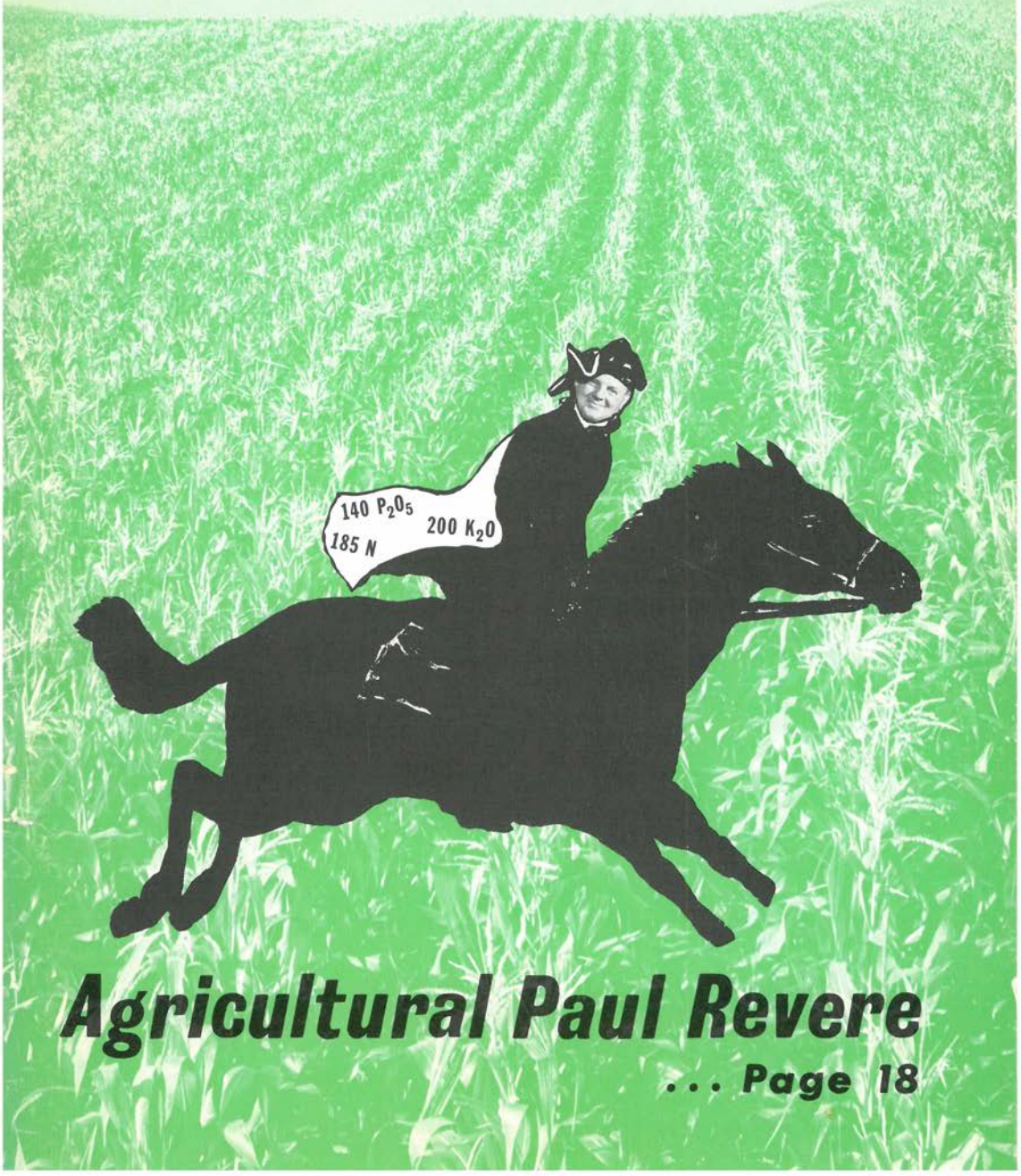
Better Crops

WITH PLANT FOOD

Number 4 — 1967 25 Cents



Agricultural Paul Revere

... Page 18

MORE KNOW-HOW THAN OLD TOM

OUR COVER, showing Clyde Hight riding Paul Revere's horse, was created before we learned of Ernest G. Moore's new book, THE AGRICULTURAL RESEARCH SERVICE.

We're lucky. We might have been tempted to put Moore on Paul's horse with the remarkable Midwest farmer. Why? Because Mr. Moore has just completed a mission equally as revolutionary as anything Clyde Hight has done. He has written a **READABLE** book about America's agricultural research achievements.

It not only informs. It also entertains. It's downright compelling in places, boring only where the academaniacs prevailed on Moore's good nature. He didn't let much of their gobbledygook get in his way.

And unlike the tom cat once known by North Carolina's colorful H. W. "Pop" Taylor, Moore knows considerably more about his subject than Old Tom knew about birth control. He should. He was top editor of the USDA's Agricultural Research Service for over a decade.

The new book, AGRICULTURAL RESEARCH SERVICE, should be in the hands of every county agent, vo-ag teacher, 4-H member, and FFA boy in the nation. Better still, it should be in the hands of those urban Americans who don't know a thing about agriculture but are mighty happy to digest its results three times a day. Judge for yourself:

Our scientists can now spy on food crop conditions anywhere in the world from space ships 100 miles above the earth? And they can even tell if the crops need fertilizer or spraying to control diseases or insects. More on page 167.

ARS scientists are making good progress in research on a blood disease of poultry that in many ways resembles leukemia of man. More on page 107.

Scientists have perfected a reliable method for birth-control in cattle that could eventually get rid of the half-starved sacred cattle of India. The plan is now being tested there. More on page 168.

When the Prince of Wales created the fashion of wearing trousers creased down the front, he also created a problem of keeping them pressed. Almost 75 years later ARS scientists solved the problem by developing a treatment that gives permanent creases to garments made of wool? More on page 138.

Only a small fraction of one per cent of the water on the earth's surface is now available to man. Agriculture is one of the biggest users of water. Pages 125-128 tell how scientists are seeking methods to cut down on the large quantities of water used in our food production.

Many plants have built-in clocks that tell them when to bloom, and migratory birds also have biological clocks that tell them when to fly south for the winter, regardless of the temperature. More on pages 10-21.

The book is available through local bookstores and the publisher, Frederick A. Praeger, Inc., 111 4th Avenue, New York City, New York 10003. It's worth every cent of the price, $5.95.

Better Crops
WITH PLANT FOOD

The Whole Truth—Not Selected Truth

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CONTENTS

TOP GROWER SURVEY

A SURVEY by the National Soybean Crop Improvement Council, Urbana, Ill., shows top Midwest soybean growers are shooting for a 54-bushel yield average this year, a 63-bushel yield average by 1970 and 75 bushels by 1975.

The same growers, 86 of them in Illinois, Indiana, Iowa, Minnesota, Missouri and Ohio, each had at least one field yielding 50 or more bushels last year.

They averaged a 42.4-bushel yield on their total 1966 bean crop, compared with a 37.7-bushel yield in 1965.

In addition to aiming for a yield boost, the 86 top growers plan to increase 1967 soybean acreage to an average 162 acres, compared with 147 in 1966.

Which new soybean growing practices have paid off best the past few years?

The growers listed one or more practices as follows:

29 said herbicides.

24 said narrow rows.

22 said better weed control (through cultivation or herbicides).

FERTILIZED Can Match Corn

A BETTER CROPS condensation of the S. E. Younts Speech

FEW GROWERS fertilized soybeans for years. And when they did, it was no more than token amounts.

Why? Because they thought soybeans would not respond to fertilizer—and they considered soybeans a second-class crop. In fact, indifferent management practices killed most chances for fertilizer response.

Times—beliefs—discoveries change. Soybeans are a FIRST CLASS crop now. And they are beginning to get first-class treatment.

1—Research shows that soybeans respond about as well as corn to phosphate and potash, especially on a percentage-increase basis.

It's unfair to compare straight bushels because potential yields of the two crops are so different. In fact, small soybean increases may be more profitable since they bring at least twice the price of corn per bushel.

In Table 1, Indiana soybeans and corn showed very similar response to phosphate and potash fertilization—ranging from 0 to 100 lbs. P_2O_5, from 0 to 150 lbs. K_2O per acre.

Table 1: Response of soybeans and corn to phosphorus and potassium fertilization.* (14-yr. study)

Rate of Nutrient	Phosphorus Yield		Potassium Yield	
	Soybeans	Corn	Soybeans	Corn
	(bu. per acre)			
0	37.6	118.3	35.6	101.9
Maximum	43.5	131.1	43.9	132.0
% Yield response to nutrient	15.8%	10.8%	23.3%	29.5%

* S. A. Barber, Purdue University

SOYBEANS Profit-wise

Before American Soybean Association in Peoria, Illinois

In Table 2, North Carolina soybeans and corn showed a similar picture percentage-wise from 80 lbs. P_2O_5 and K_2O yearly.

Table 2: Corn and soybean response to phosphorus and potassium (7-yr. avg.)*

	Phosphorus Response		Potassium Response			
	Corn	Soybeans	Corn		Soybeans	
	(soil test level)		(soil test level)			
	M	M	L	M	L	M
Bu./A Increase	6	4	29	10	8	4
% Yield Response to Nutrient	6	11	38	11	26	11

* E. J. Kamprath and R. E. McCollum, North Carolina State University.

