Better Crops WITH PLANT FOOD

FALL—1972

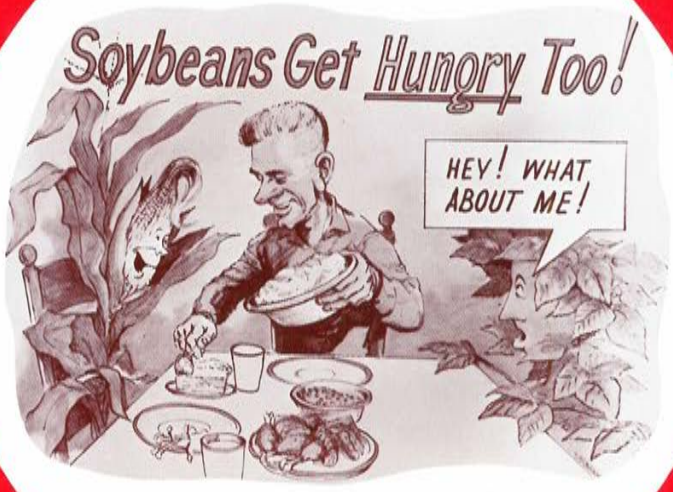
25 CENTS

WHY?

AVERAGE SOYBEAN YIELDS

1949	1972	PROGRESS
22 bu/A	28 bu/A	6 bu in 23 yrs

A Peck A Year



Are YOURS Fed ENOUGH?

One thing in common . . .

SOYBEAN CHAMPS seem to have one thing in common—plenty of fertilizer for their crop. They fertilize directly or indirectly—for the crop before the beans or for the beans themselves—according to the *Soybean Digest's* survey of last year's yield champions. The evidence speaks for itself:

M. V. Griffin—72.5 bu/A—North Carolina . . . Broadcast 1,500 lb/A 0-10-20 . . . plus 2 lb copper per acre because of general copper deficiency on most of his previous wheat crop.

Sam Redfern—65.75 bu/A—Iowa . . . Fertilizes and limes previous corn for high yields . . . plowing down 500 lb 20-10-10/A plus 150 lb nitrogen on the cornfield that won the soybean contest.

Hugo Kugler—70.5 bu/A—Michigan . . . Fertilized previous corn with 300 lb. 6-24-24/A and 5 gallons of 10-20-10 liquid in row at planting . . . then broadcast 225 lb 5-10-30/A on bean ground before planting and 4 gallons 4-20-10 liquid with drilled seed.

Leonard Esselman—81.9 bu/A—Missouri . . . Applied 200 lb 6-24-24/A on 1970 soybeans and 225 lb 5-22-24 on his 1971 champion crop in the same field.

Walter Lee—66.3 bu/A—Georgia . . . Applied 1,000 lb 5-10-15/A to the previous corn . . . then broadcast 1,000 lb 3-9-18/A ahead of soybean planting . . . plus 1 ton/A lime.

Arden Searson—68.6 bu/A—Ohio . . . Plowed down 200 lb 12-12-12/A in fall for previous corn crop . . . and applied 300 lb 15-15-15/A along row at corn planting plus 150 units of nitrogen on the previous corn.

Rease Seals—58.1 bu/A—Alabama . . . On a field growing soybeans 5 consecutive years, he applied 400 lb 0-20-20/A to 1970 soybean crop and the same rate on 1971 champion crop.

Albert Kientz—61.3 bu/A—Kansas . . . Applied 100 lb 10-34-0 right after planting and broadcast Lasso with the fertilizer. In April, he applied 200 lb 18-46-60 and 10 lb/A of 36% zinc sulfate. His philosophy: "Put on a little more fertilizer than 50 to 60 bu/A will take off."

Michael Birkel—60.9 bu/A—Nebraska . . . Sidedressed previous (1970) crop with 120 lb 15-35-10-2 zinc dry starter . . . plus 265 lb nitrogen sidedressed.

W. E. Peace—71.7 bu/A—Virginia . . . Has built a foundation for high soybean yields . . . with high phosphate and potash levels because VPI research shows soybeans respond to high fertility levels. Applied 500 lb 3-18-18/A to the 45-acre field before plowing in spring plus foliar applications of a liquid fertilizer carrying minor elements.

Billy Haller—73.63 bu/A—Arkansas . . . Fertilized area with 200 lb 0-26-26/A four weeks before planting . . . then followed with 200 lb 19-19-19/A and four applications of 45% nitrogen topdress.

Russell Stevens—63 bu/A—Mid-Atlantic (Maryland) . . . Plowed down 400 lb 5-15-30/A in early spring . . . plus 100 lb 8-24-8/A at planting . . . on a field receiving 1 ton lime/A in 1970.

ON THE COVER—have we progressed more than this? Do double-crop areas mask yield improvements by combining full-season and short-season acreage to determine annual state average yield? Should we report the two classifications separately for a truer picture? Six bushels in 23 years leave room for target yields—especially with current exports expected to increase 20% over last year's 423 million bushels.

Better Crops
WITH PLANT FOOD

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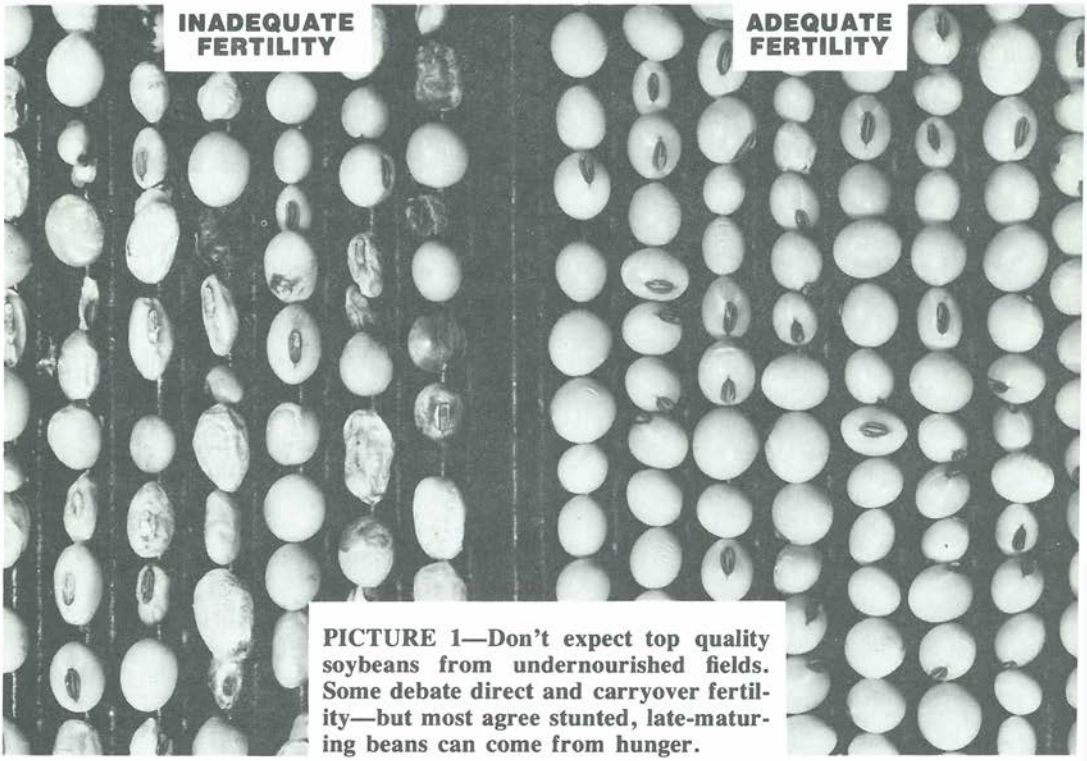


PICTURE 1—Don't expect top quality soybeans from undernourished fields. Some debate direct and carryover fertility—but most agree stunted, late-maturing beans can come from hunger.

There is no such thing as

WERNER L. NELSON
402 Northwestern Avenue
West Lafayette, Indiana 47906

WHY DO WE fertilize our corn, small grain or cotton crops quite well and pay little attention to soybeans? Everyone has a stake in the answer—farmers, processors, elevators, banks, supply agencies. The whole community has a stake in the answer, because higher yields mean a more prosperous agriculture.

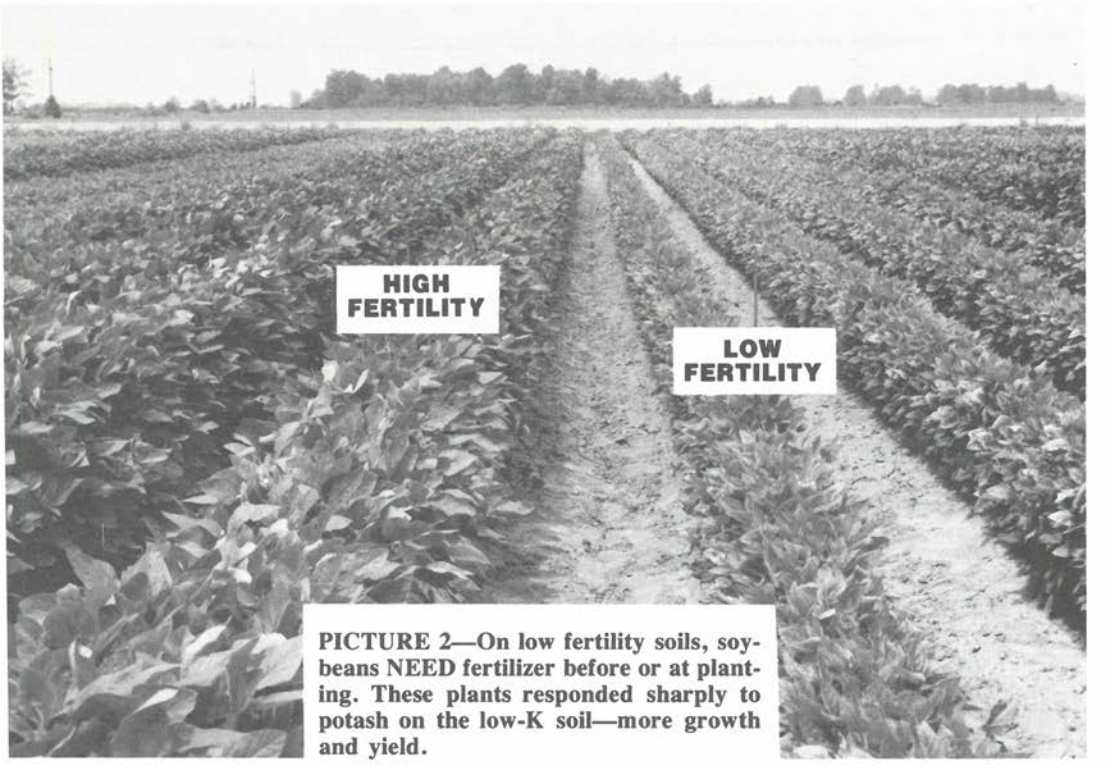
The usual answer is that we put enough fertilizer on other crops to take care of the soybeans. If we do, this is fine. But when one examines the fertilizer rates applied, they are usually not high enough to do the job. Also, the soybean acreage in many states is rapidly approaching or exceeding the corn acreage and this intensifies the problem.

