SEE PAGE 16

Better Crops WITH PLANT FOOD

NUMBER1—1976

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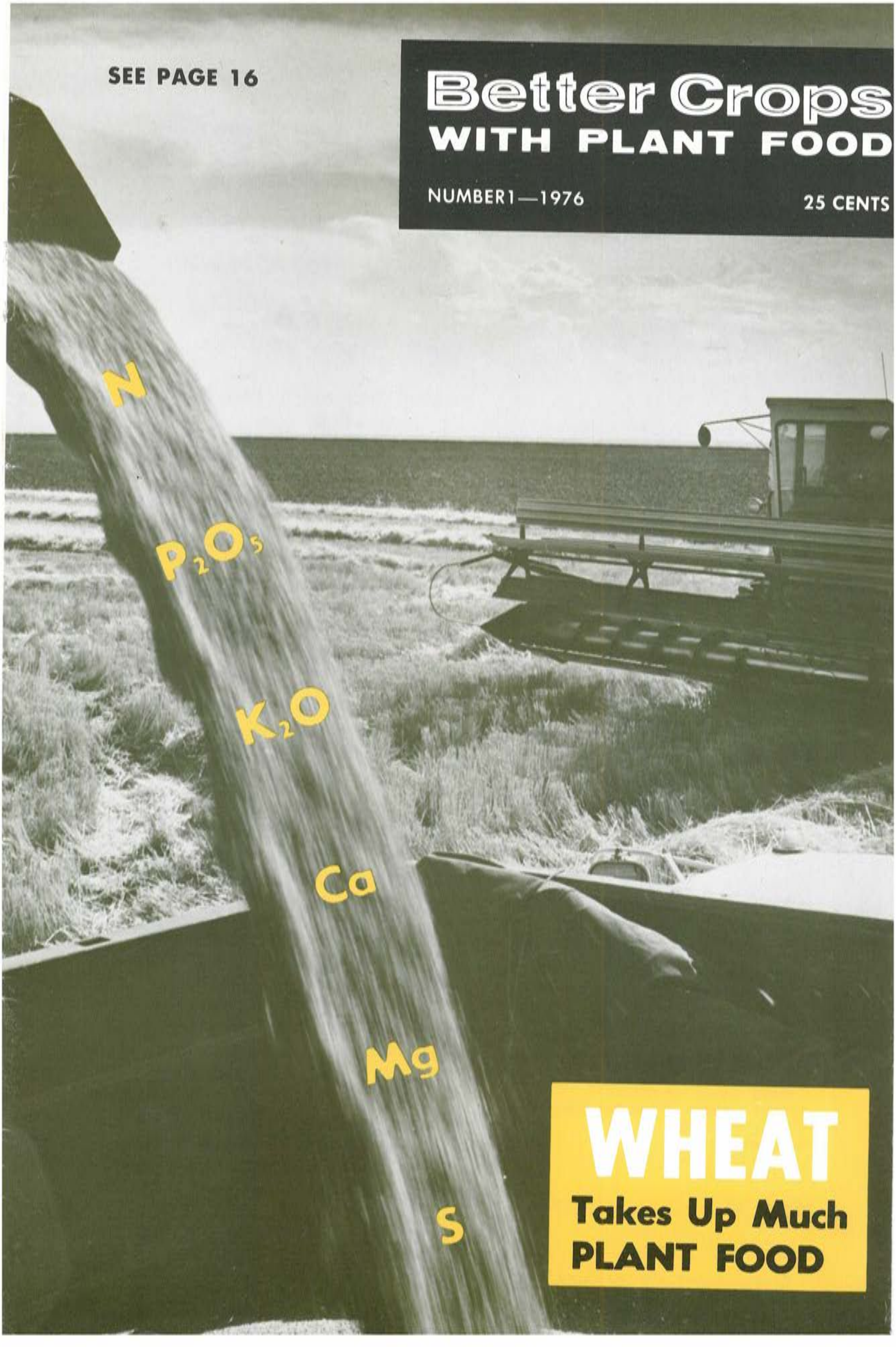

WHEAT

Takes Up Much PLANT FOOD

Better Crops WITH PLANT FOOD

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CONTENTS

P-K Fertilizer BOOSTS Soybean Nodules 3
G. D. Jones, J. A. Lutz, Jr., and T. J. Smith

Reduce Crop STRESS With Right PLANTING TIME 4
K. M. Pretty and K. B. MacDonald

Your Wheat Profit Is In The Balance 8

Your Soybean Profit Is In The Balance 9

Fertilize The Lawn . . . ALSO! 10
Robert W. Schery

NEWS & VIEWS 12

Wheat Takes Up Much Plant Food 16
Based on data of F. E. Koehler

BIFOCALS 19

Fertilizing Soybean FOLIAGE Pays 20

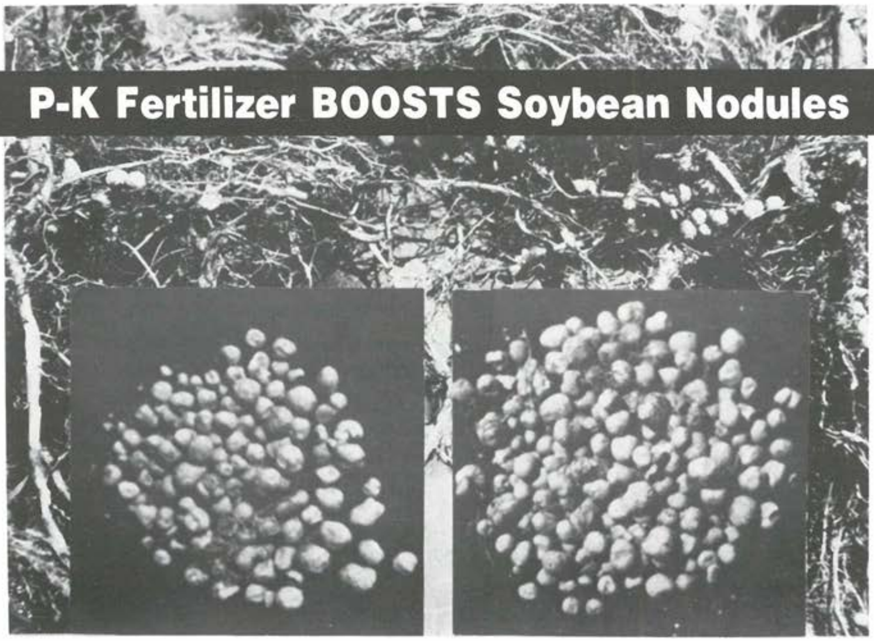
Managing For MINIMUM Harvest Stress 22
Robert D. Munson

Corn Profit Is In The Balance 29

Alfalfa Protein For HUMAN Use 30
L. D. Satterlee, J. G. Kendrick, and Kathy J. Liska

Planting DATE Can Affect Corn's RESPONSE 31
Stanley A. Barber

P-K Fertilizer BOOSTS Soybean Nodules



NO POTASH 120 LBS POTASH

G. D. Jones, J. A. Lutz, Jr., and T. J. Smith
Virginia Polytechnic Institute and State University
Piedmont Research Station

HOW DOES P-K fertilization influence soybean nodulation, so vital to ultimate yield and quality?

We are seeking the answer with York soybeans on Davidson clay loam at our Piedmont Research Station. We used 4 fertilizer treatments with 4 replicates at each of two locations. Available phosphate (P_2O_5) and potash (K_2O) are shown below:

Fertility Status of Davidson Clay Loam in Spring of 1974

Treatment (Lbs/A)		Available Nutrients (Lbs/A)	
P_2O_5	K_2O	P_2O_5	K_2O
0	0	16	76
0	120	14	151
120	0	41	73
120	120	32	145

The number of nodules in one cubic foot of soil (12 inches within the row and 6 inches deep) increased 91% with 120 lbs P_2O_5 per acre, 95% with 120 lbs K_2O, and 220% with both nutrients.

Total green weight of nodules increased 110% with 120 lbs P_2O_5 per acre, 192% with 120 lbs K_2O, and 393% with both nutrients. Dry weights of nodules were less but they paralleled green weight yields.

On unfertilized plots, green weight of each nodule averaged 13.3 mg. This weight increased 16% with 120 lbs P_2O_5 per acre, 59% with 120 lbs K_2O, and 57% with both nutrients.

This influence of P_2O_5 and K_2O fertilization on nodule number and size paid the ultimate bonus—more than 58 bushels per acre or double the check treatment. The End

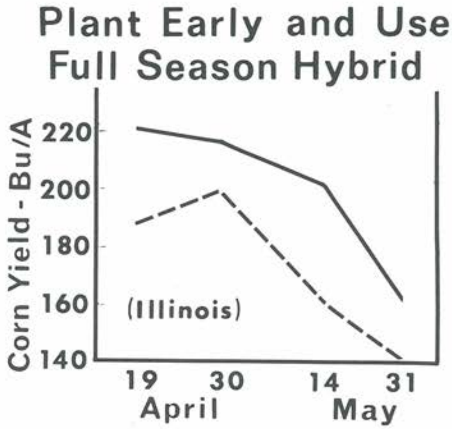


FIGURE 1

rot to damage seed. In general, however, losses are greater from delayed planting. But, generally, delayed planting causes greater losses.

In northern latitudes, it has often been said, "one good growing day in late June or early July is worth two days in late August or early September" in increased growth.

Ohio researchers boosted soybean yields from 47 to 69 bushels per acre by artificially increasing amount of light on the plants for only two weeks. That two-week period was from late flowering to early pod set.

Reduce Crop STRESS With Right PLANTING TIME

K. M. Pretty
K. B. MacDonald
Mississauga, Ontario

TIMELINESS IS CRITICAL to successful farming. When the farmer delays tillage, seeding, weed control or other operations, he usually reduces yields. The best rule of thumb for planting is "the earlier the better," especially in northern latitudes with certain exceptions. Even in northern areas, early fall frost damages crop more than late spring frosts, generally.

DOES LATE PLANTING CAUSE CROP STRESS? Stress during the germination period generally results in reduced yield. The causes of stress at this period are cold soil temperatures and excess soil moisture levels. Some crops in northern areas yield less when seeded May 1-15 than May 16-31 because cold soil and excess moisture slow germination and allow disease and

Varieties respond differently to day length. Extensive research on planting date of determinate type soybeans in southern U.S. indicates soybean height and yield can be reduced by early planting during periods when day length is relatively short. **Table 1** shows that day length, and hence planting date does not affect long season varieties as sharply, in Florida research.