2—The modern idea is to build up soil levels to medium plus high P and K for top-profit soybean yields.

Soybeans contain large amounts of plant nutrients. Look at what a 50-bushel crop contains: about 185 lbs. N, 50 lbs. P_2O_5, 120 lbs. K_2O, 60 lbs. Ca, 30 lbs. Mg, 20 lbs. S, and 2.5 lbs. total of the six micronutrients.

Nature taught many cotton farmers the merit of high soil fertility for high soybean yields in 1966. When they lost many cotton acres to cold weather in late spring and early summer, they planted soybeans on these more fertile acres. With good management, their soybeans on intended cotton fields yielded 5 to 10 MORE BUSHELS per acre than regular soybean areas.

WHY? The fields had been BUILT UP for cotton.

TOP GROWER SURVEY

17 said better varieties.

13 said more direct fertilizer application.

7 said more fertilizer carry-over from preceding crops.

5 said liming.

4 said thinner plant population.

3 said better harvesting equipment.

Other listed practices included: early planting, certified seed, less cultivating, shallow planting, inoculating seed and minimum tillage.

Asked why their soybeans yielded more last year than in 1965...

29 of the growers credited use of more fertilizer.

28 said better weed control.

22 said they planted a higher-yielding variety; 18 said beans were on better soil.

16 credited a switch to narrow rows.

13 said better moisture conditions.

TOP GROWER SURVEY

For this year's soybean crop, 79 of the 86 growers report the crops preceding their 1967 bean crop were fertilized —yet the majority of them plan to also fertilize this year's soybeans.

Twenty-five will broadcast the fertilizer.

14 will apply it as starter and 12 will apply it both broadcast and as starter.

Three of the growers will include micro-nutrient fertilizer.

Thirty-nine of the growers indicate they will change varieties on part or all of their 1967 acreage; 44 will stick with the same varieties they planted in 1966.

Forty-eight growers said their 1967 soybean row width will be 27 to 32 inches; 8 said 16 to 26 inches and 9 will plant 7 to 15-inch rows.

Seventy-one of the growers will cultivate their beans this year, along with using a herbicide, and eight plan to go it alone with herbicides.

ORDER REPRINT FOLDERS OF THIS ARTICLE

BACK COVER

Why not build up fields for first class soybeans?

3—The BIG Three—Lime, Phosphate, Potash—are a MUST for building average soybean acres into heavy-duty producers.

Acid soils hold down soybean yields. Scientists differ slightly over the best soil pH for top soybean yields, because soil regions differ in pH-dependent chemical properties. In most situations, a pH 6.0-6.5 will not limit yields. On soils low in Mn, any pH above 6.2 has usually reduced yields. On soils with toxic amounts of Mn, liming to pH 6.5 or above may help yields.

High phosphorus levels and high soybean yields go together all over the country. Many soil areas respond well to P.

Stop potassium drainage. High soybean yields drain hard on soil potassium supply. Lighter textured soils of the Atlantic and Gulf Coast rarely have enough potash for top yields. Potash competes with soil acidity as the NUMBER 1 limiting factor in these sandier areas.

On very low-K soils, Arkansas increased yields up to 13 bushels per acre with extra potassium. They boosted yields up to 4 bushels per acre with extra phosphorus on low-P soils.

LPK teamwork is the key. Louisiana shows why in **Table 3.**

Table 3: Soybean response to fertilizer and lime (La. Agric. Exp. Sta.)

Lb./A			Increased Yield (Bu./A)		
N	P_2O_5	K_2O	From Fert.	From Lime	Total
0	0	0	0	5.0	5.0
0	48	0	4.5	2.0	6.5
0	48	48	7.4	3.7	11.1
0	72	72	14.0	3.1	17.1

How much P and K should a soil test to give top yields? How much phosphate and potash fertilizer should a grower add for given soil test levels?

To shoot for 47 bushels per acre, Tennessee's Walker and Long set optimum levels at 105 lbs. P and 264 lbs. K, with top pH at 6.9. Yields might be higher if other factors were also optimum.

Though most states don't advise growers to apply P and K directly to high testing soils, they emphasize BUILDING soil fertility for all crops in the rotation.

For low testing soils, they recommend phosphate rates up to 80 lbs. and potash up to 100 lbs. per acre. The average recommendation runs about two-thirds these rates.

Tables 4 and 5 show how Ohio suggests P and K rates according to soil test level and yield goal.

Table 4: Effect of yield goal on P recommendations for soybeans

Soil Test Value	Yield Goals (Bu./A) 25-34	35-44	45 +
P (lbs./A)	Annual application—pounds P_2O_5 per acre		
0-9	50	55 [1]	65 [1]
10-19	40	45	55 [1]
20-29	30	35	45
30-59	20	25	35
60 +	10	10	10

[1] It may be difficult to obtain listed yield levels at these test values.

Table 5: Effect of yield goal on K recommendations for soybeans

Soil Test Value	Bu. of Soybeans Per Acre—Loams and Silt Loams		
K (lbs./A)	25-34	35-44	45 +
	Annual Application—pounds K_2O per acre		
0-99	50	65 [1]	75 [1]
100-149	40	50	60 [1]
150-199	35	40	50
200-299	25	30	35
300 +	10	10	10

[1] It may be difficult to obtain the listed yield levels at these test values.

4—Why is nitrogen not usually recommended for soybeans? Because the bacteria of properly inoculated soybeans fixes N from the air.

But high yields—say 50 bushels—take up a third to a half of N from the soil. A few trials have gotten small responses to nitrogen fertilizer, such as this Minnesota work in **Table 6:**

Table 6: Response of soybeans to PK and N (Minnesota)

N	P_2O_5	K_2O	Yield	Yield Increase
	(lb./A)		(Bu./A)	(Bu./A)
	0		23.6	—
	40	40	27.7	4.1
40	40	40	29.1	1.4

TOP GROWER SURVEY

In total, 80 will use herbicides, either with or without cultivation.

Rating their results with herbicides last year, 22 reported excellent; 13, very good; 28, good; 16, fair and 5, unsatisfactory. Or, 75% said they had good to excellent weed control.

When asked what special equipment or procedures they will use to insure lowest possible harvest losses . . .

26 growers said they will use an automatic header control on the combine.

22 said special reel on combine.

18 said they'll combine at 13% or higher moisture.

16 will drive slower, 10 will harvest as early as possible.

5 will cut lower, 5 will use a slower cylinder speed.

4 will use a special cutter bar.

3 will run the combine reel slowly, and two said they will avoid ridging soybean rows.

From the Farmer

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BACK COVER

Talked to your soybeans lately?

This Minnesota soil tested 5.9 pH, 8 lbs. P, and 190 lbs. K.

Nitrogen increased soybean yields on pH 7.6 soil in Washington, Nelson and others report, but 10 lbs. of zinc apparently caused the crop not to respond to N.

South Carolina specialist Musen says, "A well-limed, thoroughly inoculated soil is the best way to supply N to soybeans."

For several years he has failed to increase yields with nitrogen fertilizer, except on soils below 5.5 pH. And then, in such acid soil, he had to use about 50 lbs. N per acre to get measurable yield increases.

A few situations may warrant nitrogen application —not over 25 lbs. per acre—for deep, loamy, coarse sandy soils or on recently cleared land that is strongly acid.

5—A good liming program usually meets any needs for secondary elements, such as calcium and magnesium.

But two factors may create a need for magnesium:

1—Not all liming materials contain sufficient magnesium.

2—Soybeans grown on acid soils inherently low in magnesium might respond very profitably to applied magnesium. In fact, they did in earlier work by W. L. Nelson on a North Carolina coastal plain soil testing 5.0 pH. **Table 7** shows this historic work:

Table 7: Yield of soybeans as influenced by magnesium additions*

Mg. (lb./A)	Yield (Bu./A) Ogden	Yield (Bu./A) Average of 3 varieties
0	20.3	18.0
7.2	25.4	20.2
21.6	27.1	23.0
36.0	26.5	22.0

* 24 lbs. P_2O_5 and 120 lbs. K_2O per acre applied to all plots.

Soybean vegetation has responded to 22 lbs. of sulfur per acre in current Arkansas work by Keogh. But sulfur shortages, so far, are rare.

6—Two micronutrients most often needed by soybeans are manganese and molybdenum. And the interesting paradox is this: Manganese becomes LESS available with liming or as soil pH INCREASES, while molybdenum becomes MORE available with liming or as soil pH DECLINES.

Guard against manganese shortages in certain soil areas of the Midwest and Coastal Plain regions of the South.

Guard against molybdenum shortages where soybean soils are not adequately limed. **Table 8** shows the importance of molybdenum under acid conditions.

Table 8: Response of soybeans to Mo and lime (Miss. Agric. Expt. Sta.)

	Soybean Yield (Bu./A)	
pH	Mo lacking	Mo Added
5.4	22	31
5.5	24	31
5.9	26	31
6.2	31	32
6.4	32	32

Needs for other micronutrients in fertilizer have been few and far between, so far.