WHAT ABOUT rotational fertilization? Let's look at our two biggest acreage corn and soybean states, Illinois and Iowa:

Average rate (lbs/A) in 1971 USDA

	Corn			Soybeans		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
Illinois	107	60	56	3.6	7.0	9.6
Iowa	95	51	43	0.7	3.7	5.0

Average corn yield in both states in 1971 was 102 bu and soybeans 33 and 32 bu, respectively.



PICTURE 2—On low fertility soils, soybeans NEED fertilizer before or at planting. These plants responded sharply to potash on the low-K soil—more growth and yield.

a FREE meal for soybeans

These yields and rates may fit the man satisfied with average yields and little profit, but look at what fairly high yields remove in the grain (lbs/A):

Grain only	N	P_2O_5	K_2O
150 bu corn	135	60	40
50 bu soybeans*	200	40	70
Total	**335**	**100**	**110**

*Legumes can get much of their nitrogen from the air.

More of our 1973 farmers must shoot for or exceed these kinds of yields to stay in business. How many farmers put this much P_2O_5 and K_2O on their corn? Do you know any?

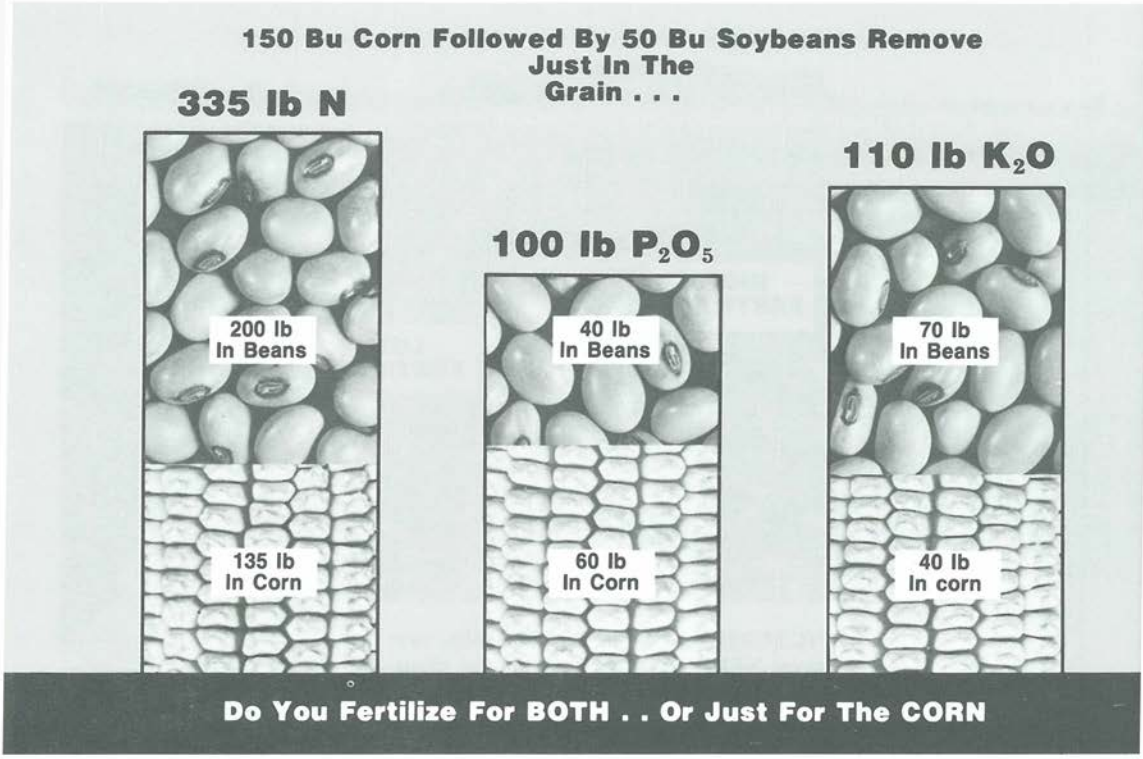
We know the plant is far from 100% efficient in picking up all the fertilizer applied. So how much should be applied to the corn to meet soybeans needs, too?

From 25 to 50% more if the soil is not high in fertility?

Double cropping small grain and soybeans is growing in popularity. How many farmers are putting enough P_2O_5 and K_2O on the small grain to take care of the soybeans, too?

ADEQUATE FERTILITY helps soybeans meet weather stresses. Recently I saw a folder entitled "Fertilizer + lime help soybeans meet ALL weather." Most farmers realize this but must be continually reminded.

In an 18-year rotation-fertility experiment on a soil low to medium in fertility, Purdue University found when the 12-week rainfall after planting was 10-15 inches, soybeans



responded about 10% to buildup P level. But under drier conditions, the crop tended to respond 40 to 60%.

A similar trend occurred with buildup K—about 25% increase with 10-15 inches and about 50% increase with lower rainfall.

We know adequate fertility helps iron out some of the ups and downs from weather and other stresses.

Such increases give profitable returns on the fertilizer investment. They must be seriously considered, particularly with the present price of beans.

DIRECT FERTILIZATION pays. I have photos and data in my files, put there 30 years ago by my predecessor, showing how fertilizer applied for soybeans on low fertility soils gives a profitable response. So, this is nothing new.

If you plant soybeans on low fertility soil, there is no question you should fertilize them either through bands or broadcast.

If you broadcast the fertilizer, it will be most effective plowed down rather than disced in. In fact, a good time to fertilize is in the fall before plowing—to put it down in the moisture zone.

On soils medium in fertility, direct fertilization is a good bet if you have set the stage for high yields (50 bu or better) by including the following 8 practices:

- **Soil pH 6.0 to 6.5**
- **Deeper plowing on some soils, 10-12″**
- **Recommended variety plus inoculation—molybdenum in some areas**
- **Narrow rows—30 inches or less**
- **Earlier planting—May 1-15 for full season varieties**
- **Thin planting—this takes nerve**
- **Weed control—herbicide plus shallow cultivation**
- **Harvest at 2 MPH**

On low fertility soils, beans may have few pods and hold their leaves almost until frost.

Well fertilized beans mature and shed their leaves for a good yield.

PICTURE 3

Even on high fertility soils, you might try sideband fertilizer on part of the fields with earlier planting. You may see it get the soybeans off to a faster start. Also, fertilizer at planting provides a good way to put in manganese if it is needed. And when the previous crop has not been fertilized adequately, this is one way to help *maintain soil fertility.*

FERTILIZER PRACTICES of state soybean champions don't always get reported. Some remarkable yields are being obtained in contests—83 bu. in Illinois in 1971.

Some published reports show winners may not apply any fertilizer for the soybeans. But what is often omitted is that the field was in a *high state of fertility* due to several years of good management, including *plenty of fertilizer on the previous crops.*

Can more effort be made in future years to get the facts on past management, including previous fertilizer practices?

NUTRIENTS MUST come from somewhere. They may be from the soil or added fertilizer—but *there is no such thing as a free lunch.*

I met with a farmer group last winter and asked how many were averaging over 40 bu on their whole farm. Several put up their hands. When I asked about 50 bu, no one admitted it. But after the meeting, two farmers came up and said they were getting that.

I dare say if I visit with the same group five years from now, several will put up their hands on 50 bu. The slogan 40 by 80 (a 40 bu state or even national average by 1980) is a good one. This means many farmers will be averaging over 50 bu and some over 60!

PICTURE 4—If you double crop small grain and soybeans, you have plenty of company. A perfect time to apply enough P and K for BOTH crops is before planting small grain.

You know what 50 bu removes. Scale this up for 60 bu and also count on 180+ bu of corn or higher yields of grain or silage.

If you are a farmer, **I dare you** to try those eight practices listed previously, along with sufficient fertilizer on at least one field.

If you are in the farm supply or service business, **I dare you** to convince six farmers to do this. They will sell themselves and their neighbors. I heartily agree with the statement I saw in the OHIO FARMER magazine. It said farmers who are **TRYING** to get high yields usually **GET** high yields and high profits. **THE END**

"Soybean yields can be pushed UP 5 or 6 bushels per acre with potash . . ."

University of Wisconsin scientists L. M. Walsh and R. G. Hoeft learned this with broadcast and in-the-row tests.

Putting on 35 to 70 lbs of potash per acre increased the yield as much as 20 percent when the soil potassium was below 200 lbs per acre. When the soil potassium was above 200 lbs per acre, there was no profitable yield increase.

In one of the field trials where the soil contained 167 lbs of available potassium, the yield of soybeans was 41 bushels per acre. When the soil test potassium was increased to 222 lbs, soybean yields increased to 47 bushels per acre.

Row applications of potash were similar. Without fertilizer applied in the row, one field had an average of 44 bushels of soybeans per acre. Addition of 35 lbs of potash increased this yield to 49 bushels. Another field yielding 47 bushels per acre increased to 51 bushels per acre when 70 lbs of potash were applied. Condensed from University Bulletin 601.

"SOYBEANS ARE EAGER EATERS and Require Large Amounts Of Fertilizer Elements . . ."

SO SAYS BILL SCHROEDER from Pine Bluff, Arkansas in the DELTA FARM PRESS. He warns neglecting soil fertility can result in "gradual decline in yields, as shown as results of an experiment at the Rice Branch Experiment Station." Over a 7-year period, yields on check plots dropped from 34 to 26 bushels per acre. Yields on fertilized plots were held at 34-36 bushels per acre—6 to 8 bushels above the national average.

Soybean FERTILIZATION Aids

ORDERS of less than $1 must have payment attached in order to be processed.