Throughout much of North America,

TABLE 1—Florida

Planting Date	Hood (Early)	Bragg Midseason	Hampton (Late)
Apr. 15	32	41	41
May 15	42	44	45
June 15	34	38	42
July 15	11	28	26

the growing period is limited for full-season crops. Early planting means each possible growing day between germination and maturity is utilized. **Figure 1** shows how full-season varieties or hybrids usually outyield short-season types.

Early seeded corn is generally shorter and reaches pollination during more favorable moisture, temperature, and sunlight conditions. **Table 2** shows this increases yield by increasing grain weight per kernel and per ear, in Kentucky research.

TABLE 2—Kentucky

Planting Date	Matured Kernels No. (ear)	Grain Weight lb/ear	Grain Weight g/kernel
April 15	721	0.52	0.330
May 22	706	0.50	0.319
June 26	794	0.37	0.210

Many crops (corn, cereal grains, etc.) are very sensitive to stress during reproductive stages. Water. Fertility. Temperature. Or a combination of all three. Although moisture and temperature stresses are largely unavoidable without irrigation, early planting can lessen the effect of drought or heat.

For example, if weather records show very high temperatures and low moisture may occur from mid or late July onward, planting early for flowering and pollination to occur before this time can improve yield potential. Many corn studies have shown early planting really pays off in drought years.

Early harvesting can also lower frost damage risk, decrease field losses from inclement weather, reduce soil damage in wet fields, and give more chance for fall tillage in preparation for the next season's crop. In some cases, early harvested crops command higher prices.

PLANTING DATE AND CROP YIELD. Spring-seeded cereals are very sensitive to planting date. Small grains are more of a cool-season crop. With early seeding, tillering is increased, plants are sturdier and can use more nutrients, especially nitrogen, without lodging. **Figure 2** shows how oat yields declined as planting date grew later.

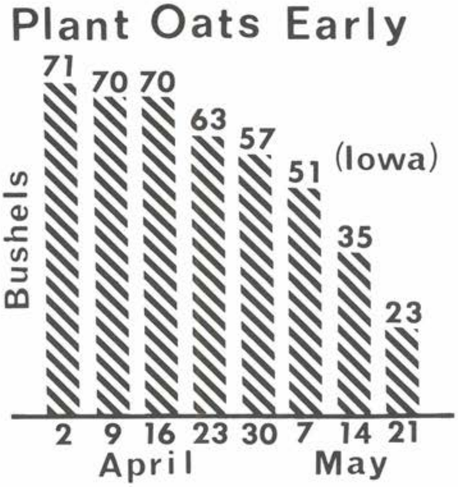


FIGURE 2

Planting date influences both corn grain and corn silage yields. Many studies have shown grain yields declining at least one bushel per acre per day after the "best" planting date for a region.

Figure 3 shows silage also declining.

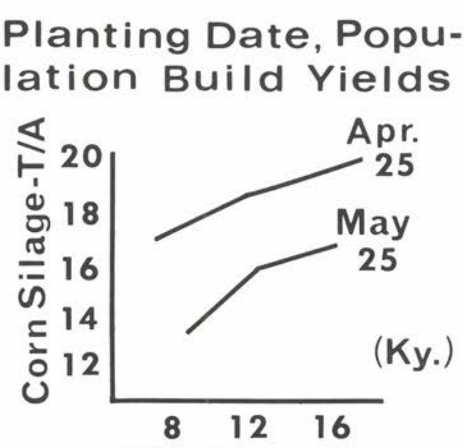


FIGURE 3

Shorter, sturdier stalks from early planting mean higher plant populations to further increase yields. Planting date is only one factor involved in producing high soybean yields. **Table 3** shows right planting time and top management can give yields well above national averages.

TABLE 3—Illinois

Variety	May 7	May 21	June 8	July 19
		Soybean Yield bu/ac		
Corsoy	56	62	49	42
Calland	56	51	47	40

PLANTING DATE AND CROP QUALITY. With grain and silage crops, shorter stalks or straw can be more than compensated by an increase in grain yield. **Table 4** shows how important this is in producing quality silage.

TABLE 4—Indiana

Planting Date	Yield T/A	% Grain
April 26	23	52
May 9	23.5	54
May 22	21.9	47
June 3	21.5	43

Table 5 shows how early planting increased cotton yields and quality—lint yield, fiber length, and strength.

PLANTING DATE AND OTHER STRESSES. Early planting usually decreases lodging. This may result from a shorter, sturdier plant, with a better root system. Or from a decrease in disease or insect infestations.

Kansas research showed a 25 percent infestation of southwestern corn borer when corn was planted April 14, 64 percent from a May 26 planting. **Table 6** shows how delayed planting increased European corn borer and earworm infestations on 4 hybrids of differing maturity over a 9-year period.

TABLE 6—Missouri

Planting Date	Tunnels per 10 Plants	Earworm Penetration*
Apr. 1	23.9	2.5
Apr. 20	27.1	2.7
May 10	44.1	3.6
June 1	60.6	4.5
June 20	69.0	4.5

*1 (low) to 5 (high)

Figure 4 shows how stronger plants, with less insect damage, suffer less lodging.

PLANTING DATE AND NUTRIENT RESPONSE. Right planting time improves potential response to applied nutrients. **Table 7** shows how early planting dramatically increased corn yields and increased the response to larger applications of nitrogen.

TABLE 7—Illinois

Nitrogen Applied (1b/A)		Corn Yield (bu/A)		
Plowdown	Sidedress	Apr. 17	May 17	June 17
120	0	138	136	67
120	120	155	142	68

In a nine-year study, stress from late planting reduced yields and response to

TABLE 5—Texas

Planting Date	Yield Lint kg/ha	Lint %	Fiber Length (in)	Fiber Strength gf/tex	Micronaire Units
Apr. 20	1077	24.3	0.96	15.9	3.65
June 1	907	22.6	0.95	16.0	3.28
June 10	751	21.6	0.93	16.3	3.32
June 20	494	18.3	0.92	16.4	3.03
June 30	254	14.2	0.90	16.8	2.47

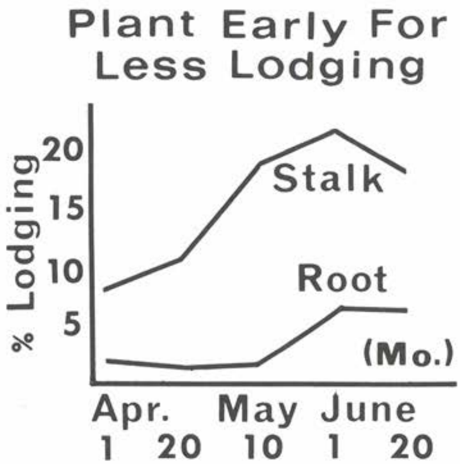


FIGURE 4

potash. **Table 8** shows what happened.

TABLE 8—Indiana

Planting Date (Avg.)	Corn Yield (bu/A) −K	+K
Apr. 26	116	142
May 7	116	141
May 21	113	132
June 2	105	116

Without added potash, delayed planting reduced yields up to 10 percent. But the combination of delayed planting and no applied potash reduced yields 37 bushels or 26 percent.

This interaction between planting date and nutrient response is not unusual. Higher yields require more nutrients. Also, **Table 9** shows how adequate nutrition influences grain formation and development processes.

Planting date had little influence on grain filling period, but a delay in planting reduced amount of grain produced per day. Potash fertilization lengthened filling period and increased the grain production rate.

The combination of two stresses, delayed planting and low potassium, reduced yields from 170 bushels to 125 bushels—a 26.5 percent decrease.

Studies in North Dakota and Canada demonstrated that early seeded barley gave greater responses to both N and K than barley seeded two weeks later. The proportion of plump kernels was also increased by early planting and adequate fertilization.

Early planting means seeds must germinate in cooler soils. In most cases, moisture content of the soil will be relatively high. Nutrient availability to the seedling is usually lower with cooler spring temperatures.

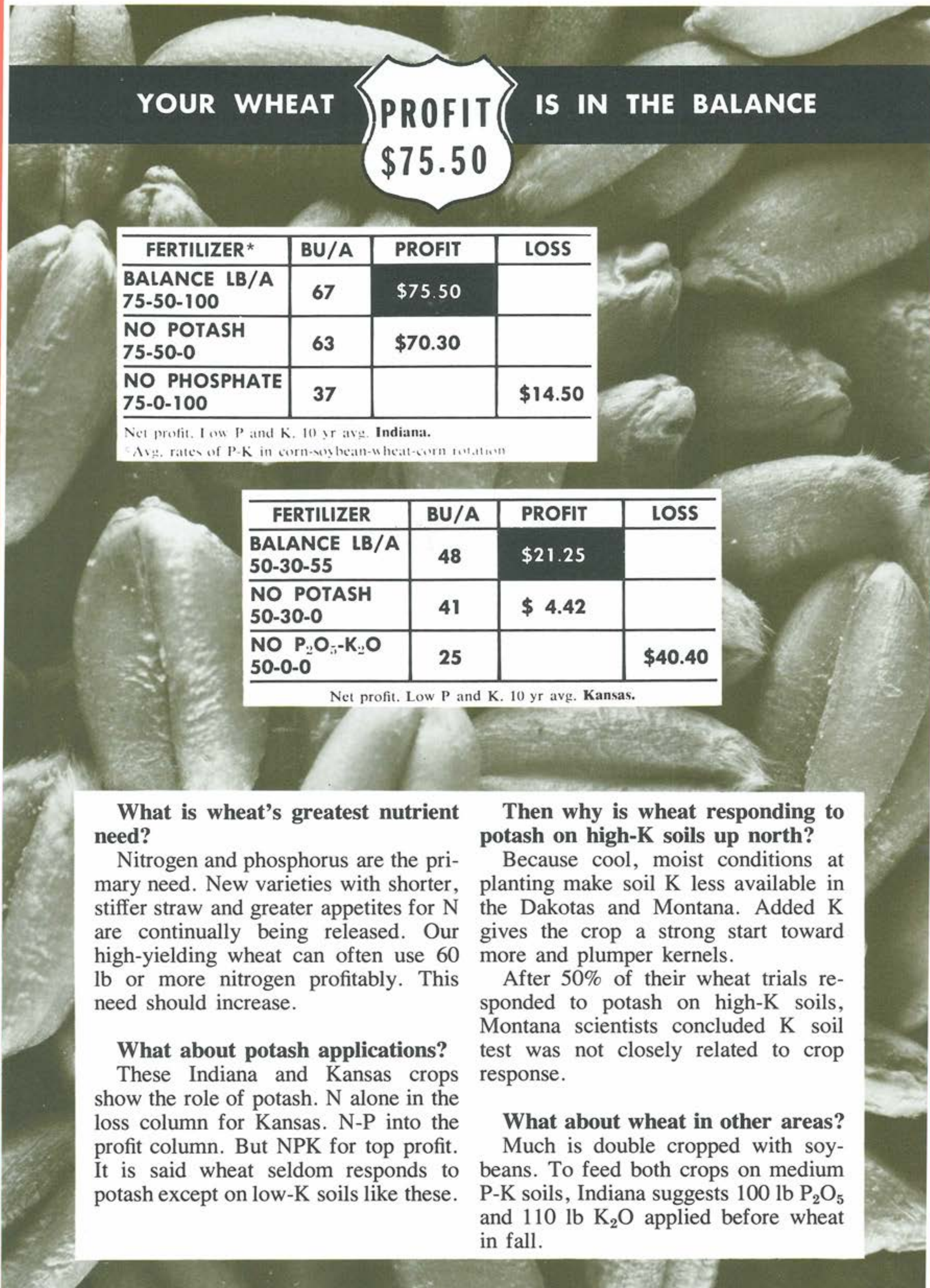
Applying some fertilizer close to, or in contact with, the seed can give faster initial growth and increased yields when crops are planted early.