7—Low subsoil fertility and hardpans can limit soybean yields severely. Table 9 shows how South Carolina's Musen boosted soybean yields greatly with deep plowing and subsoil fertilization down to 16 inches:

Table 9: Effect of profile disruption and subsoil fertilization on soybean yields

	Yield—Bu./A	
Treatment*	Norfolk s.l.	Lakeland sand
	(5-yr. ave.)	(1 yr.)
Undisturbed check	33.6	30.0
Disturbed check	42.9	28.6
Disturbed + 1 ton lime + 160 lbs. P_2O_5/A	48.2	53.2

*All soybeans planted with 300 lbs. per acre of 0-10-12 banded. Topsoil pH 6.1 for both soils, near 5.1 at 15-20 inches deep.

What about doing this on a field scale? No one knows the solution yet. But better farmers now plow twice as deep as they did just a few years ago—down to 8-10 inches. It is playing a role in higher yields.

THE END

REPRINT FOLDERS OF THIS ARTICLE AVAILABLE INSIDE BACK COVER

ORGANIC VS. INORGANIC

Grandpa Had Little Choice

JOHNNY W. PENDLETON
M. G. OLDHAM
J. E. DILLON

UNIVERSITY
OF
ILLINOIS

THE ORGANIC way was grandpa's way. It is still the only way many farmers around the world can supply their crops with needed plant food.

Many American farmers have a choice today. Some have animal manures—and all have the greatest selection of inorganic fertilizers and the easiest ways to apply them in the history of Agriculture.

Suppose you were a livestock farmer on good Corn Belt soil. What would you do with your manure? Spread it thinly, spread it heavy, run it into a lagoon and buy fertilizer, or use a combination of manure and fertilizer? Would rotation or pH level affect the decision?

Five years ago at the University of Illinois Aledo Agronomy Experiment Field we started a trial to answer these questions. We used corn yields as the measuring stick on Sable silty clay loam, a highly productive Corn Belt soil.

We compared a 3-year rotation (corn, corn, oats with alfalfa catch crop) to continuous corn. We applied six rates of animal manure yearly—from 0 to 80 tons—in the spring to each corn crop. The manure came from a large cattle feeding operation nearby and contained no bedding materials.

We alternated fertilizer (160 + 60 + 60) in strips across these manure plots and then applied lime to half of every plot. So all fertility treatments were compared at surface pH levels of 5.4 and 6.4.

WHAT HAPPENED?

Figures 1, 2, and 3 show what happened the last four years (1963-1966) of the experiment:

1—Corn yields climbed with manure rates when no fertilizer was applied. But 160 + 60 + 60, with or without manure, gave essentially the same yield.

2—The usual small applications of 10-20 tons of manure per acre did not give as high yields as the inorganic fertilizers. Top corn yields apparently demand huge manure applications or supplementary fertilizer.

3—The continuous corn plots receiving no manure or fertilizer yielded 20-30 bushels less than the rotation corn. When either fertilizer or 40-80 tons manure was added, the continuous corn plots (Fig. 1) yielded the same as second year corn (Fig. 2) and only

FIGURE 1

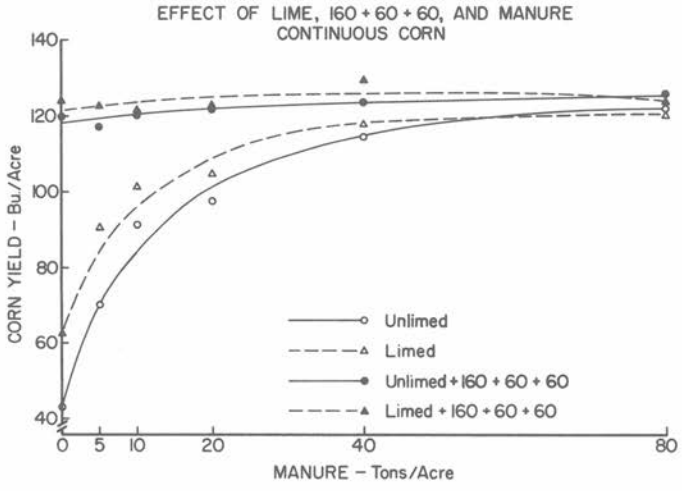


FIGURE 2

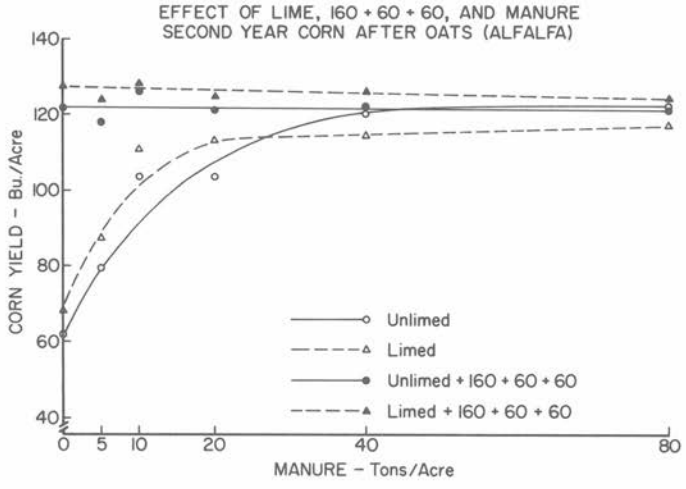
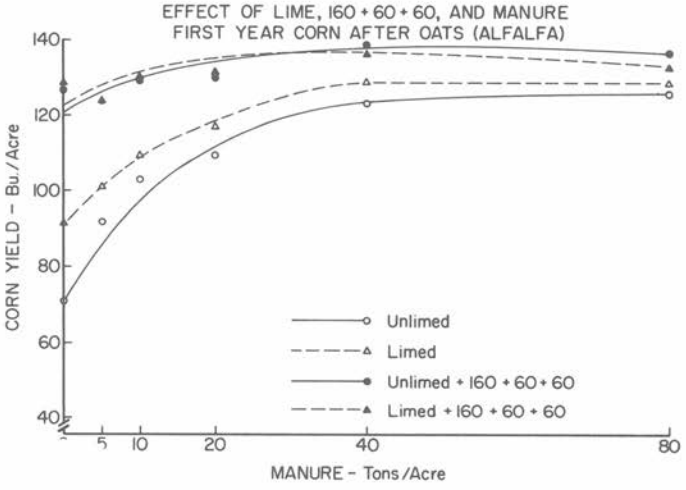


FIGURE 3



5-8% less than first year corn following oats with an alfalfa interseeding (Fig. 3).

4—Lime increased yields 10-20 bushels at low manure levels and where no fertilizer was added. Lime increased yields only slightly at high fertility levels. This may be due simply to greater root growth and access to neutral pH levels in the lower horizons of this particular soil type.

5—Huge amounts (80 tons) of animal manures applied annually to continuous corn for 5 years did not affect corn yields much more than 40 tons annually.

NO MAGIC ANSWERS

On this excellent Corn Belt soil, organic fertilizer and inorganic fertilizer got the same yields. A livestock farmer can supply plant nutrients by manure, fertilizer, or a combination of the two.

To get top corn yields, he must really pour on the organic fertilizer or invest in supplementary inorganic fertilizers.

A cash grain farmer can equal the livestock farmer's corn yield by simply supplying adequate inorganic fertilizers.

Now—we haven't come up with simple answers on how to get all that manure out of the back stalls . . . how to dispense with the fragrant odors and other lagoon problems . . . or how to measure the economic values of organic versus inorganic fertilizers.

We leave these answers to our friends in Agricultural Engineering and Agricultural Economics.

THE END

Potash wonders never cease. UPI reports Englishman fertilizing tomatoes with "new fertilizer", rubbed some on his balding dome. The hair started growing. The man says the fertilizer contained "fowl manure, fine sand, and potash." Plans to add "lavender" to cure social problem—not bad breath, not B.O., but H. O.!

Two golfers were talking and one spoke, "I'm eager to make the shot because that's my mother-in-law on the club-house porch." The friend replied, "That's silly, it's over 200 yards and you surely can't expect to hit her from here."

The city boy was visiting his uncle's farm for the first time. *"Oh,"* he said, as some small calves scampered across the meadow, *"what cute little cowlets."*

"I'm sorry, son," replied his uncle, *"but those are bullets."*

Janie, a first grader, from a big farm family, was excitedly telling her teacher all about her brand-new baby brother. "Now," she added, "I've got seven brothers and three sisters."

"That's lovely, Janie," said the teacher, "but a big family like that must be very expensive."

"Oh, no," objected little Janie quickly. "You see, we don't buy them, we raise them ourselves."

An oldtimer watching teen-agers doing the twist commented: "Well, if this don't bring rain, nothin' will."

From a Church Bulletin: "If you find a mistake in this paper, please consider that it was there for a purpose. We publish something for everyone, including those who are always looking for mistakes."

The milkman pulled a note from the bottle on the back porch. "Please leave 54 quarts," the note read.

"Fifty-four quarts?" he thought. "This must be a prank or a mistake." So he knocked on the door.

The lady of the house opened the door, saw his doubtful look, and said, "That's right. My doctor told me to take a milk bath and I figure I need 54 quarts."

"Pasteurized?" he asked.

"No," she replied, "just up to my chin."

All big things have little names, such as life and death, peace and war, or dawn, day, night, hope, love, home.

Learn to use little words in a big way. It's hard to do—but they say what you mean. When you don't know what you mean, use big words. That often fools little people.

REMOVAL STUDIES SHOW

The Queen Needs ADDED Phosphate & Potash

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WHY IS alfalfa the "queen"? It's the "queen" because it can produce large quantities of high quality forage. And these high quality yields demand large amounts of nutrients from the soil or fertilizer or both.