FOLDERS	**QUANTITY/COST**
Know The Plant Food Your Soybeans TAKE UP (D-2-71)	_____ 5¢ ea.
Fertilizer + Lime Help Soybeans Meet ALL Weather (G-3-71)	_____ 5¢ ea.
Soybeans DO Respond To Fertilizer In A Rotation (F-2-71)	_____ 5¢ ea.
Will Fertilizer Boost Soybean Yields? (I-3-70)	_____ 5¢ ea.
Potassium Builds Soybean Quality (B-1-68)	_____ 5¢ ea.
Are You Fertilizing For BOTH Crops? (Mini-folder F-3)	_____ 2¢ ea.
NEWSLETTERS	
Fertilize Those Soybeans (M-148)	_____ 5¢ ea.
He Fed His Soybeans! Do YOU? (S-156)	_____ 5¢ ea.
WALL CHART (16" x 22") & FACT SHEET (8½" x 11")	
Soybeans Get Hungry, TOO. Feed Them! **Fact Sheet**	_____ 5¢ ea.
Wall Chart	_____ 5¢ ea.
PLACE MAT (For dinner meetings)	
Shoot For 80+ Bushels of Soybeans Per Acre	_____ 5¢ ea.
FERTILEGRAMS (Kits of key questions & answers	
Fertilize Your Soybeans For A Bumper Crop	_____ 5¢ ea.
Tips For TOP-Profit Soybeans	_____ 5¢ ea.
PROMOTION PICTURES (5" x 7" glossy prints)	
Pix 1—Why adequate fertility is vital to healthy beans.	_____ 35¢
Pix 2—When hungry, soybeans respond sharply to fertility.	_____ 35¢
Pix 3—Well fed beans mature right for a good yield	_____ 35¢
Pix 4—Feed small grain for BOTH crops—grain AND beans.	_____ 35¢

SLIDE SETS	**10-Day Loan Date Desired**	**Purchase**
Fertilize Those Soybeans, 36 slides	_____	_____ $6.00
Ten More Bushels of Soybeans, 51 slides	_____	_____ $7.35

Total payment enclosed $_____ (no shipping charge)

Bill us ☐ (shipping charges added on invoice)

Name _____ **Address** _____

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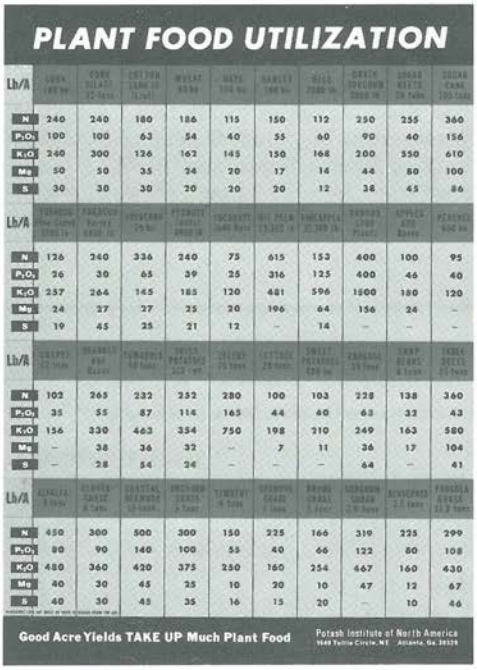

PLANT FOOD UTILIZATION

Lb/A	Corn 180 bu	Corn Silage 22 tons	Cotton Lint 1 bale	Wheat 60 bu	Oats 100 bu	Barley 100 bu	Milo 2000 lb	Green Soybeans 2000 lb	Sugar Beets 20 tons	Sugar Cane 200 tons
N	240	240	180	186	115	150	112	250	255	360
P_2O_5	100	100	63	54	40	55	60	90	40	156
K_2O	240	300	126	162	145	150	168	200	550	610
Mg	50	50	35	24	20	17	14	44	80	100
S	30	30	30	20	20	20	12	38	45	86

Lb/A	Oranges Per Grove 200 tn	Tangerines Per Grove 40 tn	Grapefruit 15 tn	Pineapple 60 tons	Hay Alfalfa 12 tons	Pineapple 20,000 lb	Bananas 1000 Plants	Apples 400 Boxes	Peaches 400 bu
N	126	240	336	240	75	615	152	400	100	95
P_2O_5	26	30	65	39	25	316	125	400	46	40
K_2O	257	264	145	185	120	481	596	1800	180	120
Mg	24	27	27	25	20	196	64	156	24	–
S	19	45	25	21	12	–	14	–	–	–

Lb/A	Cabbage 25 tons	Broccoli 400 Boxes	Tomatoes 10 tons	Irish Potatoes 300 cwt	Celery 25 tons	Lettuce 20 tons	Sweet Potatoes 500 bu	Cabbage 25 tons	Carrots 6 tons	Table Beets 25 tons
N	102	265	232	252	280	100	103	228	138	360
P_2O_5	35	55	87	114	165	44	40	63	32	43
K_2O	156	330	463	354	750	198	210	249	163	580
Mg	–	38	36	32	–	7	11	36	17	104
S	–	28	54	24	–	–	–	64	–	41

Lb/A	Alfalfa 8 tons	Bermuda Grass 8 tons	Coastal Bermuda 10 tons	Orchard Grass 4 tons	Timothy 4 tons	Bermuda Grass 3 tons	Brome Grass 3 tons	Sudan Grass 2½ tons	Bermuda 2.5 tons	Pangola Grass 12.5 tons
N	450	300	500	300	150	225	166	319	225	299
P_2O_5	80	90	140	100	55	40	66	122	80	108
K_2O	480	360	420	375	250	160	254	467	160	430
Mg	40	30	45	25	10	20	10	47	12	67
S	40	30	45	35	16	15	20	–	10	46

Good Acre Yields TAKE UP Much Plant Food

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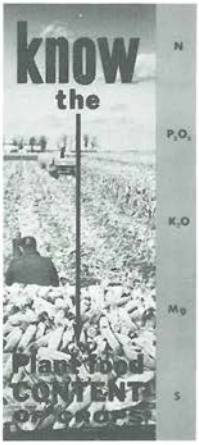

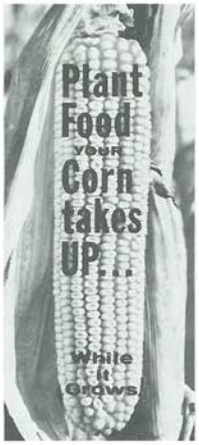

Plant Food UPTAKE Aids . . .

ORDERS of less than $1 must have payment attached in order to be processed.

	QUANTITY/COST
FOLDERS	
Know Plant Food SOYBEANS take up While They Grow (D-2-71)	_____ 5¢ ea.
Plant Food Content of Crops—5 nutrients, 40 crops (A-1-72)	_____ 5¢ ea.
CORN absorbs Much Plant Food While It Grows (B-2-72)	_____ 5¢ ea.
WALL CHARTS (16″ x 22″)	
Plant Food Utilization—5 nutrients on 40 crops	_____ 5¢ ea.
Plant Food Utilization—3 nutrients on 20 crops	_____ 5¢ ea.
FERTILEGRAMS (Kits of ques. & ans.)	
Today's Farming Must Be UPTAKE Conscious (NEW)	_____ 5¢ ea.
Modern Tips For TARGET Yields (NEW)	_____ 5¢ ea.

	10-Day Loan Date Desired	Purchase
SLIDE SET		
Plant Food UPTAKE Powers of Your Crops, 16 slides	_____	_____ $5.00

Total payment enclosed $____ (no shipping charge)

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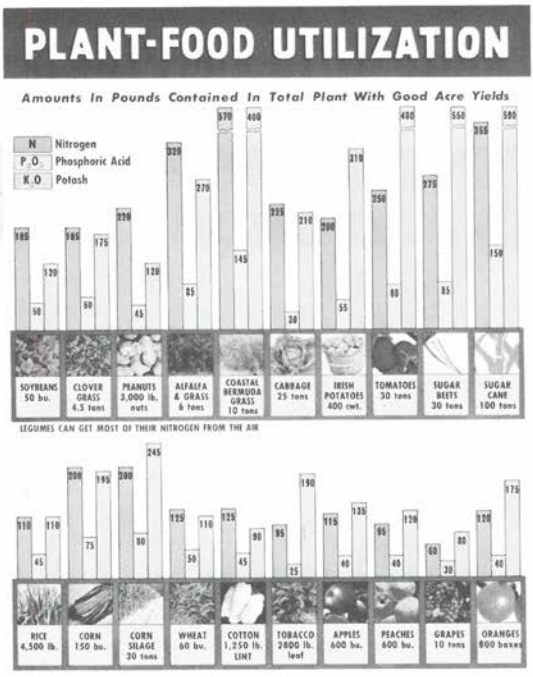


Make folks UPTAKE conscious

If pollution shouts ever make our farmers gun shy about returning the nutrients high-yield crops take up, we had better watch out.

Many scientists say our crop and livestock farming still removes more nitrogen, phosphorus, and potassium than we add. A classic example is nitrogen. We apply about 7 million tons a year, but the food we eat accounts for 8,200,000 tons. That figures to about 1,200,000 more tons going out than in the soil.

The constant threat of soil depletion is not news to the Potash Institute. It has pioneered plant food uptake education since the time 60-bushel corn was called "a challenge." A million copies of its Plant Food Utilization wall chart and PFU folder-story have been used around the world.

And now the Institute offers five new aids to make grower and consumer alike more uptake conscious:

A new Plant Food Utilization Wall Chart expands the earlier chart from 3 nutrients on 20 crops to 5 nutrients on 40 major crops. The new chart shows how much nitrogen, phosphate, potash, magnesium, and sulfur are contained in good acre yields of 40 crops.

A new Plant Food Content Folder features the large wall chart in colorful miniature and briefly tells some principles behind plant food uptake in more than 40 crops.

A new Corn Uptake Folder shows plant food corn absorbs while it grows through four 25-day periods into the last 15 days . . . small, but vital, needs the first 25 days . . . seedling reliance on phosphate . . . over 50% of its potash and 43% of its nitrogen absorbed first 50 days, about when the corn is exploding past knee-high stage.

A new Soybean Uptake Folder shows how soybeans seem to absorb nutrients much like corn during early growth . . . then hit peak demand during rapid vegetative growth just before pods form . . . holding a steady hunger right up to maturity.

A new Plant Food Uptake Slide Set features 16 color slides showing the nutrient uptake powers of major row crops, forages, fruits, vegetables, and tropicals.

A single kit of these four publications with an order form for borrowing or purchasing the slide set can be secured for a nominal 25c handling and shipping charge. Send order to **UPTAKE KIT,** Potash Institute of North America, 1649 Tullie Circle, NE, Atlanta, Ga. 30329.

High potash content needed for

T. R. GORMLEY AND P. A. GALLAGHER
KINSEALY RESEARCH CENTER

Condensed from
Farm and Research Magazine
Dublin, Ireland

IN THE TOMATO growing industry attention has been given to producing a high yield of well shaped and colored fruit. The flavor aspect, however, has been largely neglected.

There is increasing awareness of flavor among consumers and they are willing to pay a premium price for tomatoes that taste and look good. This trend should continue and would probably be intensified under EEC conditions where markets will be more competitive and fruit from sources associated with good flavor will be at an advantage.

Many processed foods and even some fresh fruit have compositional quality specifications in some countries, e.g., oranges may be paid for on the basis of their sugar or vitamin C content. It would be useful if this concept could be applied to tomatoes. For this reason, we have been examining the effect of potassium on tomato fruit flavor at Kinsealy.

