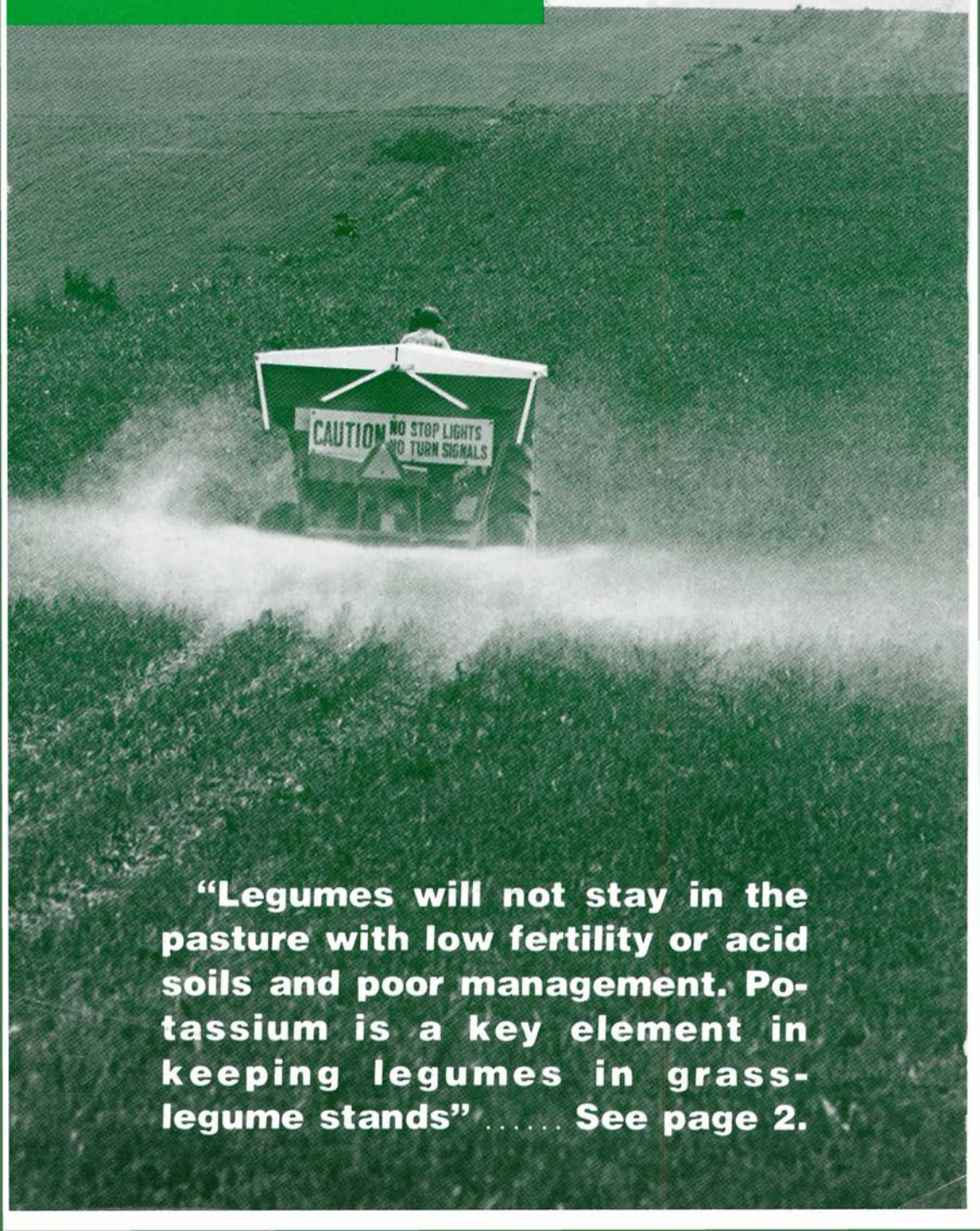
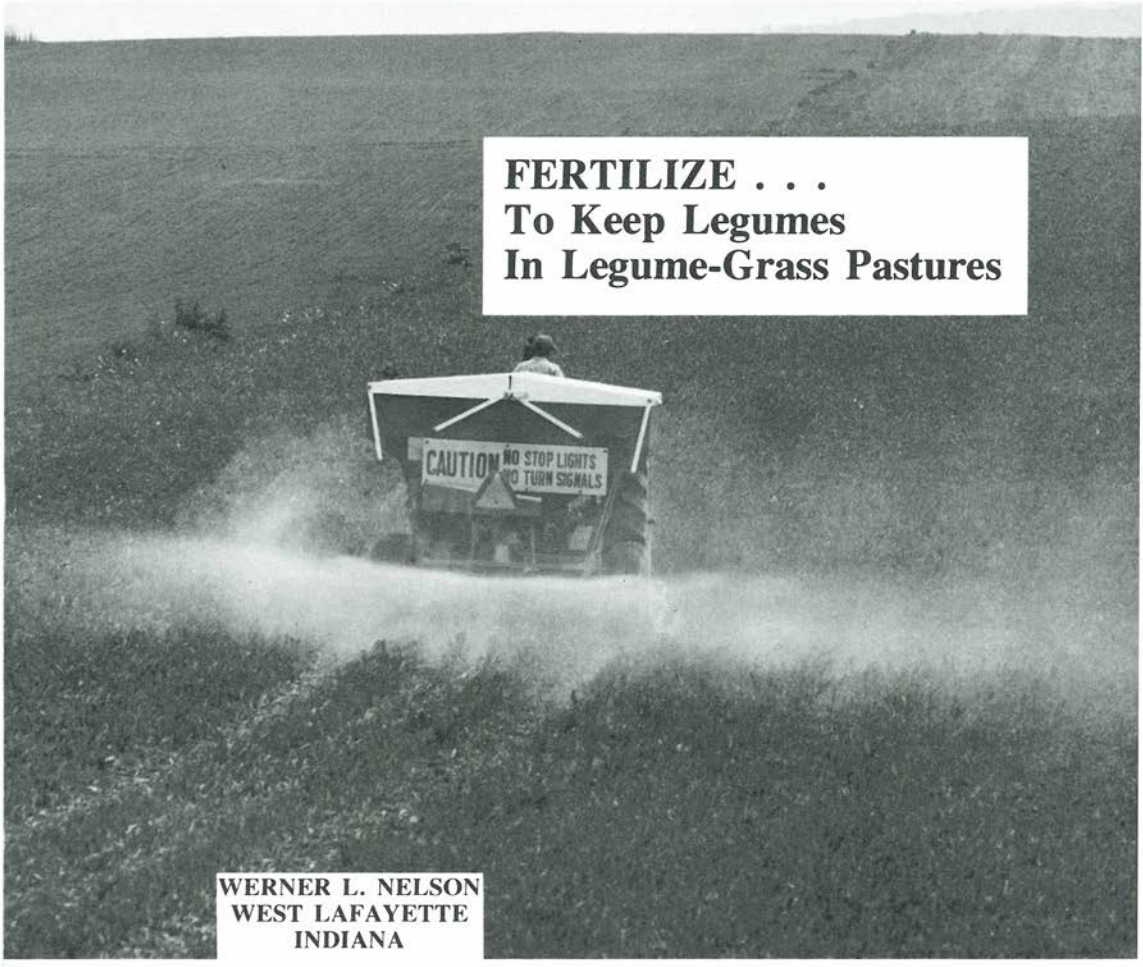
Better Crops
WITH PLANT FOOD