Good amounts of phosphorus and potassium became available as they were removed from Blount silt loam in successive harvests during a 4-year trial at the Northeastern Illinois Research Center. But both nutrients declined—potassium so much after 2 years that available soil K had to receive fertilizer potassium to maintain top yields.

K SOIL TEST LEVELS

Figure 1 shows the soil K test levels on plots that had received only 25 lbs. of K as a starter during establishment. It also shows what K topdressing did.

Several things are apparent:

1—Soil test K declined as hay was removed.

2—Where only 25 lbs./A had been applied, available soil K maintained top yields for 2 years or until the growing season soil test had dropped below approximately 150.

3—In 2 out of 4 years, early spring samplings gave higher soil K test values than samplings later in the growing season.

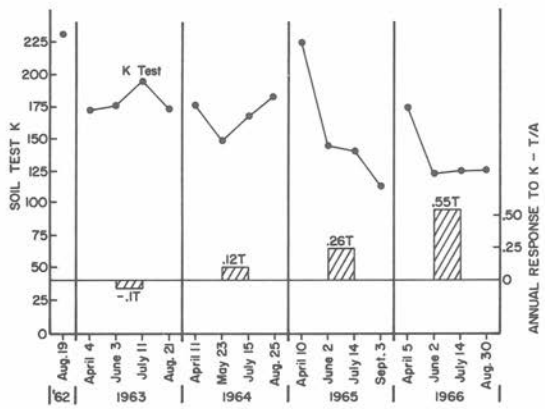


Figure 1. Soil test K values on check plots and yield response of alfalfa to K.

K BALANCE SHEET

We determined the P and K contents of the forage harvested from each plot at each cutting so we could calculate the amounts of P and K removed in the hay. We also took soil samples each spring and after each cutting on plots where the fertilizer had been incorporated into the soil.

Figure 2 shows a "balance sheet" of the "soil test K" in the plow layer and the "K" removed in the crop.

Where only 25 lbs. K/A was applied as a starter, 115, 118, 120, 119 lbs.

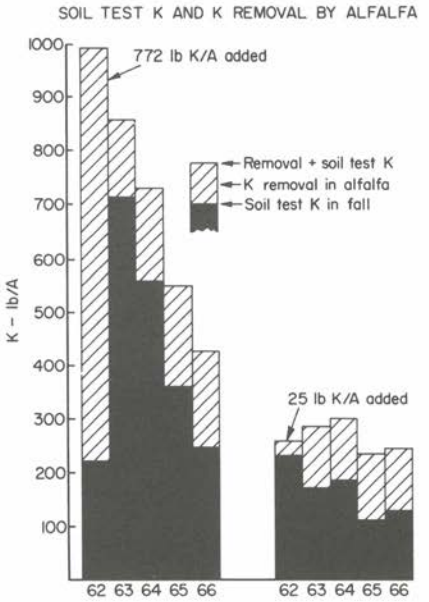


Figure 2. The available K in the plow layer as indicated by the soil test and the K removed in alfalfa hay over a 4-year period after 772 and 25 lb K/A had been incorporated into the seedbed in 1962. Elwood, Illinois.

K/A were removed in the alfalfa in four production years. But where 772 lbs. K/A was applied, considerable K was converted to a form not measured by the soil test the first year after application (1963).

In the 2nd and 3rd years after application, the soil test K and K in the forage accounted for all of the "available K" as measured by the soil test the previous year.

In the 4th year (1966), some K became available from "unavailable" forms.

P SOIL TEST LEVELS

Available P in the soil was less adequate than K. **Figure 3** shows the soil test P_1 values and the annual responses in yield. As with K, soil test P_1 dropped steadily during the experiment. The initial level was not high enough for top yield.

P BALANCE SHEET

Figure 4 shows the "balance sheet" on P. The facts indicate 8, 10, 10, 10 lbs. P/A was removed from the check plots each successive year. Where 145 lbs. P/A had been applied, available P (as measured by soil test) was being converted to an unavailable form through the first two production years. Where 277 lbs. P/A had been applied, the available P was still being converted to an unavailable form even in the 4th production year.

MAJOR CONCLUSIONS

1—Over a 4-year period, a relatively unproductive soil—Blount silt loam—supplied much P and K to the plant beyond the amounts originally indicated by soil tests of samples from the plow layer.

2—P and K levels dropped steadily to below a given level where P and K

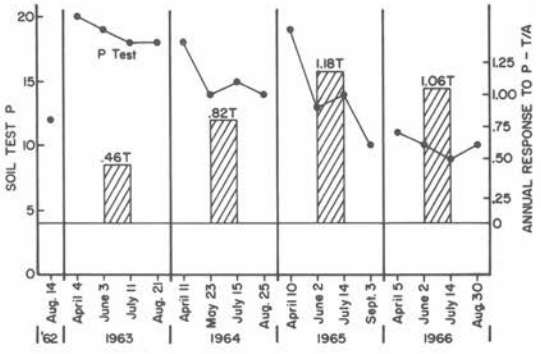
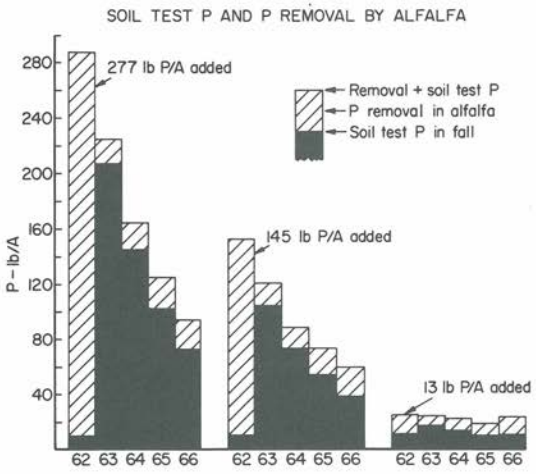


Figure 3. Soil test P_1 values on check plots and yield response of alfalfa to P.



topdressings became necessary for top yields.

3—Soil tests should be made during the growing season rather than spring, especially if K hunger is suspected.

THE END

Figure 4. The available P in the plow layer as indicated by the soil test and the P removed in alfalfa hay over a 4-year period after 277, 145 and 13 lb P/A had been incorporated into the seedbed in 1962. Elwood, Illinois.

TWO MEN TACKLE 650 ACRES SUCCESSFULLY

TWO MEN are putting out all the fertilizer on 650 cultivated acres on the Robert Mashburn farm near Bolton, Mississippi. An efficient on-the-farm bulk handling system makes this possible.

Mashburn and his farm manager, Earl Butts, put out all the fertilizer used on the farm. They can fertilize from 150 to 200 acres a day.

Fertilizer is never touched by hand on the farm. It is unloaded by air pressure from bulk trucks to the storage building, transferred by front end loader from the building to the tender truck for transport to the field, transferred to the distributor, and then applied to the ground.

The storage building was erected by Mashburn and one helper for $350. A total of 24 hours labor was required for construction.

"High labor costs made us reexamine all our farming operation," says Mashburn. "Billy Byrd, who formerly was our field representative, talked to me about going to our present method of storing and handling bulk fertilizer. He sold me on the idea, and it's been a real money and time saver. It's a real convenience to have fertilizer stored on the farm before spring planting."

Mashburn uses 500 pounds of 13-13-13 per acre on 150 acres of cotton land. On 500 acres of soybeans, he applied 300 pounds of 0-20-20 per acre. This year he is using 6-24-24 on part of his soybean land.

All fertilizer is applied broadcast, pre-plant. Mashburn increased his fertilizer applications by 50 pounds per acre over the amount he formerly applied in the drill. He does not sidedress.

"I wouldn't go back to drilling the fertilizer," he says. "You'd be surprised how much faster we can plant without having to stop for fertilizer refills. Not handling bags is also a real advantage."

THE END

—CHEMICAL FARMING
MCC & Coastal Representative

POTATO HOLLOW-HEART

HOW DO CULTURE and WEATHER AFFECT IT?

By D. C. NELSON and R. H. JOHANSEN
NORTH DAKOTA STATE UNIVERSITY

In The Packer

OUR EXPERIENCES in the past few years have shown there is need for more information on hollow-heart in potatoes, with emphasis on how cultural practices and weather conditions affect it.

Because of its importance in our area Norgold Russet has been used in hollow-heart experiments. Likely some but not necessarily all varieties are influenced by the same cultural and weather conditions that affect Norgold.

Information collected from experiments conducted over the past two years has suggested the following:

(1) Hollow-heart can occur any time after tuber-set.

(2) Weather conditions favoring hollow-heart are unusually cool temperatures, with averages in the 50's and low 60's, and soil moisture near field capacity.

(3) The "hollow" first occurs as a rupture in the potato tissue, probably due to different growth rates of the tissues. This is followed by enlargement, discoloration, and frequently additional ruptures.

(4) The severity of hollow-heart can be modified by cultural practices. However these practices must slow down the enlargement of tubers during cool-wet periods to reduce hollow-heart.

In North Dakota early planting and higher than usual levels of potash have helped in control when cool-wet periods occur in the fall. These practices likely have caused earlier maturity, resulting in slower growth during the wet, cool periods.

As has been found in many other areas, closer spacing has been an effective means of reducing hollow-heart. This means practices that result in good plant stands help to control hollow-heart.