MUCH HAS BEEN written about the influence of the acid/sugar ratio in relation to tomato fruit flavor. Tomato fruit with a low level of acidity and a low sugar content could have the same acid/sugar ratio as fruit with a high acid and sugar content. On the basis of the acid/sugar ratio both samples should have the same flavor.

But in reality, the sample containing high levels would probably be better flavored since the absolute amounts of acid and sugar are likely to have an effect.

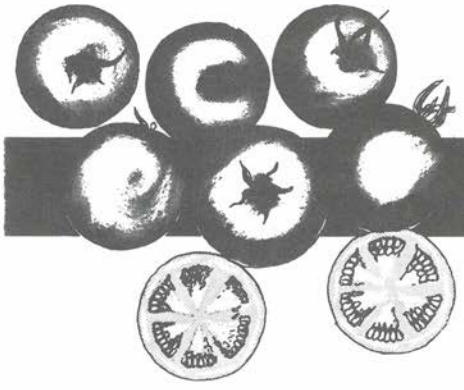
The potassium content of the fruit seems to be a more reliable index of flavor and taste panel tests at Kinsealy have shown that there is a good correlation between the two.

Tests were carried out using 10 tasters and 6 samples and each panelist was asked to rank the samples from best to worst. The potassium content of portions of the fruit tasted by the panel was measured and ranked in order of magnitude.

Table 1 shows the panel and potassium rankings in reasonable agreement. It should be stressed that the differences in potassium content of the samples were small, making it more difficult for tasters to distinguish between them. It is likely that with larger

Table 1—Relationship between potassium content of tomato fruit and taste panel response.

Fruit potassium content (ppm)	Taste panel response (mean rank for 10 tasters)
4450 (1)	**1 (best)**
4250 (2.5)	2
4250 (2.5)	3
3850 (6)	4
3950 (5)	5
4150 (4)	**6 (worst)**



good tomato flavor

IRELAND'S Kinsealy Research Center is working on tomato quality . . . especially flavor and looks for the highly competitive export market. **RESULTS:** (1) Adequate potassium level is "a warranty of flavor." (2) Soil potassium levels of 600 to 700 ppm are desirable for "good visual quality and absence of blotch."

differences between samples—2,000 to 4,500 at 500 ppm incremental levels—the panel ranking would agree perfectly with that for potassium.

IT WOULD BE very useful to have a quality image based on potassium levels for Irish tomatoes, in addition to such appearance factors as shape, size, color, and absence of defects. This in effect would be a guarantee of flavor.

To establish such a quality image, minimum potassium levels for consignments of fruit would have to be guaranteed. This should be quite feasible if nutrition and growing programs are strictly followed. This scheme could easily be tested on a small scale by a producer group.

If a good flavor image could be established, it is likely a premium price would be paid for fruit with a high potassium content.

It would be essential to carry out regular checks for potassium content at distribution points to insure levels were up to standard. This can be done very quickly by diluting one part of tomato juice with nine parts of distilled water and measuring the salt concentration (SC) of the solution. Since there is a good correlation between SC and potassium content of the juice, the latter can be read from a graph.

TO ESTABLISH minimum potassium levels in the fruit, further taste testing should be done. Kinsealy experience has established that a tomato fruit containing 2,000 ppm potassium will generally have poor flavor while that with 4,000 ppm potassium will have a good flavor. But fruit with levels between these extremes must be tested to find if a rigid break point exists between good and poor flavor.

It is also essential to know what fruit potassium levels are being obtained commercially, and last season many samples from the Dublin market were tested. On the basis of these data it should be possible to determine the minimum potassium level necessary for good flavor.

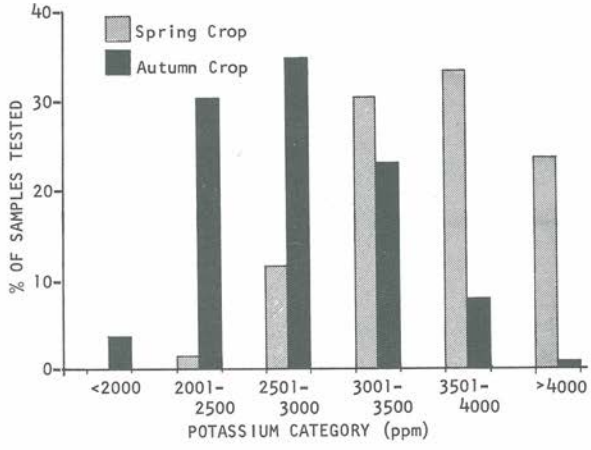


Figure 1—Fruit from spring crops (1968-71) had more potassium than fruit from autumn crops. Kinsealy scientists say more research is needed to try to raise potassium levels of autumn tomatoes.

Figure 1 shows the fruit potassium content of 380 experimental samples analyzed at Kinsealy between 1968 and 71. Fruit from spring crops generally had more potassium than that from autumn crops, and therefore should be better flavored.

More study should be done on the nutrition of autumn tomatoes to see if potassium levels of the fruit can be raised to those obtained in spring crops.

THE RELATIONSHIP between potassium and fruit quality has generated a different approach to the question of potassium nutrition of tomatoes.

High yields can be obtained at low soil (loam) potassium levels. Kinsealy tests have shown that even without an initial base dressing, sufficient potassium can be applied in the liquid feed to meet plant growth requirements, **but quality is poor.** At higher levels, yield is only slightly reduced but flavor is improved, as **Table 2** shows by the increased potassium content in the fruit. Color and shape of fruit are also improved.

Table 2—How soil potassium levels affected tomato yield and quality.

Soil Potassium ppm	Total Yield (tons/ac)		Fruit Potassium Content (ppm)
	Spring	Autumn	Spring
300	63	31	3296
650	61	27	3461
950	58	27	3553
1100	55	26	3719

Table 3—Sulphate of potash needed to raise soil potassium level to 700 ppm.

Level of soil potassium (ppm)	Sulphate of potash required (oz/sq yd)
0—200	10
201—400	6
401—600	3
601—700	1
>700	0

To insure tomato plants absorb sufficient potassium to produce good quality fruit, the soil potassium level should be maintained at about 700 ppm. This level is higher than previously recommended. But with regular soil analyses, it should be possible to maintain it accurately and avoid high SC and magnesium deficiency problems.

If the level is above this, no base dressing of potassium is used but potassium is, of course, supplied in the liquid feed during the growing period. If the soil contains less than 700 ppm, potassium is added as sulphate of potash, shown in **Table 3.**

This, coupled with the potassium supplied in the liquid feed, should give good quality fruit.

THESE RESULTS show high soil potassium levels are essential for good tomato flavor and other aspects of quality. Fruit potassium levels obtained commercially are being assessed and further tasting tests will be done to see if there is a critical potassium level below which flavor is poor.

Studies on potassium nutrition will be continued with special emphasis on the potassium content of fruit from peat and peat/loam mixtures, each containing a range of potassium levels. **THE END**

CUT COUPON ALONG THIS LINE WITHOUT DAMAGING MAGAZINE

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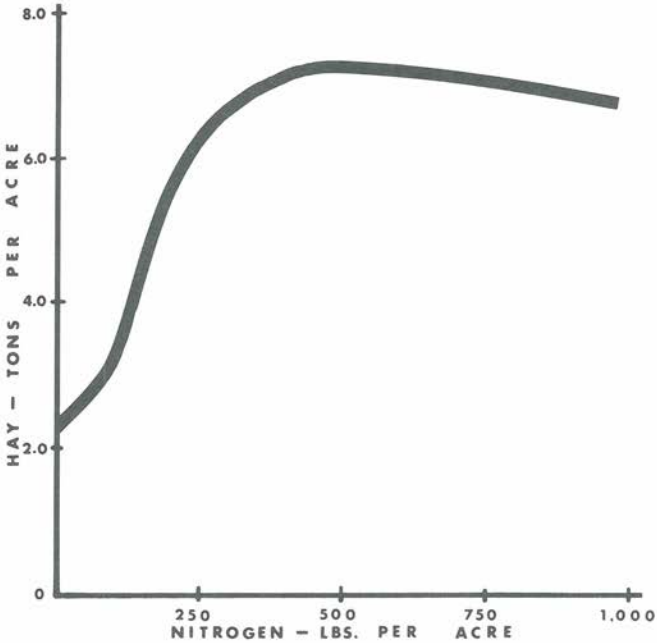


FIGURE 1

ORCHARDGRASS hay yields (12% moisture) tripled when fertilized with nitrogen.

Nitrogen increases

F. T. ABBRING, R. W. TAYLOR, L. H. SMITH, C. H. NOLLER, C. L. RHYKERD

HOW WELL does orchardgrass respond to N fertilization? The Purdue University Agronomy Farm went after some answers.

We seeded "Potomac" orchardgrass, *(Dactylis glomerata)* in the spring of 1966 on Chalmers silty clay loam, a highly productive prairie soil. We applied lime before seeding to correct acidity. The soil tested high P (105) and medium K (195). We fertilized the plots with 200 lbs P and 600 lbs K per acre per year starting in 1967.

Ammonium nitrate was broadcast at rates of 0, 12.5, 25, 50, 100 and 200 pounds actual nitrogen per acre **per harvest.** Thus, with 5 harvests annual rates actually totaled, 0, 62.5, 125, 250, 500 and 1,000 pounds per acre.

To calculate the value of a forage on an acre basis, we studied yield, crude protein content, and total digestible nutrient (TDN) content. We assumed the TDN and protein in forage will substitute for the TDN and protein in corn grain and soybean meal when fed in a complete balanced ration. Purdue University research shows high quality alfalfa competes with corn silage in dairy rations when you consider both the energy and protein it supplies. If the ration has too much TDN and/or protein, then the forage value is not appropriate.

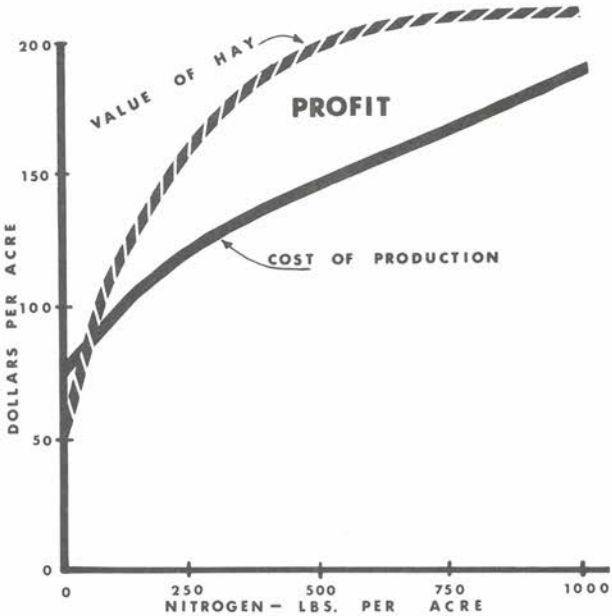


FIGURE 2

ORCHARDGRASS hay value showed fatter profit with adequate nitrogen rates.

per ton VALUE of hay

Departments of Agricultural Economics, Agronomy, And Animal Sciences

PURDUE UNIVERSITY

MARKET PRICE for corn grain and soybean meal fluctuates widely, depending on economic conditions. In this study, the value of the hay was based on a crude protein cost value of 6 cents per lb, a long-time average cost of protein from soybean meal, and a TDN value of 1 cent per lb based on a long-time average cost of corn.