In some regions, especially in cooler latitudes, some fertilizer at planting time is recommended regardless of the levels in the soil or the amounts applied as plowdown or broadcast applications.

IN SUMMARY. Untimely planting can place a crop under severe stress resulting in lower yields and profits. The pay-off from planting on time comes from: **(1) Better yields. (2) Improved quality. (3) Greater response to fertilizer. (4) Higher profits per acre. The End**

TABLE 9—Kentucky

K_2O Applied (lb/A)	Grain Fill Period (days) Apr. 6	May 26	Grain Produced (bu/A/day) Apr. 6	May 26	Corn Yield (bu/A) Apr. 6	May 26
0	55	56	2.58	2.23	142	125
60	61	62	2.54	2.45	155	152
240	62	63	2.74	2.48	170	156



YOUR WHEAT PROFIT $75.50 IS IN THE BALANCE

FERTILIZER*	BU/A	PROFIT	LOSS
BALANCE LB/A 75-50-100	67	$75.50	
NO POTASH 75-50-0	63	$70.30	
NO PHOSPHATE 75-0-100	37		$14.50

Net profit. Low P and K. 10 yr avg. **Indiana.**
*Avg. rates of P-K in corn-soybean-wheat-corn rotation

FERTILIZER	BU/A	PROFIT	LOSS
BALANCE LB/A 50-30-55	48	$21.25	
NO POTASH 50-30-0	41	$ 4.42	
NO P_2O_5-K_2O 50-0-0	25		$40.40

Net profit. Low P and K. 10 yr avg. **Kansas.**

What is wheat's greatest nutrient need?

Nitrogen and phosphorus are the primary need. New varieties with shorter, stiffer straw and greater appetites for N are continually being released. Our high-yielding wheat can often use 60 lb or more nitrogen profitably. This need should increase.

What about potash applications?

These Indiana and Kansas crops show the role of potash. N alone in the loss column for Kansas. N-P into the profit column. But NPK for top profit. It is said wheat seldom responds to potash except on low-K soils like these.

Then why is wheat responding to potash on high-K soils up north?

Because cool, moist conditions at planting make soil K less available in the Dakotas and Montana. Added K gives the crop a strong start toward more and plumper kernels.

After 50% of their wheat trials responded to potash on high-K soils, Montana scientists concluded K soil test was not closely related to crop response.

What about wheat in other areas?

Much is double cropped with soybeans. To feed both crops on medium P-K soils, Indiana suggests 100 lb P_2O_5 and 110 lb K_2O applied before wheat in fall.

YOUR SOYBEAN PROFIT $79.40 IS IN THE BALANCE

FERTILIZER*	BU/A	PROFIT	LOSS
BALANCE LB/A 0-50-100	50	$79.40	
NO PHOSPHATE 0-0-100	42	$51.00	
NO POTASH 0-50-0	40	$40.00	

Net profit. Low P and K. 10 yr avg. **Indiana.**
*Avg. rates in corn-soybean-wheat-corn rotation.

FERTILIZER	BU/A	PROFIT	LOSS
BALANCE LB/A 0-30-120	45	$54.00	
NO PHOSPHATE 0-0-120	37	$21.60	
NO POTASH 0-30-0	26		$26.40
NO P_2O_5-K_2O 0-0-0	24		$30.00

Net profit. Low to med P & medium K. 3 yr avg. **Virginia.**

Are phosphate and potash a good team for soybean profits?

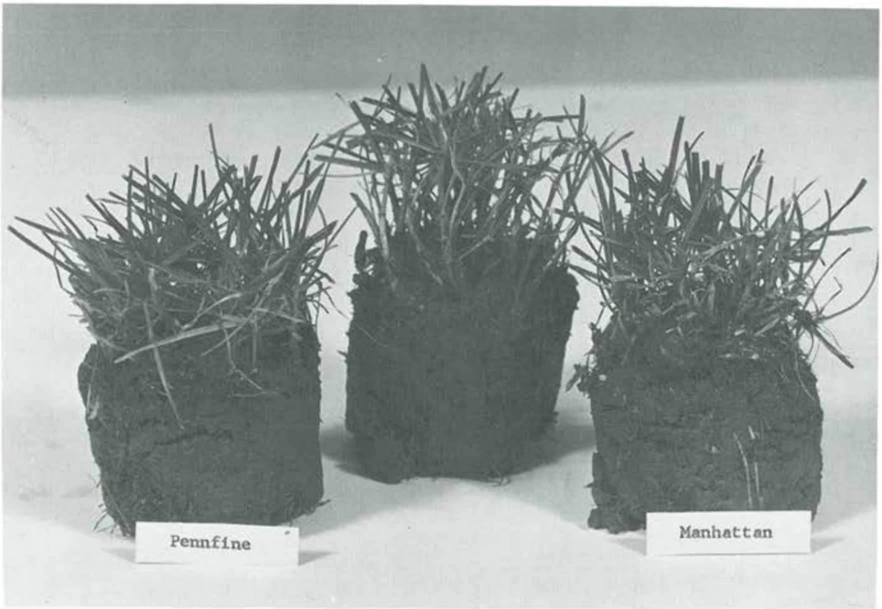
Yes, when there's enough potash. That often means 2 to 4 times more potash than phosphate, depending on soil, weather, and other conditions.

Soybeans have a high need for potash, understandable when a 50-bu crop removes about 40 lb P_2O_5 and 70 lb K_2O just in the beans.

The Virginia crop (above) needed a high potash program to net $54/A in a 3-year trial. A remarkable average since one of the years was dry. The Indiana crop (above) proved the value of P-K for soybeans in a corn-soybean-wheat-corn rotation.

What about nitrogen needs of soybeans?

They get much of their N from the air by root nodules—and leave about 1 lb N per bushel behind for next crop. These "nodule factories," so vital to soybean yields, have been doubled in number and tripled in weight by the P-K team in research trials.



These Pennfine and Manhattan plugs represent two of the "turf-type" perennial ryegrasses typical of the fine new cultivars offered today. They are lower, denser, more disease-free than the traditional center plug. And they deserve properly balanced fertilization.

Fertilize The Lawn . . . ALSO!

Robert W. Schery
The Lawn Institute

LAWN FERTILIZATION is more important than ever—because fine, newly bred varieties can now take full advantage of fertilization.

Remember when lawns consisted of little more than volunteer growth in winter and mostly crabgrass in summer? Even then fertilizer made things look "prettier" but contributed only modestly to turf quality.

Times have changed. Today the alphabet is filled with named varieties bred especially for turf, running from A (Adelphi) to Y (Yorktown). And there may be a Z around somewhere. Who knows?

These hybrids and selections have special capability built into them, not unlike high yielding grains. But they give us their fullest "talent" only when they are adequately fertilized—just like agricultural crops.

This does not mean wasteful fertilization. It means wise use according to need. A soil test tells phosphorus and potassium needs and you can bet nitrogen will be needed (and quickly recycled) with any "crop" from which you want plenty of green leaf.

An NPK ratio around 5-1-2 or 5-1-3 seems appropriate in most cases, except where regional and climatic soil differences dictate otherwise. Lawn-grass foliage contains approximately this proportion, as the table shows:

	Merion Bluegrass	Pennlawn Fescue
N	3.79%	3.48%
P	0.49%	0.60%
K	2.19%	2.32%

Five major turf fertilizer companies have 27-3-9, 34-3-7, 19-5-9, 18-4-10, and 22-4-4 as their lead brand.

Why the relatively low need for phosphorus? Partly because this nutrient has been repeatedly applied through the years and because it holds onto many heavier soils. But it does leach out of acid sandy soils.

THE NEW LAWNGRASSES are not gluttons, though some of the earlier selections were heavy feeders—such as Merion bluegrass, still great for turf quality where diseases are not a problem.

Considering 4 lbs N per 1,000 sq. ft. annually "normal" feeding for bluegrass (maybe a bit light for bermudagrass and a bit heavy for centipede and fescue), we cut rations in half on Lawn Institute test grounds during 1975. It seemingly showed no serious disadvantage to new cultivars.

But averaging only one-quarter lb N per 1,000 sq. ft., as Dr. Waddington reported prevailing in Pennsylvania and Virginia, is far below adequate.

An Ohio Field Day in Columbus showed the quality of many cultivars deteriorating markedly when fertilizer was skipped. But most of the newer releases were outstanding when they received traditional fertilizer rates.

Lawngrass is a crop that must return satisfaction and beauty rather than yields and salable produce. This makes it hard to pinpoint optimum fertilization. But we do know good grasses, well nourished, "pay for themselves" by producing a turf that demands less repair and contributes more to environmental quality than neglected areas.

NITROGEN INFLUENCE in lawn fertilization is too obvious to need much comment. It stimulates growth, especially foliage. It gives the deep, rich color so admired in thriving lawns.

PHOSPHORUS INFLUENCE is vital to sound root production. It encourages seedling grass. To "bring up" a new seeding, anything less than 30 lbs phosphorus per acre is usually inadequate.

POTASSIUM INFLUENCE is subtle and more important than many realize. It helps plant "tone" in many ways. It insures hardier, stiffer, less disease-prone growth. Potassium helps reduce damage from disease in humid climates where contagion is a constant threat, as cited by Drs. Goss and Gould in the Pacific Northwest and Dr. Horn in Florida.