While there is relatively little irrigation in North Dakota, we have been able to induce hollow-heart by irrigating just before unusually cool periods. However, if the soil is kept dry, the plants have considerable resistance to hollow-heart.

During certain years hollow-heart is much worse than in others. From variety trial data, 1966 was the worst year since records, dating from 1954, have been kept. If our dry conditions continue for the remainder of the season, hollow-heart should not be a problem this year in the Red River Valley.

THE END

Growers In The Kn

1—To take advantage of
tion equipment while
lizers are plentiful.

W

2—To feed cold, wet, hungry wheat . . . for early
spring start toward more tillering and better
heads.

3—To complete their fall k
program where possibl
the lower plow zone .
feeding in dry summer
9 to 10 bushels MORE

ow Go In The Snow

HERBERT L. GARRARD
GARRARD AG PHOTOS

dle, AVAILABLE applica-
soils are firm and ferti-

HY?

roadcast and plowdown
e . . . to get nutrients into
. . . for an extra week's
. . . sometimes meaning
per acre.

4—To avoid damages and delays from stuck spread-ers . . . and "pressed ham" soils . . . in wet spring weather.

5—To insure time for early planting, which can pay extra bushels . . . sometimes 10 to 20 bushels MORE PER ACRE over a grower's whole acreage.

THE MOWEAQUA DREAMER . . .

An Agricultural

This is a picture of an American farmer in action.

It is based on facts he has shared with the nation's top agronomists.

It is based on facts reported in many different places about his work.

It is based, mainly, on a spirit that peers clearly from behind every thought written by and about the man.

The Editor

ATTENTION, all hippies . . . all LSD acid loafers . . . all aging beatniks:

Thank your lucky stars that Clyde Hight of Moweaqua, Illinois thoroughly enjoys growing corn and has no desire to join your ranks.

If he should ever join you, tell your boo hoo's (or whatever you call your "high priests") to move over—'way over! This man, Hight, is no groggy philosopher, no idling talker, no spinner of vague theories about a free world without money . . . or profit . . . or incentive.

But he's a rebel—against "averageness," average yields, average practices, average thinking, average actions. He'll out-hip, out-rebel your "priests" so thoroughly that they'll have to find something better than acid or weeds or poppy powder to keep up with his dreams.

You see, kids, his dreams flow from a clear, air-freshened mind in love with corn—food for you and all of us. He's trying things with corn that the biggest dreamers of Henry Wallace's U.S. Department of Agriculture would have labeled "fool's talk" in the 1930's, the decade our food yields started climbing.

IS THE MAN CRAZY?

He stood before America's top agronomists last year and asked them to give him the basic formula for growing 500 bushels of corn PER ACRE —or, at least, some tools for shooting at it!

The national average was 16.2 bushels per acre in 1936, Wallace's heyday; 76.9 bushels in 1967. And Hight asked the "professors" about 500 bushels! Is the man crazy?

Let's see. He's not a theorist. He's a doer. On a farm—not a university plot nursed along by every talent from bugmen to soilmen—he averaged over 200 bushels per acre on 388 acres one year.

And in a single year, he has produced more than 100,000 bushels on 557 corn acres for a farm average of 181 bushels. Oh, yes—and a net profit of $87.97 per acre. He works for a

Paul Revere

. . . using high potash applications (200 lbs. K_2O per acre) to put strong stalks on 200+ bushel corn

living! And that profit keeps him producing food for urban stomachs that rarely understand what he's doing but are mighty glad to digest the results.

Many farm and trade journals have reported the steps he took to make his fantastic yield climb—from 90 to 200 bushels PER ACRE in just 5 years.

- **FALL PLOWING**—for a land under continuous corn production.
- **EARLY PLANTING**—every acre before May 1, if possible, using an 8-row tool bar planter that adjusts to almost any width between 20 and 40 inches.
- **WEED and INSECT CONTROL**—by broadcasting all the insecticide and most of the herbicide.
- **CLOSER ROWS**—reducing the distance from 38 inches to 20 inches after seeing an Iowa experiment with 20-inch rows.
- **RIGHT HYBRIDS**—the kind that can take high populations (28,000 half-pound ears per acre) and narrow rows, largely short-stalked hybrids.
- **HIGH FERTILITY**—a total of 185 lbs. nitrogen, 140 lbs. phosphate, and 200 lbs. potash per acre in his best year.
- **EARLY HARVEST START**—planting early and using relatively early hybrids to get in the field by the first week of September, if possible, to meet heavy yields on large acreages.

A HUMAN STORY, TOO

The Hight story goes deeper than technical practices. It's a human story, too, full of a Midwest spirit some people call efficiency. But it's more than cold efficiency. It's an urge that inflames men's minds when they once dream of the miracles their soils can perform if given the right combination of practices.

Why have men sponsored yield contests all these decades? For money, for efficiency, for prestige? Not alone. But to see if their soil can live up to their dreams for it. The same reason men climb mountains—because they are there.

To Clyde Hight, the blessed soils of Central Illinois were THERE.

In 1960, he was just another successful farmer in a land where corn is king and the growers enjoy soils, moisture, and light conditions that make good yields year after year.

He was farming 320 acres, averaging 91 bushels per acre on 200 acres of corn. But in the middle of this 91-bushel corn, a measured acre yielded 164 bushels. It was Hight's yearly entry in a corn company's yield contest.

He looked hard at that acre that fall. He was still thinking about it when a December magazine reached him

with a corn program for farmers to boost their yields and profits—IF they would try it.

Clyde Hight started figuring. Man alive! What about 164 bushels on ALL these acres? Steep cost. But net profits? Maybe double! Worth a try, he decided.

TO SHOOT THE WORKS

At the time he was renting the land from his father. They talked and settled on an 80-acre field. To shoot the works. Clyde called in three companies to advise him on fertilizer, seed, and weed control. The 80 acres were planted April 28 that year.

When the fertilizer bill came in, Clyde's partner-father in the 80-acre venture said, "This is the last time we'll do this." The season rolled on. The senior partner talked little, watched much. Prety good looking corn, he confided to Clyde around harvest.

A few weeks later Clyde dropped off a check for his partner. They chatted a minute. Clyde was about to leave when the partner looked again at the check—closer! Hey, wait a minute, this thing hasn't been divided yet.

Clyde said he had divided it. The senior partner smiled . . . and asked what they were going to do NEXT YEAR. Go back to their usual ways, Clyde figured. The partner was not too sold. They had almost doubled their profit on that 80 acres. Maybe they should think more about the future.

Clyde Hight did think—and act:

1962 . . . 140 bushels per acre on 200 acres . . . earning $60.34 net profit.

1963 . . . 157 bushels per acre on 200 acres . . . earning $82.27 net profit.

1964 . . . 133 bushels per acre on 400 acres, including 197 newly purchased acres that had yielded only 56 bushels per acre in '63 and had to be built up . . . earning $50.04 net profit in a dry year.

1965 . . . 181 bushels per acre on 557 acres . . . earning $87.97 net profit.

1966 . . . 116 bushels per acre on 950 parched acres without irrigation . . . earning $33 net profit in a year his farm received only 1.7″ rain from May 28 to August 10.

Clyde Hight not only farms—he reads, he thinks, he talks to top farmers, university scientists, agricultural advisers, company specialists, editors, etc. He constantly asks, probes, digs for a better way to do his job.

It was this searching spirit that put him on that plane for an equipment company's home office to discuss harvesting equipment for 20-inch rows in 1964—AFTER he had read about narrow rows, AFTER he had put in an order for 30-inch equipment, AFTER visiting a 20-inch row field in Iowa doing 19 bushels per acre better than 40-inch rows.

He told the company he didn't want two sets of equipment but wanted to go ALL THE WAY with 20 inches in '65—on 557 acres of corn! The company agreed to meet his need for planting and cultivating equipment.

After plowing down 400 lbs. of 0-20-20 and lime in the fall of '64, he cultivated in 200 lbs. of 0-0-60 and 300 0-20-20 the next spring, followed by 185 lbs. of actual N.

DOUBTIN' TOMS PLANT, TOO

Planting began on April 20. It was completed on May 11. And down at the local restaurant, over deep cups of coffee, doubtin' Toms started planting —also:

He'll never make it. Is Clyde well? 20-inch rows!? Too narrow to cultivate. Poor fellow. All that money tied up.

Although the weed chemical had everything under control, he still hooked up the 20-inch tool bar cultivator just to see how the equipment would work. It worked better than 40-

inch machines. And the 10-inch tires moved easily between the closer rows.

When the corn started up, the heavy population stopped people—28,000 plants per acre average out of 31,000 planted. Returning from a meeting one day, Hight couldn't get into his farm . . . cars everywhere . . . people in the field looking at his corn . . . some shaking their heads:

Poor Clyde. That corn'll never ear out. Too thick. Gettin' too tall—too. And narrow rows with THAT population . . . it'll never stand.

But to poor Clyde, the corn looked pretty good when it started tasseling around June 19. By July 4, he had solid tassels over the whole field. Strolling through pollinated corn in full milk stage by July 19, he breathed deeply, alone in the clean Midwest air, grateful for his progress, so far.

The doubtin' Toms were breathing, too:

Clyde's got the corn, all right. With good weather. Won't do him no good. The machine folks'll never hatch a rig to handle that much crop.