These values would not apply if urea could be used, since it is a cheaper source of protein than soybean meal.

The pricing system was based on No. 2 corn grain with 8.5% crude protein and 80% TDN, and soybean meal with 44% crude protein and 78% TDN. Fertilizer was priced this way: N at 9 cents per pound, P at 7.6 cents per pound, K at 3.6 cents per pound and lime at $4.50 per ton.

Figure 1 shows how much N fertilization influenced hay yield. Up to about 500 lbs N per acre fertilization increased hay yield.

The first two cuttings yielded two-thirds of the total hay crops—40 and 27%—followed by 14, 15, and 4% in the last three cuttings.

Nitrogen fertilization did not seem to affect the percentage of hay harvested at each cutting. Since the fifth cutting contrib-

to page 29

Working quietly on green answers . . .

THE ILLINOIS Rotarians wiped July heat from their foreheads as they entered the air conditioned restaurant for their weekly luncheon.

"Hot enough to fry eggs," one exclaimed. Everyone agreed—and settled down to creamed chicken, peas, and potatoes in a room that felt like the Blue Ridge in autumn.

The Chicago South Side kids unbuttoned hand-me-down coats frozen by the street's winter winds as they entered the Salvation Army gym to practice for the big game Saturday.

"Cold enough to freeze a brass monkey," one exclaimed. Everyone agreed—and settled down to running new patterns on a court that felt like the Blue Ridge in summer.

The Earth Day rally at the small high school stadium ran into the night, but field lights kept it going.

"Strip mining cripples our earth," the voice blared from PA speakers on a pole close to the 50-yard line. Everyone agreed—and settled down to reading the speaker's folder under lights so bright that 8-point type looked big.

Such incidents happen while coal from Midwest strip mines generates low-cost energy to light that stadium, to heat that gym, and to cool that dining room. But few Rotarians or South Side kids or alarmed suburbanites know what miners do to protect the land before and after they harvest the coal.

They don't know because a 10-story shovel clawing away at a 100-foot wall of coal with a bucket larger than most living rooms makes a very dramatic story—of "abuse"—much more dramatic than a herd of Black Angus calves peacefully grazing a pasture that gave up its last seam of coal 3 years before.

This is what the nation's 11th largest bituminous coal producer, AMAX Coal Company, is doing to rejuvenate the land it mines—farming it before and after it harvests the coal.

Its farming operation is called Meadowlark Farms—some 35,000 acres of reclaimed mine land and 50,000 acres of unmined land in 16 counties of Indiana and Illinois, 50 to 250 miles south and west of Indianapolis.

AMAX is run by expert miners. Meadowlark is run by expert agriculturists. They are on the same AMAX Chemical Corporation team.

The miners do not claw carelessly at the soil to get to that coal. They remove the top layers carefully so they can put them back about like they came off—not precisely, of course, but close enough for Meadowlark to develop the land's most productive resources after mining.

In one year these farms will produce some 360,000 lbs of pork, 450,000 lbs of beef, and 1,000,000 bushels of corn, soybeans, and wheat.

You won't see that on the 6 p.m. news across your TV tray . . . or hear it from the little lady by the window of Flight 10 half-yelling accusations at "the farm ponds and pit mines violating our ecosystems down there."

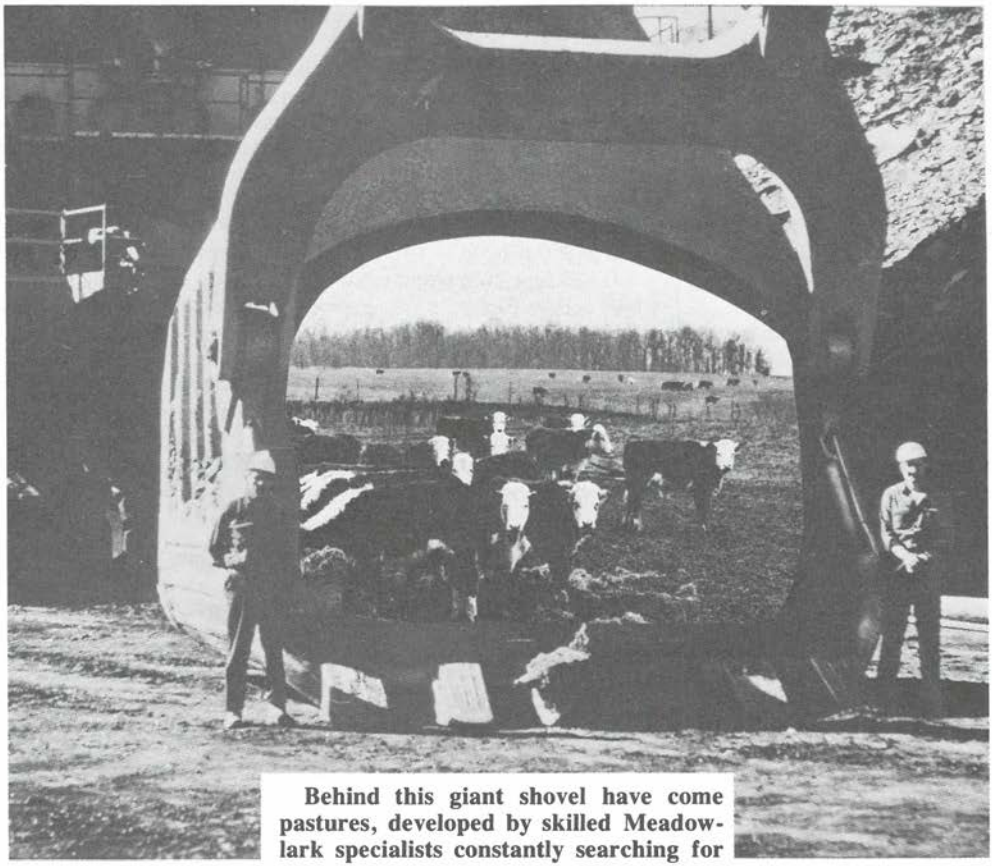
If you watch her closely, you'll see her stare intently at what appears to be much green "down there" in former pit mine areas. Then, she will fall silent . . . for a while . . .

Nothing threatens crusaders more than quiet answers to their causes. Meadowlark Farms work quietly on green answers . . . sometimes transforming the open pit into a tree-bordered lake and recreation area . . . sometimes filling and seeding it to grow a forest or pasture or grain crop.

The Meadowlark Company farms its lands through 132 leasing farmers or crop contractors and through four company-managed farms: Chinook and Clinton in Indiana, Denmark and Fairview in Illinois.

The Clinton Farm, lying in the breaks of the Wabash on 2,000 rolling acres cut up by creeks, is a model of efficiency—automatically watering and feeding 1,600 hogs a year for market, raising all grains the hogs eat on the farm, and compounding all rations scientifically.

The Chinook, Denmark, and Fairview Farms work as a beef raising team, in a sense. Calves from Chinook and Denmark herds are shipped to Fairview in early May each year to graze on mined land and to be fed out for market. A special cow beef



Behind this giant shovel have come pastures, developed by skilled Meadowlark specialists constantly searching for better ways and means to reclaim the land.

breeding head of Charlois-Angus calves are doing well on Fairview's mined-land pasture and feed lot.

On the Chinook Farm near Terre Haute, you'll find wheat, soybeans, and corn growing on unmined land suitable for these crops—BUT ALSO much land so rough it grows only trees and brush BEFORE the miners reach it.

When Meadowlark scientists reclaim it, they actually improve it. This is why farmers holding crop-share contracts with Meadowlark know they can work the land not only before, but also AFTER it is mined—and sometimes with better results.

Meadowlark specialists have polished their reclamation skills enough to convert about 80% of the mined land to forages and other crops and the balance to trees. In earlier days, most of the mined land went back to trees and scrub brush.

Meadowlark President, Irwin Reiss, has been with the venture since the beginning, a respected farm economist and manager. To the system he has brought well trained specialists in agronomy, agricultural engineering, and animal industry.

Such a team, raised on farms and close to nature, is determined Meadowlark farming will keep AMAX mining an asset to the community. They are proving man's quest for badly needed energy does not always have to injure his environment permanently.

They search constantly for better methods . . . better forage mixtures to germinate in all kinds of soils, legumes to help nourish the soil, deep-rooted grasses to help stabilize against erosion . . . better grading and terracing techniques . . . better rock-removing equipment . . . better seeding methods, etc.

In 1971, they seeded 2,000 reclaimed acres with alfalfa—all from an airplane guided by flagmen on the ground, in late winter when the ground was honeycombed from freezing and thaw-

ing, very receptive to seed that melts into the soil with small amounts of sun heat.

Last March (1972) they followed winter wheat on 500 acres of graded reclaimed land with a mixture of alfalfa, ladino, lespedeza, red clover, and fescue—a mixture with many soil-building and soil-protecting traits.

Future yield and feed demands may dictate new fertilization where none was used in the past—such as the 2,000 alfalfa acres seeded by plane. And one day they may come up with a soil-sorting and liming technique that will reduce the areas of highly acid soil to a bare minimum.

But, on that day, don't look for any stadium rallies or TV news on Meadowlark, because there is little "drama" in changing a soil's pH value from 2.5 to 6.0—except the excitement of a few agronomists.

The "unfortunate polarization" between economic and ecological concerns, recently reported by U.S. Secretary of Commerce Peterson, may be due partly to poor communication. Such polarization does not exist between AMAX Chemical Corporation's remarkable teammates, the AMAX miners and the Meadowlark farmers—and it's easy to understand why.

After the miners take energy from the earth to heat and cool and light our people, the farmers come along to put a new energy back into the earth called forage and grain and meat.

Man needs both energies—even little ladies with lecture notes and strident voices atop Midwest clouds that open enough for them to see "green answers" below. END

How do we APPLY 600 lbs Potash (K_2O) on ALFALFA

K. L. COLLINS
G. C. NADERMAN
C. L. RHYKERD
C. H. NOLLER

Departments
Of
Agronomy
And
Animal Sciences

PURDUE UNIVERSITY

YIELD AND QUALITY of alfalfa grown by researchers and top farmers have increased tremendously in the past 10 years.

These increases have come from improved varieties, herbicides, insecticides, higher fertilizer and lime rates, proper cutting management, farm weather forecasts and irrigation in some areas.