Potassium is weakly fixed to soil particles, so it can be displaced by other ions. This makes it pointless to try to build up huge reserves of K. The best practice is to add potassium from time to time whenever rainfall or irrigation causes leaching.

People want a uniform, dense, green turf for home and recreation areas. Omit fertilizer just one year and see what happens. Just one season and you'll SEE the value of regular, consistent fertilizer application for good turf.

New lawngrasses are always coming along—sometimes with new "talents." But always with an appetite for sound fertility. **The End**

NEWS & VIEWS

W. K. Griffith, 865 Seneca Road, Great Falls, Va. 22066 .... Phone: 703-450-4835

SOYBEAN GROWERS must make money. To do it, successful growers set optimum yield goals . . . for THEIR soil resources. Then they give those resources what they need to do the job.

TOP-profit yields use land, capital, and management much more efficiently than average or low yields. Why? Because they spread FIXED COSTS across more bushels. Look at these Illinois soybeans. As good fertility-management increased yields 67%, the costs per bushel decreased 39%.

Soybean Yield bu/A	Cost Per Bushel
30	$6.55
40	5.00
50	4.01

High yields hammer down costs. The grower certainly has a better CHANCE to make more money through high-yield management.

LOOK AT THIS EXPERIMENT on a Davidson clay loam testing low to medium P_2O_5 and K_2O at Orange, Virginia. The highest-producing fertilizer was an 0-1-4 ratio, clearly reflecting the high potash needs of soybeans.

Fertility Treatment Lb/A		Yields 3-Year Avg.
P_2O_5	K_2O	Bu/A
0	0	24.1
120	30	39.0
30	120	43.7
120	120	45.6

SOIL FERTILITY is a vital key—both the fertility in the soil and the fertilizer applied. Vital to soybean yield and profit. How vital? A 50-bushel crop per acre will take up about 50 lb P_2O_5 and 125 lb K_2O. Or, 1 pound P_2O_5 and 3.5 pounds K_2O for every bushel of soybeans produced. Shortchange these soil fertility needs and yields suffer, quality declines, and profit drops.

Long time fertility studies in a crop rotation of corn-soybeans-wheat-corn points out the importance of balanced fertility on this Indiana silt loam soil.

Fertility Rate* P_2O_5	K_2O	Soybean Yield Rotation
......lb/A......		Bu/A
0	100	42
50	0	40
50	100	50

*Average rate applied in the rotation

WHAT ABOUT NET DOLLARS returned per acre? Much of that depends on the price the farmer gets for his crop. This becomes clear when we convert Virginia's agronomic returns into economic returns:

1—A $1 change per bushel in price affects net returns—dramatically.

2—Fertilization and yield level affect net returns—dramatically.

Fertilizer Rate		Yield	Net Return Per Acre Various Soybean Prices		
P_2O_5	K_2O	bu/A	$3.50	$4.50	$5.50
0	0	24.1	$−40.65	$−16.55	$ 7.55
120	30	39.0	−15.20	23.80	62.80
30	120	43.7	11.15	54.85	98.55
120	120	45.6	− 0.20	45.40	91.00

*Production costs used were $125 per acre plus $.20/lb P_2O_5 & $.09/lb K_2O.

NOTE $2/BU CUSHION just for using the right type and amount of fertilizer. Without fertilizer, a farmer must average $5.20 per bushel just to break even over the 3-year period on this type soil. **With 0-30-120 fertilizer,** the grower could receive $3.25 and break even.

Soybeans contain high nitrogen, much of it from the air through root nodules. And the P-K team is vital to these "nodule factories." In the trial (ABOVE), adequate P and K more than doubled nodule numbers (up 220%) and nearly quadrupled their weight (393%).

Fertilizer prices also fluctuate. But potash price changes would not affect net return too dramatically because K_2O is a rather small percent of total input cost. In the example (ABOVE), potash in the top-profit fertilizer (0-30-120) represented 7.6% and phosphate 4.2% of total production costs.

Fertilization is a relatively small item in the soybean production cost package—with the value of a diamond when adequate.

LOOK AT THIS EXPERIMENT on a Freehold Sandy loam soil, releasing about 125 lbs K_2O per year in New Jersey. This table shows 1974 yields in this on-going trial:

K_2O Rate	Soybean Yield*
lb/A	bu/A
0	50.6
100	55.5
200	58.2

*Yields presented are an average of three P_2O_5 rates 0, 50 and 100 at each of the K_2O rates shown. P_2O_5 application did not affect yield significantly.

Even on the no-K_2O plots, yields averaged 50.6 bushels per acre—almost double state average. So, this was good K soil. Yet, 100 lb K_2O added 4.9 bushels per acre. For a $9 investment in potash, the grower could get back $22.05 when soybeans sold for $4.50 a bushel. If you include $1 to harvest the extra yield, that gives 120% return on the potash investment.

Where else can growers get such a return? Not in 5 to 10% bank and bond notes. Even the 200 lb K_2O rate returned 27% on the potash investment . . . **on this high K-releasing soil.**

Ohio work shows the importance of K in both the quantity and quality of soybeans produced. Without K, the crop produced 38 bushels per acre, with 31% of the seeds moldy. With 125 lbs K_2O/A, yields climbed to 46 bushels per acre, with only 12% moldy seed.

	Fertility Rate (lb/A)		Yield	Moldy Seed	Seed Size
P_2O_5	K_2O	Mn (bands)	bu/A	%	gm/100 seeds
46	0	6	38	31	18.0
46	60	6	45	21	19.1
46	120*	6	48	12	20.0

*Potash application split with 60 lbs/A applied sidedressed at layby.

These results agree with Delaware work where gray-moldy soybean seed declined with KCl and/or K_2SO_4 from 87% to 13% for Delmar variety from 62% to 14% for Wayne.

LOOK AT 7 OTHER SOYBEAN TESTS where response to potash (K_2O) was greater than phosphate (P_2O_5) in all 7 cases. Under these conditions, it seems clear that best or optimum fertilizer ratio for soybeans is wider than 0-1-1:

Experiment Location	Soil Type	Study Year	Levels at Optimum Dollar Return Per Acre Yield (Bu/A)	K_2O (Lb/A)*	Soil Test
Orange, Va.	Davidson	3	45.6	120*	L-M
Orange, Va.	Davidson	3	43.7	120*	L-M
Warsaw, Va.	Sassafras	6	34.2	400*	L
Adelphia, NJ	Freehold	1	58.2	200*	H
Adelphia, NJ	Freehold	2	55.1	100	M
Salisbury, Md	Evesboro	1	32.8	80*	L
Plymouth, NC	Portsmouth	7	40	40*	M

*The top K_2O rate used in the experiment.

Soybean growers can HOPE FOR good weather and moisture at seeding.
Soybean growers can HOPE FOR good rains through the growing season.
Soybean growers can HOPE FOR no extended droughts.
Soybean growers can HOPE FOR sunny and warm days.
Soybean growers can HOPE FOR better crop prices, lower production costs.
But, without ADEQUATE fertility the HOPED-FORS are HOPELESS.

NEW WHEAT UPTAKE

FOLDER

Pinpointing nutrients high yielding wheat takes up while it grows. During 4 stages of growth—tillering, boot, milk, mature.

Order on page 28.

OFFICIAL RESEARCH YIELDS MOVE SOYBEANS TO HIGH LEVELS—1975

State	Researchers	Variety	Planting	Rows	Other Steps	Fertility	Yield
Indiana Lafayette	M. L. Swearingin	3 Varieties	May 9	8″		**pH 6.7**	82.0
Illinois Urbana	R. L. Cooper	Corsoy	May 6	7″	200 lbs N as Anhydrous preplant—2 wks. Irrigated	**pH 6.5 P–High K–High**	92.5
Illinois Belleville	D. W. Graffis George Kapusta G. L. Ross Jim Bowan Richard Mulvihill	Williams	May 22	30″		**pH 6.3 P–Med–High K–Med–High**	84.3
Illinois Carbondale	″	Peterson 3125	May 23	30″		**pH 6.0 P–V.High K–High**	83.6
Illinois Carbondale	″	Schultz-Mitchell	May 23	30″		**pH 6.0 P–V. High K–High**	82.0
Illinois Carbondale	″	Woodworth	May 23	30″		**pH 6.0 P–V.High K–High**	80.9
Minnesota Waseca	G. E. Ham G. W. Randall	Corsoy	May 13	15″	100 lbs Urea-N Spring applied	**pH 6.2 P–High K–High**	81.5
Ohio Columbus	G. J. Ryder J. E. Beuerlein	Several	May 3	Variable —many narrow		**pH 6.5 P–High K–High**	80+
Wisconsin Evansville	Ed Oplinger	Wells	May 20	10″	Manganese Chelate-Foliar	**pH 6.2 P–V.High K–High**	86.0

HIGH YIELDS are the key to high profits for soybeans and other crops. This table looks at the **research yields** that exceeded 80 bushels/A in 1975. Some farmers are approaching these yields.

Are there other 80+ bushels/A out there? If so, let us know. There may be many more we don't know about. These examples point clearly to key steps we must take to get high yields:

- **Variety with high yield potential.**
- **Generally early planting.**
- **Narrower than standard row widths in many cases.**
- **High fertility—pH above 6.0 and phosphorus (P) and potassium (K) levels high or very high.**
- **Good weed control.**
- **Ample moisture during podding.**

Success teaches good lessons. Success begets success.

David W. Dibb, 91 Pecos Ave., Rt. 1, Columbia, Mo. 65201 .... Phone: 314-442-0907

WHEAT PRODUCES most of its dry matter between boot and milk stage. A crop producing 108 bushels per acre accumulates 224 lbs dry matter per acre per day during the 20-day period. Such daily production demands plenty of plant food.

NITROGEN (N) is vital for building plant protein. Wheat takes up 68% of its nitrogen by boot stage, making nitrogen very important to early growth and grain filling.

Greatest daily uptake—2.50 lbs N per acre each day—occurs between boot and milk stages, when wheat takes up about 32% of its N. Grain alone demands 106 lb N/A. Maximum uptake is 158 lb/A.

PHOSPHATE (P_2O_5) is vital for early development, proper growth, and plant maturity. Wheat takes up 65% of its phosphate by boot stage or during the first 73 days growth.