His 20-inch corn head arrived on August 29 and was at work on the harvester next day. They got down to business, harvesting a little over two acres that first day, averaging 211 bushels dry corn per acre on the first 80 acres.

Visitors poured in . . . 10 to 200 at a time . . . watching the four-row harvestor lope down the 20-inch rows. Hight was a busy man, too busy to hear condolences along the borders of his field:

He'll never make it. That four-row machine will never handle that much corn on that many acres. Poor Clyde. He'll be shuckin' corn when the rest of us are plantin' next spring. Somebody should have told him!

Apparently nobody told him. By November 15, Hight had harvested 550 acres, leaving 150 rows for the machine company to try a larger experimental corn head. On January 5, the corn was still standing well and by the 12th was picked with the experimental head.

His final record showed 211 bushels average on the first 80 acres, 201 bushels on the first 388 acres, and 181 bushels per acre on the whole 557 acres. His crop totaled 101,087 bushels of No. 2 corn.

The doubtin' Toms blew hard on their coffee, not saying much as blue plate specials were served up:

Lucky. That's what he was! Damn lucky. Ole Clyde'll never do it again.

Maybe ole Clyde won't do it again. But BETTER CROPS magazine advises NO ONE to bet against him. Why? Largely because he's a dreamer.

And dreamers open doors. Dreamers opened those Illinois plains in the beginning. Dreamers crossed the Rockies and died in the snows of the Sierras, so a few could reach the Promised Valleys below. Dreamers will survive the troubled future facing this century —and guide the ultimate peace or build anew from the ashes.

You know what Hight's up to now?

1—He's trying to get TWO crops of corn in ONE season! How? By using early hybrids on a small acreage. It didn't click this year. The so-called "70-day" hybrid seemed little earlier than normal maturities under this year's cool, wet conditions. The projected July harvest actually fell about 6 weeks later. But don't bet he won't try again.

2—He's challenging western and southwestern growers to a sorghum

yield contest—**from central Illinois!** The cool, wet season held back his 100 acres of grain sorghum this year. Sorghum demands higher temperatures than corn. Southwestern growers have a head start—but don't bet Clyde Hight won't challenge them again.

CHALLENGES EVEN SCIENTISTS

When invited to speak to the American Society of Agronomy last year, Hight emphasized that his program was built year by year, not overnight.

"As our fertility was built up, plant populations were increased, hybrids changed, tillage practices altered, row widths adjusted," he explained.

He asked the scientists for hybrids to get higher plant populations, shorter hybrids for closer rows.

He asked them to help farmers determine what fertilizer response to expect from specific hybrids.

And the biggest thing he asked of them concerned the way they share their research with the working farmer:

"When you report your work on corn, I would like to see it put together the way the farmer has to put it together.

"For example, I believe any of the practices I am using now could be proved wrong if applied alone. When you increase populations and go to narrower rows, you have to increase fertility and you have to use corn hybrids which will take the stress. If you leave out any one factor, the whole thing can fall on its face.

"I want to know how I can take the experimental work you are doing and fit it into my operation to increase my profits. To do this I need to see how it relates to everything else I am doing."

Then he dropped his bomb:

"Last winter I heard the theoretical top level of corn production is 500 bushels. Can you give me the basic parts of the formula to reach that goal. At 200 bushels I'm just getting started."

Deafening silence set in. The scientists knew they had no theorist before them—only a doer.

Only a doer who makes a habit of "busting theories" wide open so people can see that that is what theories are for—"to bust" and move on!

—By S.W.M.

P.S. Clyde Hight told us just before this went to press, "We have another 200+ bu. corn crop again this year. We now have 1,300 acres of corn, our biggest year yet."

"PAPS" MAY PUT PAPER TO WORK FOR DEVELOPING FARMERS

A NEW PLANTING system has been devised as a positive action method whereby agronomists can pass on their knowledge to local farmers in developing countries.

Known as "PAPS"—Positive Action Planting Systems—it puts paper tissue to work as the control media in all phases of agricultural efforts to eliminate the high cost and often not available sophisticated planting machinery. Also, it helps reduce the chances of error, thievery, adulteration and spoilage or waste in the application of fertilizers, insecticides, pesticides, weedicides and to ensure the utilization of hybrid seeds in properly spaced populated fields.

The advent of hybrid seeds has caused much concern to world agronomists since high yields can only be obtained if proper amounts of fertilizers, seeds and various controlled items such as insecticides, weedicides and pesticides are used.

Incorrect spacing of seeds necessitating culling is both costly and often harmful to seedbed conditions. Proper field population does become a large factor when higher yields are demanded.

PAPS, now, can assure higher yields by its absolute control of all planting factors.

NO FANCY EQUIPMENT

The systems require no fancy extra equipment. A single bullock or horse or cattle or man-drawn rack, on wheels or without wheels on sticks, contains five rolls of paper tissue and five tines (iron or wood) which plough furrows into which falls a continuous strip of paper tissue and is covered by earth by following tines or scrapers.

The five separate paper tissue rolls contain:

(1) Evenly spaced seeds in whatever amounts and/or required distances (one).

(2) Properly mixed fertilizers ploughed into the earth three inches deep and three inches away from the seeds (two rolls, one on each side of seedbed).

(3) Various types of insecticides, weedicides or pesticides, impregnated into the paper tissue, which are buried one-half inch beneath the ground surface and over the encased fertilizers. (two)

The five rolls are the basic arrangement of PAPS, however, other variations can be systematized to meet any requirement, such as, to break hard pans.

All items, such as seeds, insecticides, weedicides, pesticides, fertilizers and micronutrients are encased in between water-soluble paper tissue walls that form shipping-packing and distributing containers.

Waste in handling, measuring and sorting is eliminated. Errors are not possible after the decision and selection of type of production has been made and ordered from factory suppliers.

EASY SHIPMENT

PAPS makes it possible to ship world-wide, safely and completely foolproof, any combinations that qualified agronomists have selected for any particular area. The indigenous farmer needs only the simplest of tools to bury the continuous strips of paper tissue.

Cost of the paper is more than offset by the assured higher yields, savings in proper storage, and distribution of all items. PAPS offers a package of practices wrapped in paper tissue that is absolutely controlled, without a margin for errors, for planting.

Patent rights have been applied for in the U.K., United States of America, Japan, Germany and in Mexico. A new corporation to effectively begin operation in 1968 is being formed in Wilmington, Delaware, U.S.A. Major paper companies have shown an expressed interest in the scheme.

AGPO—Gujarat Newsletter

IF YOU LIKE 'EM . . .

!#%$$ THAT STUCK SPREADER
Beat The Weather—Fertilizer This WINTER

YOUR TIME MAY BE WORTH $50 AN HOUR NEXT SPRING
Will You NET It or WASTE It on Delays?
Get Ahead With Our Winter-GO Plan

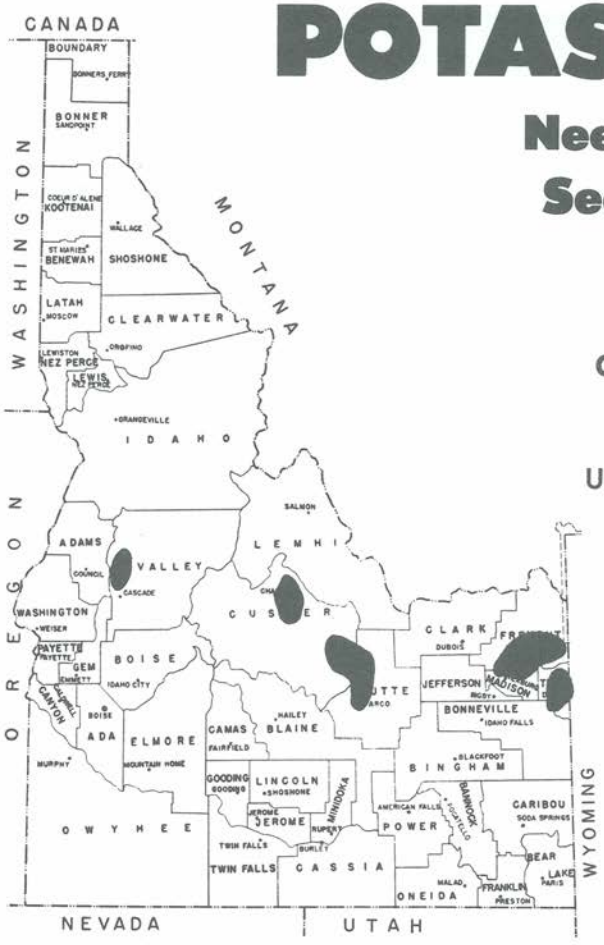
WHY WAIT FOR SPRING TENSIONS? Fertilize FALL or WINTER

. . . ORDER ON BACK COVER
(Newspaper-Radio Ads Kit)

POTASSIUM

Needs Show on Seed Potatoes

CHARLES G. PAINTER
R. E. OHMS
UNIVERSITY OF IDAHO



Solid black areas represent 25,000 acres of seed potatoes produced in areas showing potash hunger.

IDAHO IS BLESSED with some of the finest seed potato growing areas in the United States—mountain valleys often well over a mile high.

At the high elevations few insects spread the virus diseases of potatoes. Of course, high elevation brings danger from untimely frosts. The potato seed grower must make each day count.

He cannot risk nutrient deficiency.