These high alfalfa yields have demanded large amounts of potash fertilizer in many areas. More frequent alfalfa cutting at a more immature stage removes greater K because younger plants contain more K.

Adequately fertilized alfalfa hay cut at the proper stage will contain at least 2% and maybe 3% or more K. So, harvesting and removing a 10-ton/A alfalfa hay crop will remove about 500 lbs. K or 600 lbs. K_2O. Soils with a low K-supplying power will demand nearly this much potash applied (600 lbs. K_2O/A) to maintain highly productive stands.

WHEN A GRASS is grown with alfalfa, demand for K is even greater. Grasses require less K than alfalfa, but they can take up K much more readily than alfalfa. Grass grown in association with alfalfa will contain more K than alfalfa.

So, if alfalfa is to persist in a mixture with a grass, K must be applied more liberally than to a pure alfalfa stand. Wisconsin research has shown that under cool spring temperatures more soil K must be available to insure enough K in the plant.

The usual 4 to 5 tons/A alfalfa yields is no problem where 120-240 K_2O/A is ap-

plied. It should be put on in one application. But large amounts of K fertilizer MUST be applied to get high yields of high quality alfalfa and alfalfa/grass mixtures.

CAN WE INJURE forage crops by applying 600 lbs. K_2O/A all at once? Limited data suggest some burning leaf tips and possible thinning of stand and reduced yield when K_2O approaches 600 lbs./A on established alfalfa stands.

Grasses seem to tolerate high potash better than legumes. Slight burning has been noted at somewhat lower levels, especially as seedling. But in other cases, much higher levels have been applied without reducing yield measurably.

Science does not yet know what other factors cause these differences in K rate and plant injury.

Both Wisconsin and English research have found high chloride concentration to cause injury. If chloride does injure, then the potassium might be applied in split application when the rate approaches 600 K_2O/A.

And it may be necessary to allow several months between applications, depending on the rainfall pattern. Purdue University observed injury where the second application was applied about 4 weeks after the initial spring application. An application after the first cutting and one after the last cutting might be best. Such applications would do two things: (1) provide adequate K during the plant's heavy K-using period in summer, (2) help the plants enter winter with good root reserves.

ANOTHER METHOD of avoiding injury from K fertilizer rates would be to apply part of the K fertilizer as potassium sulfate, K_2SO_4. Observations to date indicate much higher K_2SO_4 rates can be applied without damaging alfalfa. This may serve areas that require S fertilizer in addition to K for high alfalfa yields.

REMEMBER: Present 120-240 lbs. K_2O/A are no problem applied in one application. The problem comes in meeting the very high K needs of those 8-10 ton yields. In such instances, splitting the 400-600 lbs. K_2O/A into two applications seems best. **THE END**

EARLY harvest . . .

MEANS much better quality feed than later harvest . . . higher K, TDN, and protein.

Virginia tests showed young alfalfa plants can contain twice as much K as mature plants—from about 3.5% K at 6-10″ growth to 1.5% K at mature stage. Prebloom plants tested nearly 1% more K than full bloom plants.

Minnesota tests showed alfalfa-grass quality steadily declining as harvest date went from prebud to full bloom—from 71% TDN at prebud to 56% at full bloom, from 20% protein at prebud to 13% at full bloom.

Ohio tests showed alfalfa-bromegrass cut May 17 and fed green to milk cows produced 23 lbs MORE milk per day than later harvests on June 7 and 28.

MEANS more moisture available early in the growing season.

Growers who take first cut in BUD stage reduce chance of short water supply limiting good second-cut yield.

MEANS one extra harvest per growing season . . . 3 or 4 cuts instead of 2 or 3.

First-cut removed in BUD stage lengthens season for later harvests. A good variety WELL FERTILIZED regrows much faster than a less vigorous variety poorly fertilized and managed. When managed right, alfalfa regrowth may be ready for harvest 3 to 7 days earlier after clipping.

2 REMINDERS: Let one harvest go to *early bloom* stage to insure good root reserve supply. Apply a fertilizer HIGH in potash every year . . . because the early cutting is taking away more forage higher in potash. EACH TON of alfalfa removes 10 lbs. of P_2O_5 and 60 lbs. of K_2O . . . a 1 to 6 ratio that makes the traditional 0-1-2 and 0-1-3 ratios look narrow.

These tips can be ordered as kits of FERTILEGRAMS for distribution to farmers, advisers, and fertilizer outlets. The rate is 5¢ per kit. Order on page 8.

From NEW target yields kit: (12 questions and answers)

Will long range planning reach target yields?

Both business and government make long range plans. A good farmer knows he cannot correct acid or low fertility soils or eliminate all weeds in one year. Nor is he likely to go from 100 to 160 bu corn, 80 to 135 bu sorghum, 35 to 50 bu soybeans, or 4 to 8 ton alfalfa in one year. He must have time to study, select, and become proficient with new varieties and practices that continue to flow from fertile minds. This is why a 5-year plan, flexible but clearly set on certain targets, might help reach targets. Realistic target yields will change as new varieties and practices are applied and management improves.

Is there a good way to decide how much fertilizer to use for target yields?

Yes. Take nitrogen, for example. Most universities and soil test labs base their advice on yield goal and cropping system. Amount may depend on the region, but continuous corn might average 1.25 lb N applied for *each bushel* of corn expected. This means a 120 bu target would receive 150 lb N . . . a 160 bu goal would receive 200 lb N. These applications are geared to crop needs and USE, so they are economically sound for the farmer and ecologically safe for the environment.

The same principle applies to other crops. If the field has received low N rates in the past, you'll have to apply more N than this average at first to get the yields you are shooting for.

Are phosphate and potash important to nitrogen use?

Very important. They help you get greater return from nitrogen, as Missouri research has shown. On a soil already testing 200 lb K and receiving 100 lb N and adequate phosphate, first-cut orchardgrass absorbed 50% of the N applied. When 200 lb K_2O was applied, the orchardgrass yields increased 70% and the grass recovered 106% of the nitrogen applied. Balanced fertilization is vital.

How can a new practice change my target yields?

Your weakest practices limit yield. Your strongest practices have an additive or cumulative effect. For example, combine better weed control with earlier planting and you'll get better results from your fertilizer.

Well fertilized crops sometimes produce half or less of what they are capable of giving you. It can happen when you use the wrong hybrid or improper plant spacing or poor pest control or any ONE practice that puts HIDDEN BRAKES on fertility. A good researcher carefully watches ALL factors when working to improve just ONE factor. So does a good farmer. Forty or 50 bushels per acre MORE is worth it. This is what trouble shooting is all about.

From NEW uptake kit: (21 questions and answers)

Why must I be more UPTAKE conscious today than ever before?

Because each soil area has just so much natural nutrition (organic matter, minerals, etc.) sometimes not too available to the crop.

Because modern farming still removes more nitrogen and minerals (phosphate, potash, etc.) than we add each year, scientists warn.

Because manure contains only the nutrition of a previous crop—so, it enriches one field only by robbing another.

Because composting offers little to you as a modern farmer. You already leave residue from previous crops on your fields or work them into the soil.

When does growing corn actually USE its nitrogen, phosphate, and potash?

A 180 bu/A crop uses about 43% of its N need, around 30% of its P_2O_5 and over 50% of its K_2O during the first 50 days, while leaves are developing toward tassel and silk. Grain development pulls hardest on nitrogen and phosphate, while most potash demand comes during early growth (75% of total K_2O by silking time) to insure healthy leaf growth and adequate sugar for developing ears.

Are corn crops hurting for nitrogen and potassium? I've heard they are.

Many are, according to plant tissue samples tested by Nu-Ag Laboratories for DeKalb's well known Gro-Plan program. The independent lab has tested samples from 32 states for the major corn hybrid firm. A release recently concluded, "Much of the nation's corn was hurting for nitrogen and potassium during 1971 . . . though 1971 deficiencies were somewhat less than 1970's."

The testers cite four theories behind the deficiencies: Dryness in some areas, excessive rainfall in other areas, compaction from wet planting, and not enough potassium to meet the crop's high-nitrogen use.

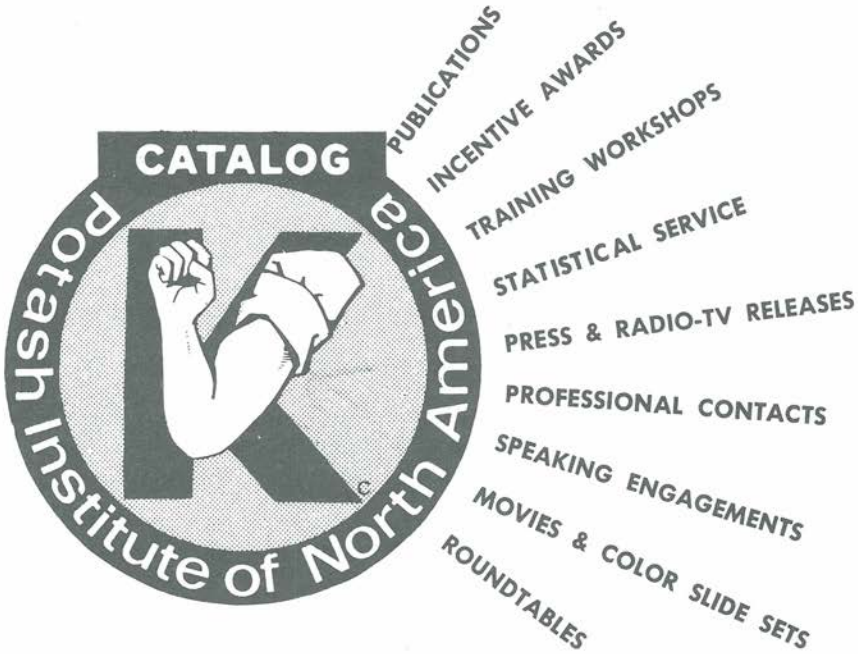
Can just one nutrient influence my corn profits?

It surely can. Get 'em out of "balance" (right proportion to each other) and you'll soon pay for it! You might ask how much potash you need to "balance" a given nitrogen rate. That depends on the N rate. When Illinois added N to K deficient soil, the best N rates boosted yields to only 100 bushels with 50 lbs. K_2O. But when 150 lbs. K_2O was applied, 240 lbs. nitrogen was profitable—getting 150 bu/A and still going up. More nitrogen calls for more potassium to get the most out of today's high-yield crops. Keep a close eye on your nutrient balance and needs. Your profit may well be in the balance.

Does the new "land stretching" device called double cropping require double fertility?

Maybe not double but certainly more than single cropping. Growing two crops on the same field in the same year puts a heavy load on the soil. When you follow corn silage with small grain silage, you should be nutrient conscious.