NUMBER 3—1974 25 CENTS



"Legumes will not stay in the pasture with low fertility or acid soils and poor management. Potassium is a key element in keeping legumes in grass-legume stands" ..... **See page 2.**



FERTILIZE . . . To Keep Legumes In Legume-Grass Pastures

WERNER L. NELSON
WEST LAFAYETTE
INDIANA

HOW DO WE KEEP LEGUMES—so vital to good animal performance?

After establishing legume-grass pastures, the major problem is to keep legumes in the mixture.

Along with grazing management to favor the legumes, a big key is proper fertilization. **In plain terms, the legume is usually starved out.**

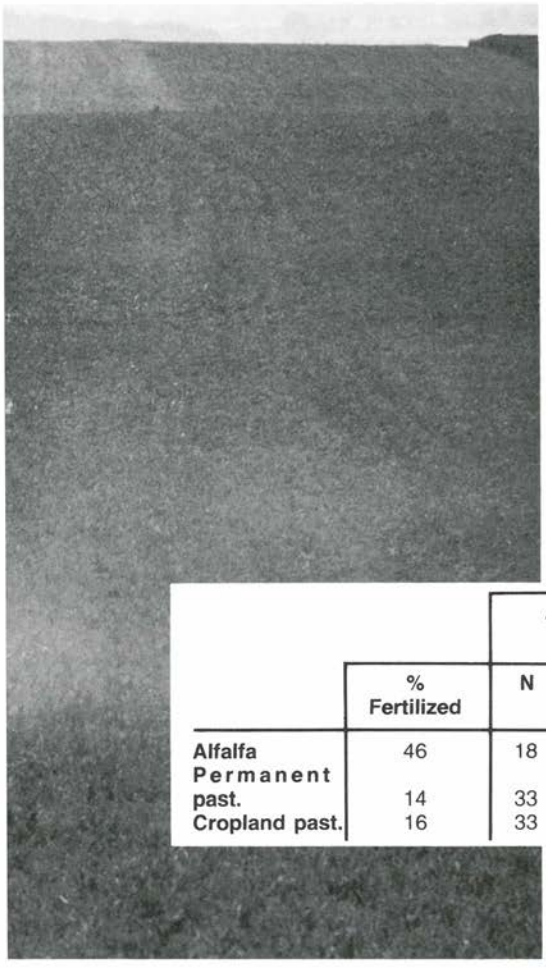
A beef cow and calf in a well-managed pasture will consume from about 4 to 6 tons dry matter. About 5 to 6 tons will take care of a cow and her calf for a year. This six tons will contain about:

N	**300 lb**	**Mg**	**30 lb**
P_2O_5	**90**	**S**	**30**
K_2O	**360**	**Ca**	**60**

Little plant food is carried off by the animals, so we may tend to think pastures receiving one or two good fertilizer applications can pretty well take care of themselves.