During the summer of 1965, Earl Spencer of the Idaho Crop Improvement Association found potassium deficiency symptoms appearing on potato plants in some fields of the Lost River, Teton Basin, and Upper Snake near Ashton. In most cases, the potatoes were growing in coarse, gravelly loam soils.

In 1966, we initiated field tests with county agents and farmers in Teton, Butte, and Fremont counties near the towns of Victor, Moore, and Chester, respectively. **Table 1** shows results.

Table 1. Effect of Potassium Fertilizer on Seed Potato Production.

Potassium applied lbs. K_2O/A	Bagley Farm Victor, Idaho cwt./A		Jones Farm Moore, Idaho cwt./A		Blanchard Farm Chester, Idaho cwt./A	
	Total yield	No. 1's	Total yield	No. 1's	Total yield	No. 1's
0	54	15	137	65	308	225
60	70	27	152	85	315	238
120	77	29	157	81	312	230
240	88	38	163	89	314	228

Although severe frost hit the Bagley farm and early dying in early August struck the Jones farm, cwt. per acre climbed markedly.

The Bagley farm increased total yield 34 cwt. and No. 1's 23 cwt. per acre from 240 lbs. K_2O per acre. The Jones farm increased total yield 26 cwt. and No. 1's 24 cwt. per acre from the same amount of potash. And the lower potash rates also boosted total and No. 1 potato yields.

The Blanchard farm got less spectacular increases, as maximum total yield and No. 1 potato yield came from 60 lbs. K_2O per acre.

Mid-season potato petioles showed total potassium in the plants well below 8 percent needed for producing potatoes on these coarse gravelly loam soils.

Table 2 shows how potassium fertilizer raised total percent potassium in the potato petioles. But only at the 240-lb. K_2O rate did levels approach the 8 percent needed for best production.

Soil tests for exchangeable potassium ranged from 113 to 273 lbs. per acre. Apparently available potassium needs to be higher in these soils than in the silt loam or loam soils growing most of the commercial potatoes.

How many acres of seed potatoes are grown on these coarse gravelly loam soils? Dr. Maynard Fosberg, Associate Soil Scientist of the University of Idaho, estimates about 100,000 acres are under irrigation or have the potential for irrigation in the Salmon, Challis, Mackay, Stanley, Cascade and Chester or upper Snake areas.

Potatoes growers having such soils should have their soils tested for available potassium. If the soil tests below 300 lbs. per acre of exchangeable potassium, they should apply about 120 lbs. K_2O per acre to their potato fields.

THE END

Table 2. Effect of Potassium Fertilizer on Total Percent Potassium in Potato Petioles at Midseason Sampling.

Pounds K_2O per acre	Total Percent Potassium			
	Locations			
	Bagley	Jones	Blanchard	Average
0	4.28	7.77	6.42	6.59
60	5.71	7.45	6.67	7.00
120	6.22	7.56	6.86	7.27
240	7.23	7.93	7.70	7.84

IN TOTAL-TEAM PROGRAM

Loafing Acres Go to Work

W. C. THOMPSON
R. F. CORNELIUS

UNIVERSITY OF KENTUCKY

WHEN ABOUT 70% of your open cropland acres is in grass and produces at only 25% of its potential, what do you do?

You might get busy, as some Kentucky farmers did, and put the grass to work.

Back in the mid-50's there were nearly 9 million acres of pasture and hayland in Kentucky. Cattle were not doing well on grazing or hay from most of these acres. Clovers had largely been eliminated by highly competitive cool season grasses (mainly tall fescue and Kentucky bluegrass), drought, and low fertility management. Farmers were discouraged.

RESEARCH PINPOINTED THE PROBLEM

To tackle the problem of low meat and milk yields, key farm leadership requested research help from the University of Kentucky College of Agriculture. They wanted to learn what was wrong and why.

The Agronomy Department studied the problem carefully and then launched a pasture renovation research program. Renovation is the "improvement of a pasture by partial destruction of the sod, plus liming, fertilizing and seeding as may be required to established and re-establish desirable forage plants without an intervening crop."

Figure 1 shows how pasture renovation was an excellent short-and-long-term answer. Note how no treatment areas made less than 1 ton of dry matter per acre.

Where red and Ladino clovers were introduced, yields climbed more than 50% in the establishment year. The clovers needed to be renovated on a 3-year basis to maintain top yield because of root diseases. High fertilization and top plant management kept yields high during "production years." Alfalfa did real well under this program for as many as 4 to 5 years. "Better Crops with Plant Food" No. 1 XLIII: 32-38.

By the late 1950's, research had developed basic steps to renovation:

1—Start with a good stand of grass.

2—Graze grass close so that tillage would be easy to do and most effective.

3—Add potash, phosphate, and lime by soil test. (No nitrogen since it encourages the grass at the expense of the newly established legumes).

4—Till to disturb prevailing grass stand.

5—Establish legumes in spring rather than late summer because of more favorable moisture conditions.

6—Manage the new stand to favor the legumes.

EXTENSION CARRIED THE BALL

Extension put the practice to work, largely through field size demonstrations. The theme was: "What would this area be like if renovating was *not* done." In the early stages, it performed three missions:

1—Sharpened recommendations under field conditions.

2—Gave confidence to professionals.

3—Served as location for field days, tours, etc. These demonstrations were located largely on "Top Innovator" farms. Demonstrations exceeded 10 acres, to show application on large acreage. **Figure 2** shows how each demonstration always included a "no treatment" area for visitors to contrast with renovated practices.

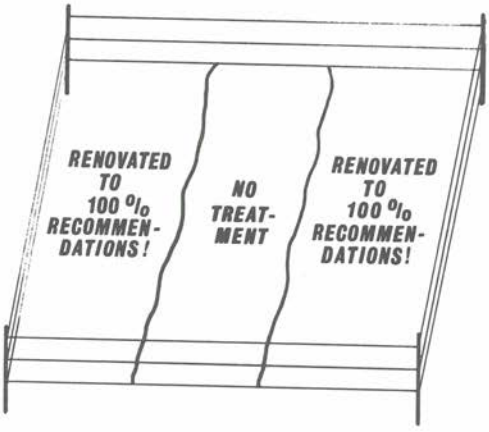


FIGURE 2

SHARPENED STEPS

From these demonstrations came some sharpened-up recommendations:

1—Start with a good stand of grass —a MUST.

2—Graze it in late fall and early winter while still palatable—to make tillage easier and to furnish needed grazing while most tasty.

3—Spread lime and fertilizer after summer soil testing and before tillage.

4—Practice late fall and early winter tillage—before January 1, if possible—to take advantage of better moisture and help assure early seedings.

5—Seed early—mid-February—to get a head start on summer weeds and more time in February than March. Farmers consider danger of winterkill no serious hazard.

6—Use discreet rotational grazing—a MUST. Early heavy stocking of 6 to 8 animals per acre for short time periods helps keep grass in check while legumes are getting started.

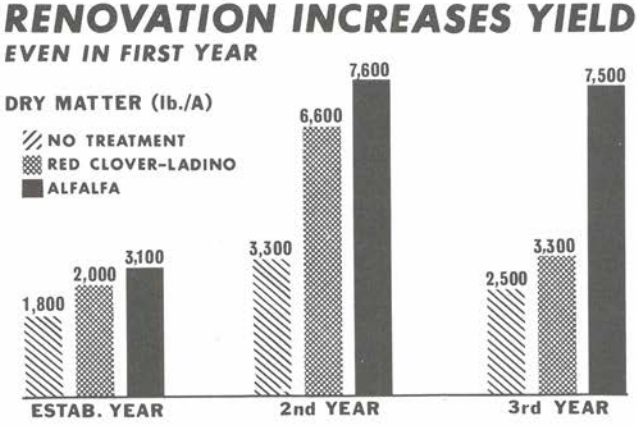


FIGURE 1

A good short and long term ANSWER!

HIGH & FAST ACCEPTANCE

Pasture programs are accepted slowly. Pasture renovation in Kentucky would have been no exception with AVERAGE efforts. But superior radio-TV programs, newspaper and magazine features, meetings, tours, method and result demonstrations at all levels —caused a major acreage breakthrough in just 5 years.

This table shows how 1966 renovated acres jumped three times over 1965 acres:

	TOTAL ACRES RENOVATED (Estimated)
1962	75,294
1963	101,855
1964	148,926
1965	219,270
1966	685,300
Total	1,230,645

IN DOLLARS AND SENSE

The increased meat and milk from 1 million-plus acres of renovated pasture represent $90 million in new income to Kentucky farmers.

What about the **individual** farmer? It means going from 50 to 400 or more pounds of gain per acre—or from about $12.50 gross return per acre on unimproved pasture to about $100 on renovated pastures.

For the dairyman, it means going from 1,200 to 5,000 pounds of milk per acre—or from about $48 gross return per acre to about $200 on renovated pasture.

During the last 5 years, beef cattle numbers increased nearly ½ million head, while dairy cattle declined 17%. Yet total milk production went up 11%. These results point to higher forage production. And renovation has certainly played a major role in these profitable changes.

The program has caught on. And all those involved—from professional agriculturists to eager farmers—are looking across the fence at those remaining 6 million acres. They want to put them to work. Renovation has been a "natural" for everyone to work together on and go for "More Profits from Grasslands."