Silage crops are greedy. Corn silage takes up nearly 4 times more potash than corn grain alone. An 8.8 ton oat silage crop cut in boot stage took up 355 lb. K_2O/A in Kentucky. Waiting to cut at soft-dough stage increased yield to 11.6 tons and K_2O uptake to 438 lb. K_2O/A.



We work on the agri-business team ... PROUDLY!

FOR NEARLY 4 DECADES the Potash Institute has served agriculture—the farmers, the University-USDA specialists advising them, and the industries supplying the farmers.

At no time in this long history of service has the Institute been prouder of the team called agri-business than it is today. That team is under attack by a few. But for such attack there are solid answers—constructive, not destructive . . . scientific, not emotional . . . carefully studied and tested and proved.

For this reason, the Institute is taking a liberty it has never taken before in its magazine—combining one-page interpretations of its services with the latest catalog listings of its educational materials.

The listings are designed to serve the coming year. New 1973 materials will be reported and offered as they are created.

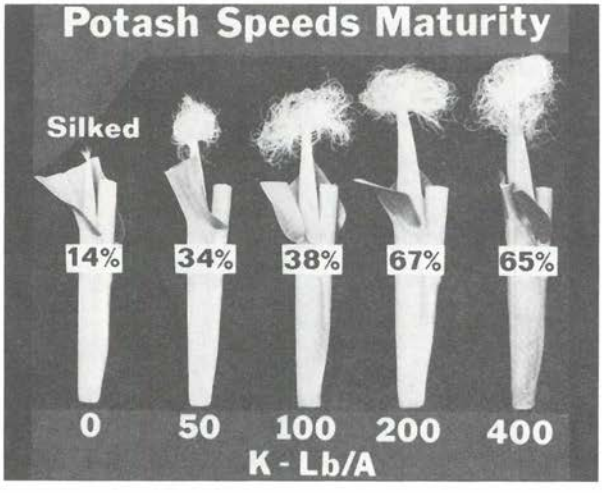
The four very brief capsules report the Institute's role in agricultural investigation, cooperation, demonstration, and communication.

The purpose is simple: (1) To show that the Institute is an educational and research organization which seeks scientific facts that will sell fertilizer. (2) To show that selling fertilizer on a scientific basis helps consumers, educators, and producers improve their programs by improving their efficiency.

Potash, for example, is vital to human and animal survival. It is vital to crop survival. Few soils contain enough in available form to meet the high-yield demands of today's food needs. So, someone must search for it, mine it, process it, transport it, and then SELL the grower on using it.

Keeping enough potash on the soil nutrition team to insure quality food is a continuing program . . . of research and education . . . no faster and no slower than scientific truth will permit. The Potash Institute is dedicated to that truth . . . and very proud to be a member of the agri-business team.

Investigation



....to find the need

POTASH INSTITUTE of NORTH AMERICA has invested thousands of dollars into research projects at 50 state universities and experiment stations . . . through the years . . . helping some 300 research leaders and graduate students seek more efficient plant food uses . . . profitable to grower and producer. **They have found . . .**

- **THAT** high potash can improve the plant's USE of higher N rates, raising true plant protein in forage, important to feed quality.
- **THAT** potash builds strong corn stalks and more brace roots by delaying tissue and cell breakdown during plant's maturing period.
- **THAT** low soil temperature reduces potash uptake—making high potash levels a must in successful early planting programs.
- **THAT** potash improves quality—better kernels in corn, nodules in soybeans, protein in alfalfa, color in tomatoes, flavor in fruit.
- **THAT** deeper plowing demands more potash—to compensate for fertilizer dilution you get from turning over more soil, sometimes 50%.

". . . the agricultural usage of potash must be increased only on a basis that is sound and profitable to the farmer."
Dr. J. W. Turrentine
Institute President, 1936-1948

Cooperation

....to sell the need

POTASH INSTITUTE of NORTH AMERICA has been called "a catalyst" by university and industry scientists . . . "helping program planners . . . giving field assistance, etc." The staff cooperates in many ways . . .

- **BY SPEAKING** to market-building audiences . . . an estimated 100,000 agricultural leaders yearly . . . at university short courses, dealer and grower meetings . . . field clinics . . . scientific societies.

- **BY CARRYING** new ideas across state lines . . . via *Institute Roundtables* that bring scientists together by regions . . . *Farm Management Tours* that carry experts to top trials in other states . . . *Professional Consultation* that specialists request . . . to share year-round fertility thoughts, hidden hunger dangers, etc.

- **BY PROVIDING** complete statistics on potash production, inventory, disappearance, and deliveries by state, nation, and the world.

- **BY REWARDING** human achievement . . . youths and adults who have excelled in soil fertility work and high-yield production . . . from 4-H Soil Fertility Demonstrations to Student Essay Awards.

". . . consumer betterment is basic in our education for potash use. If we did not believe that, we should not exist."

Dr. H. B. Mann
Institute President, 1949-1963

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Demonstration

....to teach the need

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. . . by conserving water to sustain the earth.
. . . by building the soil to insure greater crop yields.
. . . by improving croplife to feed more and more people.

Demonstrations to improve efficiency help protect the environment by producing a crop that does not discard, BUT USES, most elements at its command to give us top food yields. **This work has shown . . .**

- **THAT** good management insures more nutrient (NPK) uptake, better soil cover, and less surface movement of nutrients and soil.

- **THAT** potash helps stretch water for thirsty crops through a greater root system that can tap a larger volume of soil for water.

- **THAT** soil and plant tests uncover needs BEFORE profit-eating hunger sets in, supporting the idea of modern diagnostic farming.

". . . the prosperity of the consumer is the best assurance of the prosperity of the producer. We should act accordingly."
Dr. J. Fielding Reed
Institute President, 1963—

Communication

....to tell the need

POTASH INSTITUTE of NORTH AMERICA has distributed over 24,400,000 publications . . . on market-stretching themes around the world.

- **Some 40 publications** are created in a given year . . . from reprint-folder and newsletters to place mats and fertilegrams. Requests have consumed more than 1,000,000 copies in recent years.

- **17 color slide sets,** teaching everything from hidden hunger detection to K in high-yield farming, are maintained and updated as methods demand. About 1,000 sets will be used each year.

- **Two movies**—on **Alfalfa** and **K for Agriculture**—are viewed by about 50,000 people in a given year.

- **Press and radio-TV aids:** (1) Fertilegram Kits answering fertility questions in such journals as Penn. Farmer, Tenn. Cooperator, and Prairie Farmer; (2) **Radio Tapes** used by 138 stations in 23 states.

- **The 49-year-old magazine,** BETTER CROPS with PLANT FOOD, has published 3,730 reports read by agricultural leaders in **40 nations.**

From NEW uptake kit: **(21 questions and answers)**

From NEW target yields kit: **(12 questions and answers)**

OTHER FERTILEGRAMS ON PAGE 25

Table 2. Fixed and Variable Costs of Production of N-Fertilized Orchardgrass

Annual cost items	Pounds Nitrogen Applied Per Acre 0	62.5	125	250	500	1000
	DOLLARS PER ACRE					
Fixed costs						
Land	40.00	40.00	40.00	40.00	40.00	40.00
Harvest	26.50	26.50	26.50	26.50	26.50	26.50
Total Fixed	**66.50**	**66.50**	**66.50**	**66.50**	**66.50**	**66.50**
Variable costs						
Establishment	3.00	3.00	3.00	3.00	3.00	3.00
Fertilizer[a]	6.60	20.59	30.84	47.35	72.38	121.25
Harvest	3.62	6.12	8.82	12.30	13.42	12.78
Total Variable	**13.22**	**29.71**	**42.66**	**62.65**	**88.80**	**137.03**
TOTAL ANNUAL COST	79.72	96.21	109.16	129.15	155.30	203.53

[a]Replacement cost of P and K removed in forage in addition to cost of N.

from page 15
uted only 4% of the annual yield, it is questionable whether this cutting is economical.

WE NEED more research to determine the most profitable number of cuttings. Number of cuttings affects the cost of harvesting, the quantity of forage harvested, and the nutritional value of the harvested forage. So, a compromise must be made between production costs and value of the forage harvested to secure highest net return per acre.

The crude protein concentration of orchardgrass ranged from 9.2 to 24.5% on a hay basis. It increased with level of N applied and also tended to increase with later cuttings. This suggests forages produced in later cuttings had a higher nutritional value. We should remember it takes less of the higher crude protein hay to meet the protein requirements of livestock.

Protein is one of the most expensive nutrients in a ration. So, N fertilized grasses with their higher protein concentration are more valuable per ton!

Table 1. Nitrogen Fertilization Increased Per Ton Value Of Orchardgrass Hay.

Pounds Nitrogen Applied Per Acre 0	62.5	125	250	500	1000
Dollars Per Ton					
23.90	**23.82**	**24.76**	**27.15**	**31.33**	**33.37**

For example, **Table 1** shows how the value of a ton of orchardgrass hay increases with N application. This increased value per ton was most pronounced at the higher N rates. The lack of N response (based on hay value per ton) at low N fertilization rates is due to the presence of volunteer clover which disappears with N rates under hay conditions.

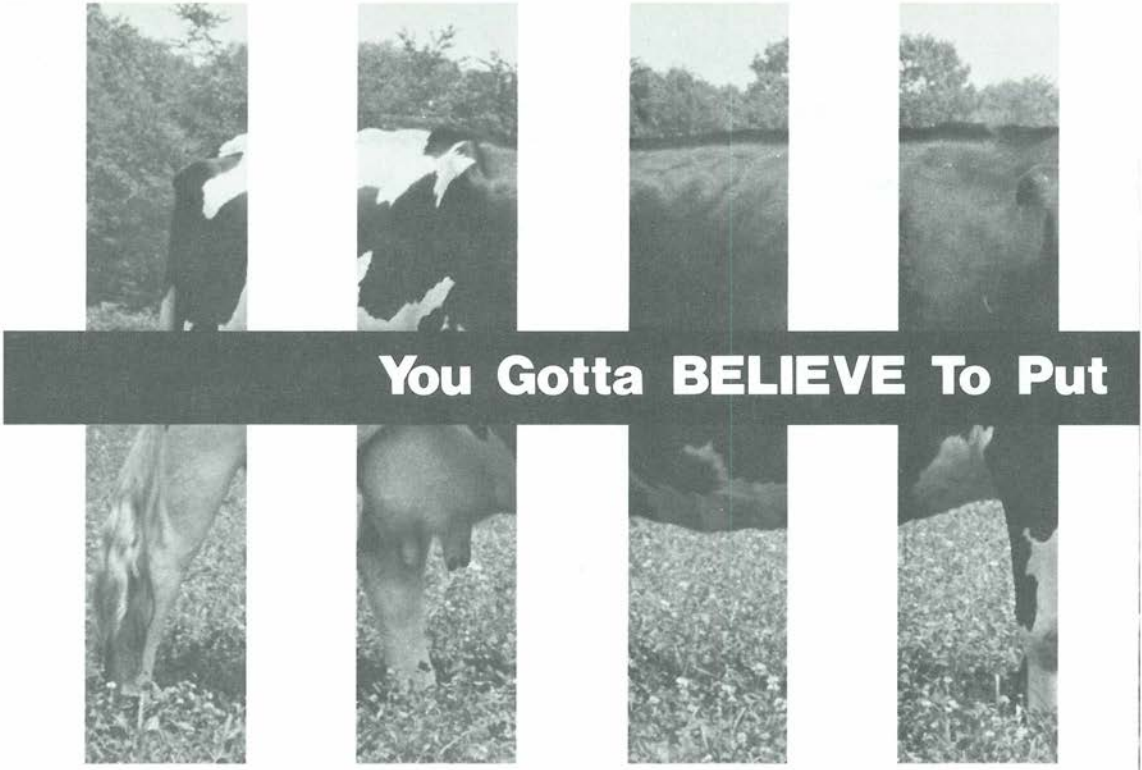
Figure 2 shows annual production cost and annual hay value. **Table 2** shows the method of calculating annual production cost.