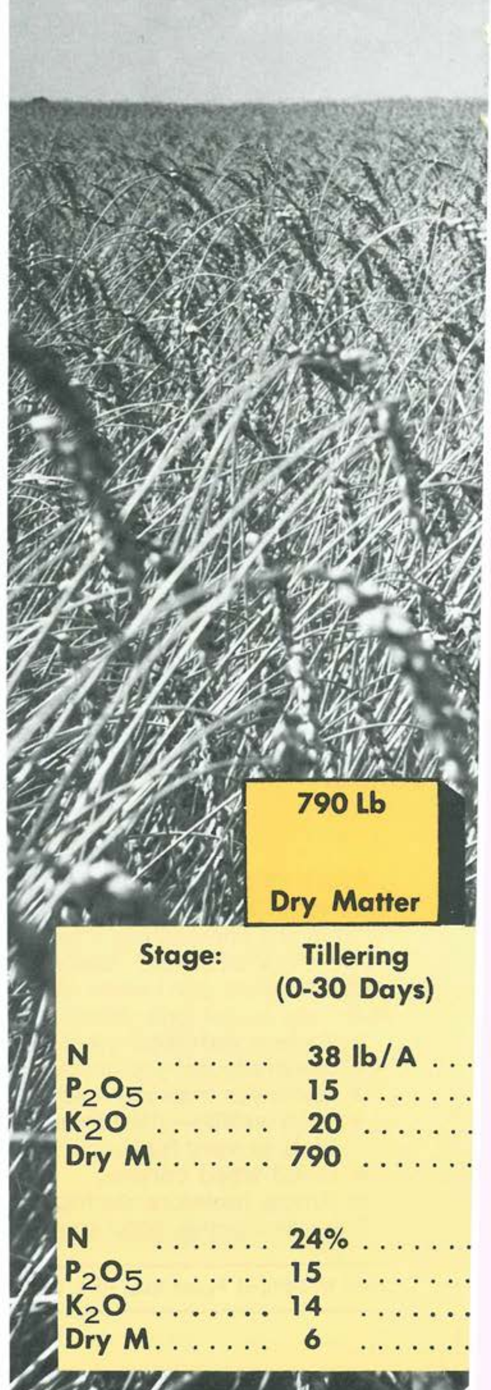
Greatest daily uptake—1.75 lbs P_2O_5 per acre each day—occurs between boot and milk stages. Grain alone contains 79 lbs P_2O_5. Maximum uptake is 99 lb/A.

POTASH (K_2O) is vital for opening leaf pores (stomates) so carbon dioxide gets into leaves to build sugars and protein. Potash also helps build strong stems against lodging and helps translocate sugar and convert it into starch in grain.

Wheat demands or takes up nearly 90% of its potash by boot stage. Greatest daily uptake—2.5 lb K_2O per acre each day—occurs during the 43 days from tillering through boot stage. A 108-bushel crop contains 25 lbs K_2O in the grain, but 144 lb/A in maximum uptake.

The chart right shows how much nitrogen, phosphate, potash, and dry matter a 108-bushel wheat crop accumulates during each growth stage from tillering to maturity.

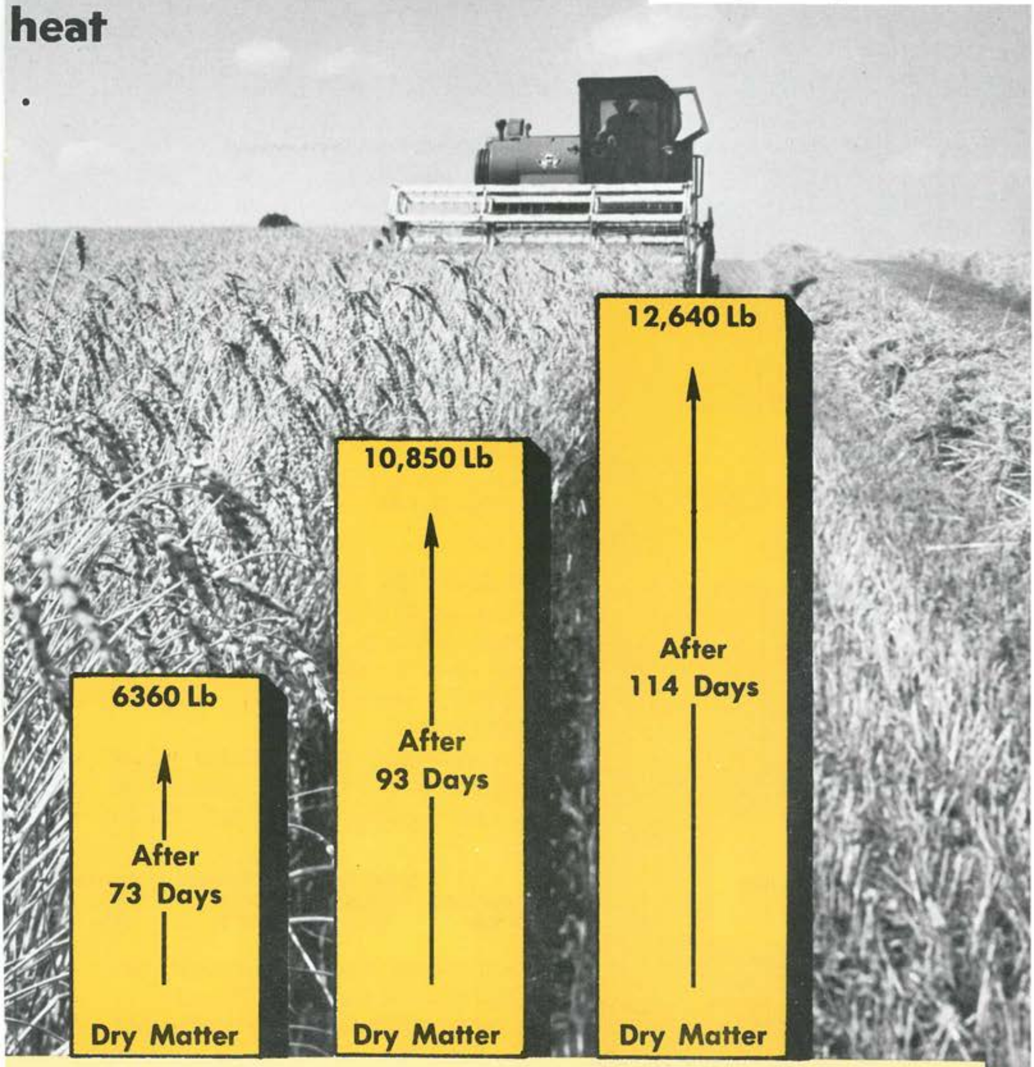
Plant food take
by 108 Bu/A w
while it grows . .



Stage:	Tillering (0-30 Days)
N	38 lb/A . . .
P_2O_5	15 . . . .
K_2O	20 . . . .
Dry M	790 . . . .
N	24% . . . .
P_2O_5	15 . . . .
K_2O	14 . . . .
Dry M	6 . . . .

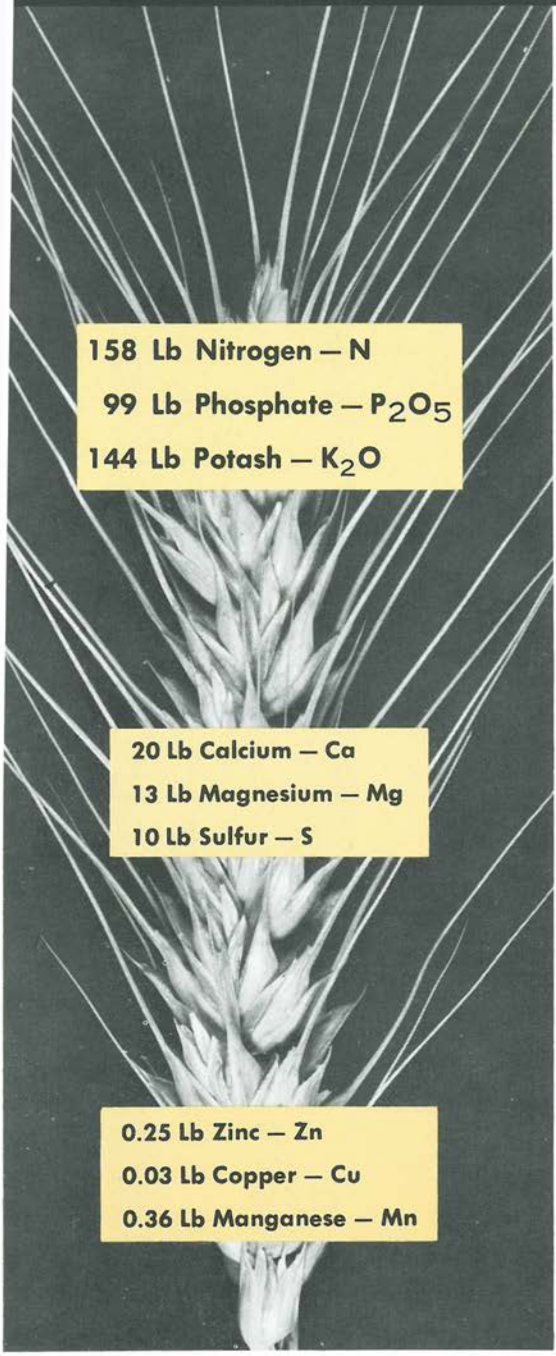
n up
heat

Based on data of F. E. Koehler
Department of Agronomy and Soils
Washington State University
Pullman, Washington



	Boot (31-73 Days)	Milk (74-93 Days)	Mature (94-114 Days)	Season Total	
...	70 lb/A.....	50 lb/A.....	−17 lb/A	158 lb/A	
...	49	35	− 6	99	
...	108	16	−39	144	
...	5,570	4,490	1,790	12,640	
PERCENT OF MAXIMUM UPTAKE				Straw	Grain
...	68%	100%	89%	...22%...	.67%
...	65	100	94	...14	...80
...	89	100	73	...56	...17
...	50	86	100	...49	...51

108 Bu/A Wheat Absorbs



The table below compares nutrients in grain and straw. Maximum uptake values for nutrients do not equal the totals of grain and straw, because they occur during milk stage and some losses occur before harvest.

	POUNDS PER ACRE						
Maturity	**N**	**P_2O_5***	**K_2O***	**Mg**	**S**	**Dry Matter**	
Grain	106	79	25	8	7	6480	51%
Straw	35	14	80	5	3	6160	49%
Maximum Accumulation	158	99	144	13	10	12,640	

*To convert P_2O_5 to P multiply by 0.437. To convert K_2O to K multiply by 0.83.

WHEAT IS VERSATILE, taking adverse conditions in stride. But it responds sharply to good management—correct seeding date and rate, adequate balanced fertility, adequate moisture, etc.