It **has** been worth the effort. Chances are, the future is even brighter. Professionals now know the program and farmers are learning the techniques. The excitement of the program has caught on. All those involved are anxious to put the remaining 6 million acres to work.

THE END

the Manlius PROBER

"We carry insurance on our homes. What about insurance on sure levels of nutrients in a crop."

AMERICA's LEADING agronomists have voted Dr. Werner Nelson, senior vice president of the American Potash Institute, president-elect of their highest professional body, the American Society of Agronomy.

On learning the news, I couldn't help but recall the late genius-of-a-man, Billy Carmichael of the University of North Carolina. He had just visited a session of conference-table palaverers haggling over a proposed bulletin that was to help raise a few thousand "free enterprise bucks" for North Carolina's tax-supported land-grant institution.

The afternoon was gray and damp-cold and his "university car" coughed as he jiggled the starter. So, he was ready to sire one of his Billy Carmichael conclusions:

"You know, Martin, what this old world needs is someone who can humanize these damn scientists and simonize the humanists."

I have never gotten over that.

Why should Werner Nelson's election bring it to mind? Because we who have worked many years in the American Potash Institute know not only what kind of scientist the ASA has

elected—but, more importantly, what kind of human!

Werner Nelson has spent his professional life—a quarter of a century—probing for gremlins that cripple food production, leading national and international conferences for fuller crop production, and encouraging closer teamwork between university and industry minds.

Credentials say one thing . . .

- **Former chief of North Carolina's Soil Fertility Research and Director of the state's Soil Testing Division.**
- **Senior Vice President of the Potash Institute's national and international programs.**
- **Former Vice President of the Soil Science Society of America and chairman of several ASA committees.**
- **Fellow of the American Society of Agronomy and Fellow of the American Association for the Advancement of Science.**
- **American Society of Agronomy Agronomic Service Award for "extraordinary service to the Society, to the profession of agronomy, and to agriculture throughout the world.**
- **An American Vice President for the International Society of Soil Science.**
- **Co-author of a major college textbook, chapters in 9 other books and more than 50 scientific articles.**
- **Member of the United Nations FAO Fertilizer-Industry Advisory Panel for Freedom From Hunger Fertilizer Program.**
- **Who's Who in America, Who's Who in American Men of Science, Who's Who in American Education.**
- **Alpha Zeta, Gamma Sigma Delta, Phi Kappa Phi, Sigma Xi, and associate member of Farm House.**

. . . but the human being can often say another thing.

Werner Nelson does not wear his Who's Whos and Done Whats on his sleeve.

Personally he's a quiet man, unpretentious, but firm of word and action. Somewhat subtle, like the growth of a potato, unnoticed until it yields a huge tuber. Sturdy in a strong-stalk-corn-way, reminiscent of the full fields around Manlius, Illinois where he dug his first soil sample in 1919—at 5 years—though he didn't call it a sample at the time.

Professionally he's a busy man, intensely scientific, sometimes jarring colleagues with his elephant-memory of a long buried detail. Questioning. Probing. Wondering. Constantly puncturing complacency.

When Nelson arrived at N. C. State University in the fall of 1941, few knew, or ever learned, that the methodical Midwesterner had led the agricultural scholarship ranks of huge University of Illinois. Few knew he had held high standards at Ohio State while tacking "doctor" to his name.

They wouldn't have cared. They wanted to know what he could do for their crop yields. Nelson was in the vanguard of young scientists joining N. C. State to raise agricultural know-how to new levels—names that were to become nationally known: Baver, Brady, Cummings, Krantz, Lovvorn, Reed, Tisdale, York.

Much of the sophistication and prosperity enjoyed by North Carolina agriculture today can be traced to work begun by such men. Any doubters can check the crop yields and quality before 1940.

North Carolina developed Nelson's talents the hard way. They sent him to a branch Experiment Station where he lost himself in the soil chemistry lab for

7 months, searching out "oxidation and reduction reactions."

While he was searching for those "reactions," the State's Station Director was searching for a more compatible place for Nelson's talents. In March, 1942 he was named leader of cotton fertility research under Dr. Ralph Cummings. Soon soybeans and potatoes were added to his duties and ultimately peanuts, for a brief period, before he was named Director for the state's Soil Test Division and head of all Soil Fertility Research.

SOYBEANS BOOST MORALE

Fertility research involves far more grinding field work than laboratory theorizing . . . driving till midnight, lugging fertilizer bags to the field at dawn . . . planting, fertilizing, checking back . . . often to face stubborn soils or sensitive crops or unpredictable weather or a dozen other factors that conspire to ruin a season for an ambitious young scientist.

Four years on the job, Werner Nelson was such a scientist when a soybean field near Rocky Mount, N. C. gave his morale a badly needed boost. At the time, corn trials were the thing in that area. A large group of agricultural leaders were looking over some nitrogen-treated corn when someone on the edge of the tour spied an odd-looking spot in a nearby soybean field.

No one had paid much attention to soybeans. But, shortly, the whole tour was standing in amazement before the sharpest response difference Nelson has experienced in a quarter of a century of fertilizer experiments.

Struggling in the center of a rich soybean plot were six rows of perfectly yellowed leaf edges on stunted plants that almost cried out to the group: "Help! We're starving!"

And they were—for potash.

Dr. Nelson told the group what was wrong. He said they could expect a big yield difference. Come harvest, the potash-fed beans, with lime and phosphate, yielded 27 bushels MORE per acre than the potash-starved beans, still with lime and phosphate. The range? From 5 bushels to 32 bushels!

Such work pioneered interest in soybean fertilization as a profit-making practice. Nelson also early recognized the potential in radioactive tracer techniques for studying plant nutrition. And he helped pioneer some of the first soil test summary reports, as well as early application of soil test results to farm practices.

Werner Nelson is where he is today, in all probability, because of where he was in 1954. That year former Institute President, Harvey Mann, called him from Carolina soil fertility leadership to try on the shoes of the late Doc Hoffer, long-time Midwest Director of Institute programs, the huge-domed Dutchman cornbelt growers called "the corn doctor."

BEHIND THE SCENES

Nelson soon hit his stride with the Institute.

"And the American Potash Institute has never been the same since," President Reed contends with a mixture of amusement and pride in Nelson's boundless energies.

Those energies helped transform many Institute programs, especially in the Midwest: *Newsletters,* evolving from paragraphic duplications of college news releases to idea-planting themes; *a whole series of educational slide sets,* teaching everything from fertilizer placement to "extra" soybean bushels; *workshops and roundtables,* providing a scientific forum for viewpoint exchanges between top-level scientists out of universities and industry.

He works behind the scenes. Few

people know or see many of his roles. The Institute's year-round fertility programs of the past 3 years are a good sample. Many of the ideas came from him and his staff.

Nelson is a great question planter: a discontentment breeder, constantly jabbing at mediocrity, trying to shake things a notch higher, trying to convince growers, scientists, industralists that they have just begun to tap their potential.

Nowhere is this more evident than in the hundreds of talks he has delivered from Canada to Texas. To the American Chemical Society, Ohio Salesmen's School, Ontario Crop Association, American Ag Engineers, TVA, Delaware Farm-Home Week, countless state and local fertilizer conferences, etc.:

It is difficult to find something really new. We usually dust off a practice and try it again under more favorable conditions . . . kicking a limiting factor and getting a new yield level.

Suddenly some growers and researchers are producing extremely high crop yields. Why? A very few are using every possible practice in a teamwork approach . . . realizing the value of that last piece in the jig-saw puzzle.

With deeper plowing and heavier nutrient application, we are remaking the furrow slice into an artificial soil. This is logical. Growers use artificial crops through breeding. And Mother Nature cannot be expected to meet these new demands.

We carry insurance on our homes. What about insurance on "sure" levels of nutrients in a crop?

While we must generally live with what we get, there are ways to get greater yields from each inch of water: minimum tillage, closer soil-covering rows, deeply-plowed nutrients. Tomorrow we may ask not how many bushels per acre but how many bushels per inch did you get.

The future of corn farmers and the fertilizer industry depends greatly on the breeders . . . the idea is to force hybrids to the limit to see which of the hybrids can take it and come up smiling.

Yields alone are not enough. Attention must be directed to quality effects. Witness Vitamin A deficiency in certain feed crops and quality problems in corn.

The University will continue to be the major source of basic facts insofar as plant nutrient information is concerned. In the future, could agronomists employed by industry serve more as consultants?

He seems happiest in the field. On major farm tours, Nelson will drift from the crowd, probing at some dead tissue in the root crown of corn plants, returning to ask the grower what hybrid he used, what fertilizer and planting rates, etc.

You can't help but think he's in a race with time. To throngs of farmers viewing Raymond Roller's corn program at Newman, Illinois last summer, he said, "We may laugh at 500 bushels and smile at 300 bushels of corn per acre . . . but I fully expect to see 500 bushels per acre before they put me away."

He once predicted to a Purdue Field Day crowd that "research specialists will be getting 200 bushels of corn and 60 bushels of soybeans per acre REGULARLY in 10 years." That was 5 years ago.

And in the disarming tone that makes the man somewhat of an enigma, he concluded, "If any of my statements do not agree with Purdue thinking, take their word for it."

And he means it, for Werner Nelson is basically a humble man. He knows what he is about. And he knows it well enough to know we have only scratched this good earth—so far.

—Wingate Martin

TO SOYBEAN PROFITS

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