On the farm these costs would decline because only one or two cuttings would be taken instead of five. At 0 and 62.5 lbs per acre N rates, the cost of producing the hay exceeded its harvested value.

The 500 lbs per acre N brought maximum return—$55.72. Because of the wide range of N rates in this experiment, we need further research to pinpoint the most profitable N application on orchardgrass.

WE CONCLUDE from this study that N fertilization does increase yield, crude protein concentration and profit from orchardgrass hay. For top yield and return, we believe the crop needs 300-500 lbs N per acre each year.

And don't forget the higher crude protein concentration in the hay at higher N rates requires less hay to meet the animal's protein need. **THE END**



You Gotta BELIEVE To Put

NIVEN MORGAN
SHREVEPORT, LOUISIANA

TO SELL a forage program you must BELIEVE in it. You cannot sell it if you do not believe in it.

I once heard a Dean of Agriculture say to a couple of people working with forages, "You are not selling a forage program because you do not believe in it strong enough yourselves." I knew the two men well and the Dean told them the truth.

To sell a forage program you have just about got to eat it, drink it, sleep it and talk it so much that some people may think you are a fanatic.

It is much harder to sell a money making pasture program than it is to sell a cotton program . . . or a corn program . . . or a soybean program because pastures call for more important decisions—**WHEN** to graze, **WHEN** to rotate, **WHEN** to make hay in the rotation, etc.

To be a good forage man, you must be dedicated to the subject and not just a "job filler." You must be a salesman of "money making" forage information. Just passing out information from a book or bulletin won't do the job.

TOO MANY BOOKS and too many bulletins don't contain the real money making information farmers need. Most publications don't offer the key points involved in profitable forage programs.

Yes, there is some very good research information—but also many publications of no value except for the authors to add **to THEIR LIST OF PUBLICATIONS.**

This reminds me of a recent note I received from a farm magazine editor. An enclosure contained the results of a forage experiment. The results showed the unfertilized pasture to be more profitable than the fertilized pastures. The editor wanted my comments.

In checking the experiment, I found they used the same stocking rate on both pastures—the fertilized and unfertilized.

A Forage Program TOGETHER

A veteran pasture doctor tells it like it is . . . after 32 years serving Southwest agriculture . . .

Apparently the researcher had not yet learned that forage must be **USED** in order to make a profit. Extra cattle were not used to utilize the extra forage from fertilization. Therefore, fertilization did not pay according to the conditions of that experiment. I know many more such publications. They are holding back money making forage programs.

I think people working with forage programs should have enough experience in the field working with cattle and forages that they can properly evaluate the difference between good research and poor research—and not accept it as a fact just because some researcher conducted an experiment.

GOOD RESEARCH is priceless when used along with field experience in observing forages and cattle. A few years ago, some of us interested in forages were discussing the subject. Data showed that most of the farmers of the area were using 3-5 acres of land or more per brood cow, or brood cow equivalent.

Considering these stocking rates and the low percentage calf crop, it was easy to determine that most livestock producers were not making any labor-management income. They were selling only 15-25 calves per 100 acres of land.

By searching far and wide we found information showing a brood cow with calf needed about 6 tons of high quality forage to meet their yearly nutritional needs. We, also, found facts showing we could grow this amount of forage per acre on most of our soils with high fertilization.

With this information we believed that a farmer should be selling 90 calves or more per 100 acres of land instead of his present 15 to 25. We then proposed the Extension Services and Plant Food Societies in the Southwest initiate some possible high profit forage-livestock programs.

We suggested 30 brood cows with 30 calves and one bull be placed on 30 acres of land divided into 3 ten-acre pastures. These pastures were to receive **TOP** fertilization and **TOP** management. We asked the soil test people to recommend high enough fertilizer rates to make sure fertility would not be a limiting factor.

IT WAS AGREED such a program had a lot of potential and the team approach was best. Texas received the first demonstration. The Extension Director suggested the use of a Forage Crops Specialist, a Beef Cattle Specialist, and a Farm Management Specialist along with a representative of the Plant Food Society to serve on the team to plan and conduct the demonstration.

The Plant Food Society agreed to pay half the cost of the fertilizer the first two years of the demonstration. The farmer would pay all other costs—including lime, fencing, seeding, water, etc.—and take care of all fertilizer costs after the first two years.

Extension District Agents selected the counties for the demonstrations. The pasture committee, assisted by the county agent, selected the farmer who would be the demonstrator.

We knew each demonstration would demand much supervision. So, only a few demonstrations were set up. They were so successful that the committee soon had a long list of requests for more demonstrations.

Similar programs were launched in Arkansas and Louisiana. In some cases, local business organizations—banks, news media, radio, TV, fertilizer manufacturers, etc.—contributed needed finances instead of the Plant Food Societies to help the demonstrations. Local contributions work very well because it gets agri-business people involved in the program.

The Extension Service has always served as the official agricultural leader.

OUR LARGEST demonstration now features 500 cows and 500 calves on 500 acres. We have requests for 2 other large demonstrations to be about 100 acres each and one for 700 acres. No financial aid has been requested or given in these large demonstrations. The smaller demonstrations proved so profitable that farmers now ask for these large demonstrations just to get the technical help.

Most of our cow-calf demonstrations make a profit of $50-$75 per acre. The stocker grazing program, winter grazing of weaned calves, makes about $100 per acre.

We use these demonstrations for Field Days and tours. And our Farm Management Specialists and Agronomists put the results into information packages that are selling a real forage educational program in the Southwest.

Our farmers—and our agricultural leaders—have learned many things from our demonstrations. We have learned that a top fertilization program is a **MUST** if we expect to grow a profitable quantity of high quality forage. We have, also, learned the forage must be USED to be profitable—**and when we use it, we don't kill it.**

Our demonstrations have proved we can stock our pastures at **a cow and calf per acre and in some cases at a higher stocking rate,** on most of our soils.

The good nutrition provided by the pasture demonstrations increased percentage calf crops from 70-75 percent to above 95 percent.

THESE SOUTHWEST pasture demonstrations have shown agricultural leaders and farmers that good fertilization of forages plus good management **(utilization while young and tender)** produces a stocking rate of 100 brood cows on 100 acres of land with a 20-25 percent increase in calf crop.

Under this program, farmers are selling 95 or more calves per 100 acres of land instead of the usual 20 to 30 calves per 100 acres.

The secret is out. You must fertilize to utilize and utilize what you fertilize. **THE END**

FOR FURTHER DETAILS from this colorful pasture scientist, you can reach him at the following address:

Dr. N. D. Morgan
2036 River Road
Shreveport, Louisiana 71105

MORE THAN 111,000 COPIES . . .

. . . were pre-ordered by organizations and individuals in 48 states and 9 other nations.

This pocketbooklet contains many facts for people alarmed by what they think agriculture is "doing" to our environment . . . alarmed from hearing so much of ONE side of a question that has TWO sides. This booklet gives some of AGRICULTURE'S side . . . in compact form . . . to place at industry, farm, professional, and civic club meetings and dinners . . . to serve students as a text supplement . . . to enclose with mailings . . . and to provide facts for talks, newspaper columns, and radio spots. The 124 questions and answers cover a wide range—from the threat one scientist calls "people-lution" to the role of nature as a major polluter.

The booklet reports many ways modern fertilizer protects the environment—from reducing sediment runoff with lush growth to freeing many acres to stay in forests, parks, and natural state. It shows why every second or third tomato and potato crop could be wiped out, and oranges and grapefruit could become curiosities without pesticides.

It brands weeds as one of the worst forms of pollution, taking Nancy Lincoln's life when Abe was her baby boy and still costing today more in lost yields, quality, and control steps than all insects, plant diseases, and animal pests combined.

The booklet cites tests showing little relation between nitrogen fertilizer farmers apply and nitrate levels in rivers. It reports studies showing Vitamin C and other elements to be the same in crops whether grown organically with manure or grown with chemical fertilizers.

It documents why America would starve to death if U.S. farmers had to depend on the nation's animal wastes and domestic sewage—all of it—to fertilize their crops, and it shows a startling contrast in food quantity and quality produced on experimental plots called Nature's Acre and Today's Acre.

It concludes with a very brief look at why modern agriculture is appreciated so little by so many who owe it so much—especially the four freedoms of manpower, income, time, and space.

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40 x 80 Is Coming

FORTY BUSHELS per acre by 1980 is a realistic production goal for the U.S. soybean industry—and ESSENTIAL if we are to maintain our present leadership in meeting competition in world protein and oil markets.

The demand is strong and will continue to grow as population increases and nations improve their purchasing ability. Authorities agree there is at least a 5 bushel per acre gap nationally between production practices now employed and improvements from research.

Farmers are turning the corner toward higher yields. Only two states ever made 30 bushels per acre before 1968—Nebraska on 206,000 acres in 1958 and Texas on 72,000 acres in 1963. Since then, seven states have hit 30 to 33.5 bushels per acre—totaling 17 times **in the last 4 years** on 58.6 million acres!

Iowa has averaged 32 bushels plus 4 times; Illinois and Indiana 31.5 plus twice; Maryland, Ohio and Pennsylvania 30 bushels plus twice; and Nebraska 33.5 once.

Management is improving now that we know higher yields are possible. Double-cropping in southern states has masked yield improvements because both full-season and short-season acreage is combined to determine the annual state average yield. A separate reporting of the 2 classifications would give a more accurate picture of yield progress.

Added profits are the real reward to farmers and the agribusinesses serving them when state yields are significantly improved. The National Soybean Crop Improvement Council will honor the Extension Service in states reaching an average of 40 bushels per acre by 1980.

Condensed from SOYBEAN NEWS

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