For example, well fertilized wheat produced 70% more dry matter and 74% more grain than the unfertilized crop.

	Unfertilized	**Well Fertilized**	**Increase**
D. Matter Yield	7400 lb/A	12,640 lb/A	70%
Grain Yield	62 bu/A	108 bu/A	74%

Fertilization sharply increased nutrient content of the wheat: N up 113%, P_2O_5 68%, K_2O 140%, Ca 150%, Mg 62%, S 100%.

These striking results indicate four pluses for properly fertilized wheat: (1) Better yields. (2) Better use of nutrients already in the soil. (3) More profit. (4) Potential improvement of soil organic matter.

This wheat uptake report now available as colorful folder. In 3⅝″ x 8½″ size for easy mailer. Order on page 28.

BIFOCALS

S.W.Martin

One Leg

WHILE DRIFTING through a college community many years ago, I urged kids studying journalism never to become an expert on anything. To leave themselves a certain free margin for enthusiastic ignorance.

So, those kids of 28 years ago were asked a simple question. What is sadder than an expert on roses staring at morning-perfect petals bathed in early dew and seeing only Bourgeauiana with obtuse double toothed leaves? A journalist whose quest for knowledge has cost him his wonder. To me, wonder is protein for the soul.

The brighter kids asked if they would be put off or scoffed at by the experts when they appeared unknowing. Not if they did it right, I suggested. One character on the G.I. Bill of that day said, "Hell, they won't laugh at me but once."

I replied, "Now, wait a minute! You have nothing to be belligerent about. There is nothing an expert likes better than to appear to be an expert. And nothing makes him more of an expert than to have an ignorant person seeking to learn from him.

"Use him. Don't abuse him. If his answers aren't clear, ask him over and over until he is clear. If he can't make it clear to you, forget him. He's no expert."

A very bright kid sat in the back, mostly on his spine, his lip curled almost into his left ear and his rhetoric rougher than the acne pits down his cheeks. But his mind was a blue diamond. He seldom spoke. Then, one morning, "Mistah Marhten, were the experts evah ignorant?"

I laughed, "Good question. Only thing wrong is your verb tense. Should be, 'ARE the experts ever ignorant?' The answer is, 'The MOST, occasionally, outside their field.'"

"Well, then," he replied, "a little 'journalating' around might make a good reporter a lot smarter than they are, wouldn't it?"

"Well, now, that depends on the reporter," I suggested.

Then a simple, concluding admonition: "One thing I want all of you to realize is that every story source you will ever have puts on its pants one leg at a time or its girdle one hip at a time—**and don't you ever forget that."**

I surely could have used "Dr. Myron L. Fox" back then to put the icing of confidence on those kids. Now, if there is a real Dr. Myron L. Fox out there, I want to make one thing "perfectly clear." This column refers ONLY to the "Dr. Fox" mentioned in the **Chronicle of Higher Education,** Oct. 15, 1973.

It was like this. Three researchers, in psychological areas apparently, hired an actor and named him "Dr' Myron L. Fox." They coached him diligently in "double-talk, neologisms, non-sequiturs, and contradictory statements."

In others words, they pumped plenty of their gobbledygook into his acting talents. Then they announced a special lecture by "Dr. Myron L. Fox." Fifty-five colleagues showed up. "Dr. Fox" apparently outdid himself. By mid-lecture, some were saying they had read his publications.

With the ending applause, he apparently got so carried away that he submitted to a question-answer period. Even then, allegedly, not a single colleague suspected "Dr. Fox" was a joke. One did think he was "too intellectual." Another said he "seemed somewhat disorganized."

The biggest reason Dr. Fox didn't blow his cover was his rhetoric, no doubt. He stayed true to the breed. He didn't slip as Dean Rusk allegedly said he did:

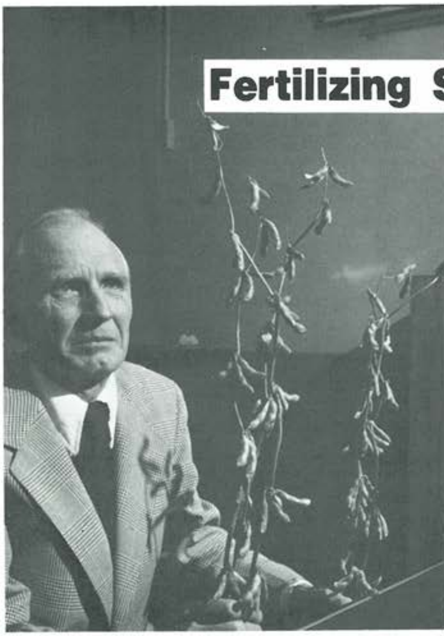
"In a speech on China, I once said in short words and short sentences what we'd been saying for some time in long words and unintelligible sentences, and everybody thought that was new policy."

With his Davidson background, Rusk could laugh at himself with ease and a certain confidence broad education seems to bring men.

But not "Dr. Fox"—he was dead serious. And there was nothing new about his rhetoric. So, no one suspected.

Yeah, one leg at a time, kids. One hip at a time. And don't you forget it!

Fertilizing Soybean FOLIAGE Pays



Iowa State University Research Agronomist, Dr. John Hanway, shows the sharp contrast in soybean plants treated and not treated with foliar fertilizer. Pods are filled to the top of the plant receiving foliar fertilizer, left. Filled pods are more sparse near the top of the plant not receiving foliar fertilizer, right. Pods near the top of untreated plants abort and never fill because nutrition runs low. Foliar fertilizer feeds pods that go undernourished on untreated plants. So, foliar fertilization produces more seed per plant and greater yield per acre.

A BETTER CROPSVIEW

THERE MAY BE many more beans in those empty or partly empty pods—10 to 20 bushels MORE SOYBEANS per acre—when they get the right nourishment at the right time.

Dr. John Hanway of Iowa State University has reported such a breakthrough—up to 23 bushel increases from properly formulated and multiple application of foliar NPKS fertilizer solution.

This is over and above yield increases from soil-applied fertilizer. He emphasizes that foliar fertilization should **NOT REPLACE, BUT ADD TO,** soil fertilization and other sound practices.

In his early research, Dr. Hanway spent many hours studying how soybeans grow and develop, how they demand nutrients, and how those nutrients shift around inside the crop on their way to the beans.

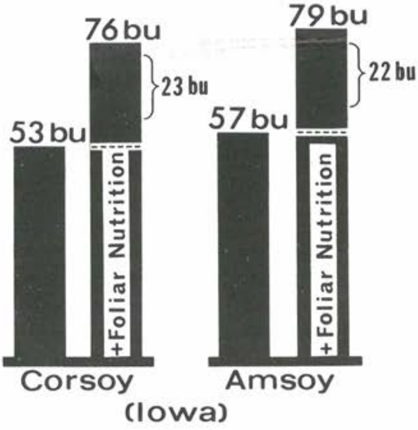
So, it seems appropriate for him to be the scientist who figures what kinds and amounts of foliar fertilizer applied during bean pod-fill may boost yields best.

For some time, researchers have noted how those little nitrogen factories (nodules) on soybean roots tend to slow down during pod-fill—probably because most of the photosynthate is channeled to the beans and little reaches roots to supply energy for N-fixing bacteria in this period.

Soil nitrogen has been tried with modest success. But early-applied N has actually reduced the numbers and activity of the N-fixing root nodules.

Dr. Dirk Barel's research at Iowa State proved nutrients applied to corn and soybean leaves could be taken up and translocated inside the plant to give added nourishment to the crop. He studied many sources and concentra-

Foliar Fertilization ADDS Bushels to Soybeans



tions of foliar fertilizer for most efficient uptake and translocation.

Dr. Hanway combined this work with his own knowledge of the soybean plant to develop his current ideas on foliar fertilization.

WHAT FERTILIZER MATERIALS did he use? A NPKS fertilizer water solution was made from urea, a polyphosphate, and potassium sulfate.

The solution contained about 25 lb N, 6 lb P_2O_5, 9 lb K_2O, and 1.5 lb S per 19 gallons. Leaving out any one nutrient decreased yields.

The solution was sprayed on the crop with appropriate equipment. From 2 to 4 applications should be made, depending on maturity of beans and season. The crop should receive 60 to 100 lb N, 15 to 25 lb P_2O_5, 20 to 35 lb K_2O, and 3 to 5 lb S per acre in the foliar applications.

WHEN DID HE APPLY the solution? During bean or pod-filling period. Sprayings began when bean development was beginning in pods at one of the four uppermost nodes having mature (fully expanded) leaves.

The sprays were repeated every 10 to 14 days until pods were yellowing and 50 percent of the leaves were yellow. The leaves must be green and active when spraying starts.

WHAT RESULTS did he get? In the first year, yields increased 7 to 8 bushels per acre. In 1975, yields jumped from the 50-bushel range on the check plot to more than 75 bu/A by proper application of this formulated foliar fertilizer solution. Figure 1 shows results from this top management site near Ames, Iowa.

Ten to 20 bushels MORE SOYBEANS PER ACRE become very significant when we realize the highest national average has reached only 28 bu/A and the highest state average only 36 bu/A by Iowa.

WHAT ABOUT THE FUTURE? These foliar fertilization results are exciting. Yet, they should not cause us to forget the 80 or more bushels produced without foliar fertilizer solutions—but with good soil fertility, weed control, plant populations under top management, and row spaces moving from 30 to 15 and even down to 7 inches for maximum use of sun energy.

These 80-bushel results with soil fertilization and other top management raise a BIG question. Can we ADD Dr. Hanway's foliar fertilizer solution to the best management now known and push soybean yields up to 100 or 110 bushels per acre? Who wants to call it impossible—in public?

Iowa State University Research Foundation maintains patent rights on this fertilizer solution and application program. You can write the Foundation at Iowa State University, Ames, Iowa, 50010, USA for further details.

Researchers can reach Dr. John Hanway in the Agronomy Department of Iowa State University at the same Iowa address. **The End**

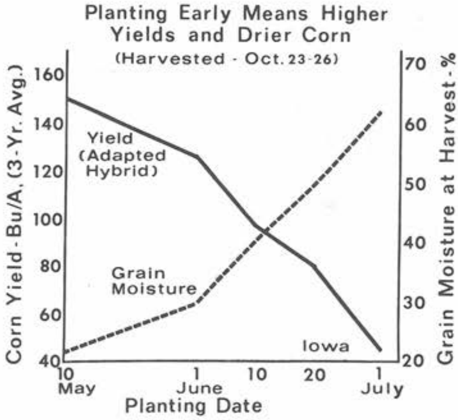


FIGURE 1

Managing for MINIMUM Harvest Stress

Robert D. Munson
St. Paul, Minnesota

HARVEST STRESSES cause problems nearly every year. They usually start long before harvest, depending on crop. Some we can control, some we cannot. Let's look at some harvest stresses and steps to control them:

1—RIGHT PLANTING DATE. Planting on time means earlier harvest, drier corn and naturally warmer air when drying needs to be done.

In **Figure 1,** Iowa State research shows Central Corn Belt corn planted by May 10 not only yields more bushels, but also much drier corn at harvest than later planted corn.

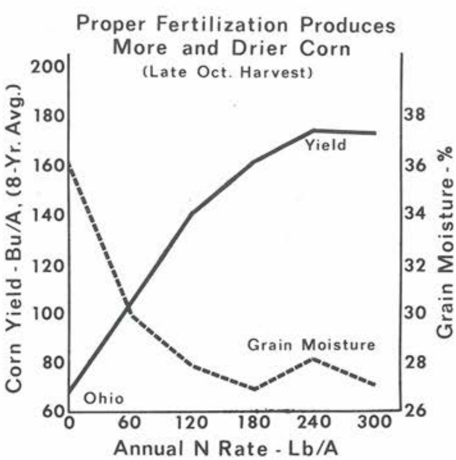


FIGURE 2

Planting as early as March 10, Ohio got equal yields (176 bu average for 6 years) and little change in grain moisture (19.3 to 20.2%) until after April 22 planting. After April 22, moisture rose rapidly.

Starting April 16 in northwest Iowa, yield holds up (126 to 122 bu) and grain moisture increases only about 1% (22.6 to 23.9) by planting May 3. Right planting date is important to harvest.

2—ADEQUATE FERTILIZATION produces higher yielding, drier crop at harvest, regardless of deficient element provided.

In **Figure 2,** Ohio got not only higher yield, but also 10% drier corn grain from adequate nitrogen (N). Illinois has shown similar relations.

Figure 3 shows how potassium (K) advanced silking date, leading to earlier pollination, higher yields, and less harvest stress, in Illinois trials.

3—LESS LODGING. In corn, sorghum, small grain, or soybeans, lodging means the same thing—increased harvest stress and usually losses.

Tennessee trials clearly showed what

can happen to corn when potash is left out of the fertilizer—75% more lodging, 134 less bushels/A. And hand harvesting would be a real stress today:

CORN YIELDS

Nutrients Applied	Lodged Corn	Machine Harvest	Hand Harvest	Stress
	%	bu/A	bu/A	bu/A
NPZn	80	12	64	52
NPKZn	5	146	146	0
Stress:	75%	134 bu	82 bu	

In Kansas trials, sorghum lodging declined dramatically as potash rates went up. **Figure 4** shows this.

Tests have long shown high nitrogen and high plant populations without adequate increases in potash can invite extra lodging and harvest stress. High populations and low nitrogen also invite lodging.

4—INSECT CONTROL helps fight corn and stalk borers, as well as greedy rootworms.

Such insects can weaken stalks and reduce root feeding so much that a field with little or no control stands at the mercy of the first high wind. Ears dropping, stalks breaking, corn falling all set the stage for lower yields, moldy corn, and harvest stress.

5—WEED CONTROL helps fight nutrient-robbing, combine-clogging weeds that lead to lower grain price.

Weeds not only compete for water, nutrients, and light, but also slow down harvest speed and load combine screens. They make it much harder to get clean crop seed.

And because they load the combine, some grain may be carried over and lost. Weed seeds often hold more moisture than crop seed or grain. So, the weeds cost you two ways—with their own seeds and with the higher moisture they put into your grain or beans.

6—DISEASE CONTROL helps prevent plants that do not ripen properly, helps reduce low quality grain or seed that does not market well.

Disease can wreck the pocketbook. Moldy or infected grain and seed, such as aflatoxins in corn. Smutty small grain. Soybeans with pod and stem blight infecting the beans, reducing germination, and spoiling its use for seed. Market rejections can lead to unbelievable harvest stress.

Research has long shown potash re-

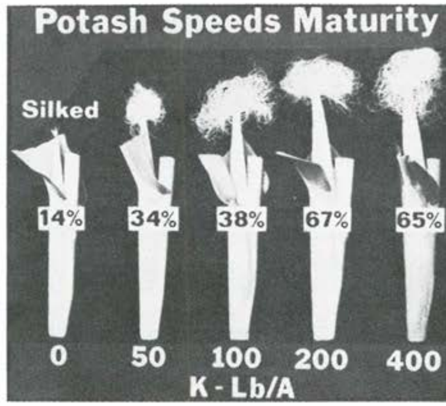


FIGURE 3

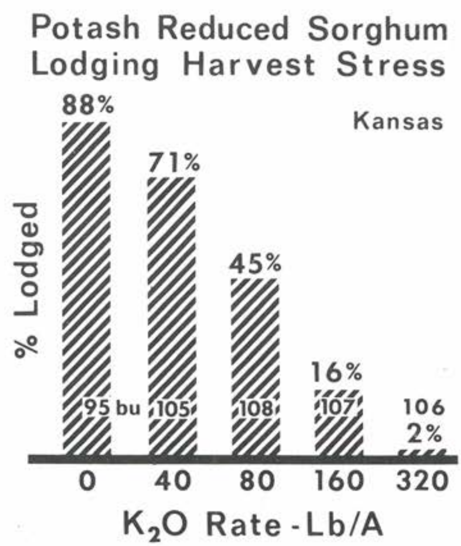


FIGURE 4

duces disease. Recent Virginia and Delaware work show potash significantly reducing the stress of harvesting purple, grain-moldy beans. These Delaware results tell the story:

Average Two Varieties	
K Level*	Diseased Beans
(KCl and K_2SO_4)	%
0	75
1	62
2	27
3	13

*Top level 1850 lb/A KCl or 2074 lb/A K_2SO_4.

Figure 5 shows ears from low-K corn and properly fertilized corn in Iowa. The K-deficient ears are poorly filled and infected with mold down into the cob, the properly fertilized ears filled to the tip and with no mold.

Figure 6 shows potash-hungry ears close up. If one thumped these tips, they broke up. We can't get away with unbalanced fertility—for long.

7—WEATHER can delay spring planting enough to cause late harvest stress. Or slow maturity from too little heat can delay harvest when every day free of wind and rain is precious.

We harvest crops in sequence—hay and grain silage three, four, or five times during a season. While hay is down and curing, during baling or chopping and until stored, weather can create harvest stress.

Heat ripens and matures crops. Corn at a certain stage of maturity must have so many heat units to mature and dry down. And photosensitive crops need certain day lengths to flower.

When your crop is deluged with wind and rain just before harvest, you know what lodging and harvest stress really mean. You know how grains may actually sprout in the windrow or while standing. How molds infect the crop and reduce market quality.

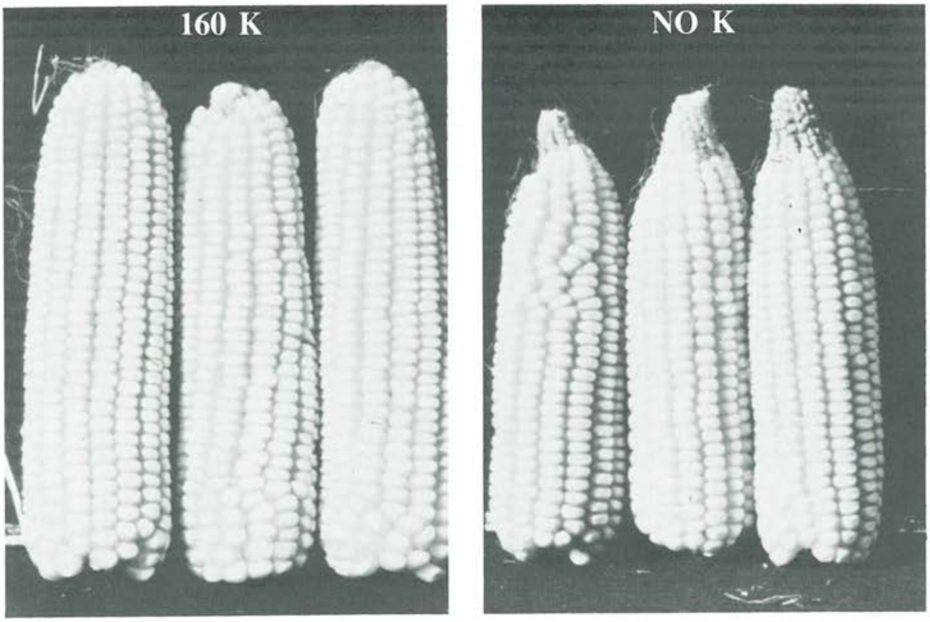


FIGURE 5

Some farmers put rice tires on their combines to get their crops out of that mud. And some believe large flotation type trucks now used to spread fertilizer may help "truck out" some of that crop during problem rains at harvest. Good surface and tile drainage always helps.

8—EARLY FROSTS can increase harvest stress. In 1974, a September 3 frost after a late spring cost Minnesota farmers about 18 bu/A in corn, 6 bu/A in soybeans. In the same year, a later frost cost Iowa farmers about 8 bu/A in corn and 2 bu/A in soybeans.

In Minnesota, the early frost stole 106 million bushels of corn from 5.9 million acres, 24 million bushels of soybeans from 4.04 million acres—or $450 million from the farmers' pockets.

SOYBEAN HARVEST STRESSES—prepare for them.

1—Leave ground as smooth as possible after planting and cultivating.

2—Grow closer rows, because close-row beans pod higher. Many growers plant rows just 7" apart and even plant solid now that weed control is so improved.

3—Seed at a recommended rate for reasonable plant population to reduce lodging potential.

4—Adjust combine cylinder speed and clearance and wind according to operation manual and make frequent checks.

5—Adjust cutter bar as low as practical. Iowa reported 5% loss at 3½ inches, 12% loss at 6½ inches.

6—Drive slowly—2.5 to 5 mi/hr, some suggest.

7—Harvest while bean moisture runs 14 to 18%. When moisture falls below 13%, physical and handling damage can become excessive. Start early in morning and work late to get all beans during best moisture time.

8—Reduce damage with low-temperature drying and keep dropping height short in handling.

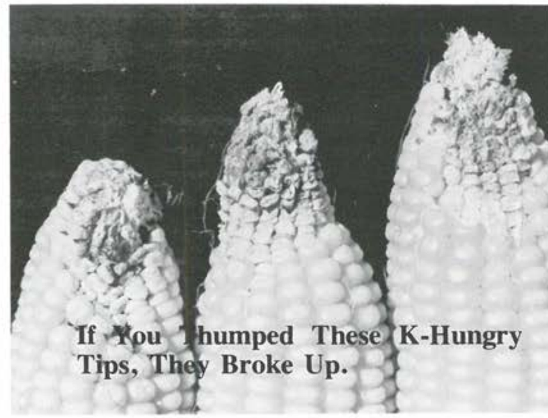


FIGURE 6

Farmers using the new soybean combines with row adaptors say they are saving 2 to 3 bushels per acre. A Minnesota Ag-Engineer reports an experimental draper extension, used with a conventional header with a flexible bar, reduced soybean gathering losses up to 29%.

Soybean Variety	**Combine With New Draper Extension** Gathering Loss Reduction 1973 %	1974 %
Chippewa 64	23	12
Steele	—	29
Corsoy	—	12

Soybean gathering losses in Minnesota average 2.4 bu/A.

Regardless of what causes loss, four beans per square foot means a bushel has been LOST.

CORN HARVEST STRESSES—prepare for them.

For Grain, we have already discussed some, but there are key points to remember.

- Energy costs (including propane for drying) make drier corn at harvest very important. Using slightly earlier hybrids can reduce drying needs sharply at harvest.

- Some estimate 2 kernels per square foot will cost 1 bu/A loss. Field losses can be checked easily.
- Corn is mature as soon as the black layer is formed on the tip of the kernels.
- For grain, harvest is usually delayed until moisture reaches 30%. Starting harvest early usually means less lodging and ear drop and higher grain recovery. And, with proper combine setting, the higher moisture means less broken or cracked corn.
- If the grower is to sell his grain on the cash market, he must dry it for proper storage.
- If he is going to use it on his own farm, he can store it in air-tight bins or silos or add acid preservatives to it, such as proprionic and acetic. Nebraska successfully stored acid-treated corn at 25% moisture in 1,800-bushel piles for a whole year. Such high-moisture corn usually contains excellent feed value for livestock.
- A new approach, called "Dryeration," increases drier capacity 60% or more. It dries corn to 17.5-18% moisture. The heat then cuts off. The system augers out the hot corn and stores it at about 160°F for 10 to 12 hours of slow cooling. The corn loses another 2% moisture during this time and gets stored at about 15.5% moisture. This is safe storage.

This new system of temperature and moisture control and storage bins really increases drying capacity and reduces harvest stress.

For Silage, some harvest stresses are hard to interpret. With most of our corn, we harvest a little over half the dry matter accumulated—and leave the other half in the field. What kind of "harvest stress" (or loss) does that create?

Let's put this loss into perspective with some Iowa corn data from 1973. They grew 12.2 million acres of corn and fed 18% (2.2 million acres) to 3.9 million head of cattle.

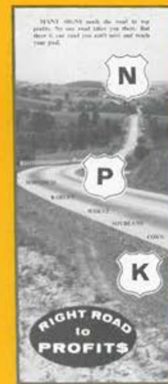
IF those 2.2 million acres had been harvested and fed as silage, Iowa could have fed about 5.8 million head of cattle. **OR** if all 12.2 million acres had been harvested and fed as silage, they could have fed 32 million head of beef—or 6 million more head than were marketed in the U.S. in 1973.

Top silage yields demand harvest as soon as the grain is mature—at late dent stage or when "black layer" shows at kernel tips.

The mature crop will contain about 35% dry matter or 65% moisture. Field losses are least at that stage. But, for least harvest stress, the grower must start when corn is about 30% dry matter and end at about 40%.

THE ROAD to less harvest stress is built by your plans. Planting plans. Fertilizer plans. Insecticide and herbicide plans. Harvest moisture plans. Storage plans. And marketing plans.

Credit Profits From NPK



ECONOMICS STARTS WITH AGRONOMICS . . . and one way to show it is with actual dollars fertilizer returns to the grower. Extra yields from fertilizer contain many extra dollars. But they rarely get pulled out of the production package and credited to fertilizer. The brochures below document dollars from NPK on grains and forages. And the postcard shows how FEW bushels pay for K. Order supplies (or kit of samples) to plan fall push IN TIME.

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TRUTH

SOIL DEPLETION GOES ON ALL SEASON . . . and one way to show it is with actual plant food a good crop takes up during different growth stages. Uptake occurs regardless of the economy. That is why the Potash Institute revises and increases its library of authentic uptake brochures. Very persuasive tools for those who have shortchanged their crops in recent years. Order supplies (or kit of samples) to plan fall push IN TIME.

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SEND US:	QUANTITY	
WHEAT Takes Up Much Plant Food	______	10¢ ea.
Plant Food CORN Takes Up While Growing	______	10¢ ea.
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ALFALFA Absorbs Much Plant Food	______	10¢ ea.
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YOUR CORN PROFIT $115.18 IS IN THE BALANCE

FERTILIZER	BU/A	PROFIT	LOSS
BALANCE LB/A 180-60-90	143	$115.18	
NO PHOSPHATE 180-0-90	111	$ 50.70	
NO POTASH 180-60-0	96	$ 10.95	
NO NITROGEN 0-60-90	41		$92.60

Net profit. Low P & medium K. 3 yr avg. **Illinois.**

FERTILIZER	BU/A	PROFIT	LOSS
BALANCE LB/A 150-30-120	114	$53.96	
NO PHOSPHATE 150-0-120	99	$24.11	
NO POTASH 150-30-0	34		$126.44
NO P_2O_5-K_2O 150-0-0	30		$130.00

Net profit. Low to med P & low K. 3 yr avg. **Virginia.**

Why should we keep our grain fertilizer—nitrogen (N), phosphorus (P), potassium (K)—in right balance?

Because profit is in the balance. Nitrogen was a key to balance on the Illinois corn above. Without N, the corn suffered $92 loss. NP and NK moved yield into the profit column. But top profit came from NPK, $115 net return per acre.

Potash was the key on the Virginia corn above. Without K_2O, the crop suffered $126 loss. With K_2O and NP, it reached nearly $54 net profit/A from balanced fertility—even with one dry year. Profit is in the balance.

Alfalfa Protein For HUMAN Use

L. D. Satterlee, J. G. Kendrick,
Kathy J. Liska

ALFALFA MAY ASSUME a new role as a possible food fortifier. Unlikely as it may seem, taste tests of alfalfa-fortified snacks scored well in University of Nebraska-Lincoln experiments.

The increasing consumption of snack food has prompted research on ways to develop higher protein fortification. Newly available plant proteins are being explored, but their use presents problems.

Many plant and cereal foods tend to be more filling than nutritional, which limits the amount a human can consume. Also, protein content in plants is low and practical methods for extracting and concentrating plant proteins must be developed.

Research has been conducted in this area; however, feasible extraction methods which are presently used on a large industrial scale will produce protein concentrates and isolates from only a few plant sources.

The basic method for producing a protein concentrate from alfalfa consists of grinding the leaves and pressing the juice from the fiber. The liquid can then be separated into a green protein coagulate plus a clear, brownish high protein solution. The high protein solution is then used to prepare a dry, tan protein concentrate that has possible uses as fortifier.

We then had to find a combination of concentrated plant protein and traditional grain protein sources that would give us a high protein flour with an essential amino acid profile better than the profile available from any single plant protein.

Using a mathematical programming system we formulated a high protein flour utilizing alfalfa protein, soybeans, dried potato, and glandless cottonseed protein isolate. The essential amino acid profile of the mixture exceeded that of soy protein which is assumed to be the most nutritious of the plant proteins.

In our tests, high protein food snacks were produced utilizing the high protein flour mixed with cornmeal and water. The fortified cornmeal was formed into a small, puffed product called a collet. The dried collets were flavored with a cheese coating made from powdered cheese, salt, and oil.

Thirteen types of snacks of varying protein concentrates (soybean protein and high protein flour at differing utilizing levels) were evaluated by a 12-member panel for appearance, aroma, texture, and flavor.

The soy snacks fared best in the testing. They exceeded the excellent rating, even with a 36-percent protein content and were as acceptable as the marketed cornmeal snack used as a control.

However, the corn snacks fortified with our high protein flour (containing alfalfa protein isolate) were also ac-

In the University of Nebraska's FARM, RANCH, and HOME QUARTERLY.

ceptable to the panel at levels of fortification up to 20 percent protein. Current research is being directed towards refining the process of isolation to yield a 73-percent protein concentrate. Further decolorization and deodorization are expected to produce an isolate that will fully compete with soy protein as a fortifier in the human food marketplace. **The End**

Planting DATE Can Affect Corn's RESPONSE

Stanley A. Barber
Purdue University

THE GOAL of fertilizer efficiency is more yield from the fertilizer we use. Since earlier planting increases corn yields, it may also affect fertilizer response. A Purdue experiment tested how planting date affects corn response to potassium.

1—The trial consisted of four planting dates as main plots split into rate-of-K sub-plots. All treatments were replicated four times.

2—The K fertilizer treatments were 0 and 100 lbs K_2O per acre per year.

3—Corn was grown continuously and the treatments went on the same plots throughout the 9-year period.

4—Planting date, which varied from year to year because of weather. So the four planting dates ranged this way: April 23 to May 3; May 4 to 15; May 17 to 26; and May 29 to June 12. The average dates were April 26, May 9, May 21, and June 3.

5—The potassium, plus 100 lbs P_2O_5 and 250 lbs N, were applied each fall and plowed under so the soil would be ready for planting in the spring.

6—A herbicide was broadcast after planting to control weeds.

7—The soil was a Raub silt loam with a pH of 6.2. At the end of the experiment, it tested 80-100 lbs K per acre where no K was applied.

8—Corn was planted thick enough to average 22,000 plants per acre at harvest.

9—Row spacing was 28 inches, with six rows per plot.

Table 1 shows corn yield declined sharply when planted after May 9—more sharply with K than without. This indicates both K and planting date were important.

Potassium fertilizer was most efficient at earliest planting date, boosting yield up to 26 bu per acre. This declined to 11 bu by the latest planting date.

So early planting is one way to help fertilizer add more yields without adding production costs, other than getting the job done early. **The End**

Table 1—Effect of planting date and K application on corn yield. Data are average of nine years' results.

Average Planting Date	Average Corn Yield −K	(bu/A) +K	Increase Due to K bu/A	%
April 26	116	142	26	22
May 9	116	141	25	22
May 21	113	132	19	17
June 3	105	116	11	11
Yield reduction due to planting date	9%	22%		

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