TWO MORE POINTS should be considered:

1—Even though manure returned to pastures is an excellent source of



But, potassium should receive key consideration. Grasses (and weeds) are often called "potash robbers" because they absorb much more potassium than legumes do.

In a New York forage study on a soil testing low K, different species showed the following % K:

	Low K	K applied
Clover	0.95 % K	2.72 % K
Grass	1.97	2.84
Weeds	2.16	3.61

In most instances, forages are underfertilized. For example, Indiana recommends 0-120-300 for 6 tons on a low test soil. The Indiana Crop Reporting Service showed these average annual applications:

		Acres fertilized received			Average for all acres		
	% Fertilized	N	P_2O_5 lb/A	K_2O	N	P_2O_5 lb/A	K_2O
Alfalfa	46	18	45	81	8	20	37
Permanent past.	14	33	41	37	5	6	5
Cropland past.	16	33	39	41	5	6	7

No wonder forage yields are low—with 14-16% of the pastures and less than half the alfalfa fields being fertilized at low rates.

Yet, some states apply much higher rates but still need to be increased. For example, Georgia applies an average of 80 lbs N, 50 lbs P_2O_5 and 70 lbs K_2O per acre.

RECOMMENDATIONS VARY greatly because of soils, climate, and management of legume-grass pastures.

In Southern U.S., the grazing season is longer, higher yields may be obtained (6 tons), and N may be suggested with rotational and/or close grazing along with the P and K.

In Northern U.S., consumable dry matter is in the 4- to 5-ton range—lower in extreme north.

fertility, the problem is uneven distribution of feces and urine by cattle. Dr. W. W. Woodhouse reports on this in the last issue of this magazine (Better Crops No. 2, 1974).

2—Many pastures are grown on low fertility, acid soils. They demand lime, P and K and in some cases sulfur, magnesium and/or boron.

A major fertility problem in legume-grass mixtures is maintaining the legume in the stand. A pH of 6.5 or above and adequate phosphorus are essential.

Annual recommendations for P_2O_5 and K_2O on legume-grass pastures on low testing soils range widely among states. Look at this range for a 4 to 6-ton yield:

P_2O_5— 30 to 120 lb/A
K_2O— 30 to 250 lb/A

Illinois recommends building the P_1 test to 50 for low, 45 for medium and 40 for high-P supplying soils. They advise building the K soil test to 260 on low cation exchange capacity soils and to 300 on high cation exchange capacity soils. A general guide is to apply as much P_2O_5 and K_2O as is removed.

Grass-legume mixtures contain about 12 lb of P_2O_5 and 50 lb of K_2O per ton of dry matter. A 5-ton yield would contain 60 lb P_2O_5 and 250 lb K_2O annually.

Pasture yield is estimated by the stocking rate. A 1,100 lb lactating cow consumes about 30 lbs of hay or its equivalent per day.

Illinois recommends not to credit the nutrients from urine or manure as part of the fertilizer available unless there is a means for uniform distribution. The soil is retested every 4 years and fertilizer rates adjusted up or down to maintain the desired soil test.

Kentucky suggests 1.5-2.0 lb/A of B (boron) for clover seed production. Sulfur is also needed for pastures in some states.

LEGUMES WILL NOT STAY in the pasture with low fertility or acid soils and poor management. Potassium is a key element in keeping legumes in grass-legume stands, It encourages energy storage in the roots. It speeds regrowth. It improves winter survival.

As adequate fertilization continues, soil fertility level and annual carrying capacity will increase. Fertility levels can be monitored with soil tests and rates can be adjusted.

But due to uneven distribution of excrement, it will take some years of adequate fertilization to increase the overall fertility level on a soil originally low in fertility.

Once the fertility level is built up to medium to high, late winter overseeding with a biennial such as red clover or with other legumes can help maintain stands indefinitely.

If you are planting a legume-grass mixture, use the best recommendation for establishment and periodic top-dressings. In general, the most desirable fertilizer ratio for maintaining legumes in a pasture is about 0-1-4, with lime as needed.

GRAZING MANAGEMENT and variety selection are other keys to maintaining legumes in pastures. The legume variety should be as disease resistant as is available. For alfalfa, that means resistance to bacterial wilt. Resistance to other diseases as the leafspots, anthracnose and phytophthora will aid in stand survival, herbage quality, and productivity.

Most legumes, particularly alfalfa and red clover, need a rotational grazing system to survive well in grass mixture swards. The grazing cycle for alfalfa or red clover in mixture with grasses should be 7-10 days grazing and 35-40 days rest between grazings.

Rotational grazing should not be *undersold* as a major component in successful maintenance of legumes in pastures. **The End**

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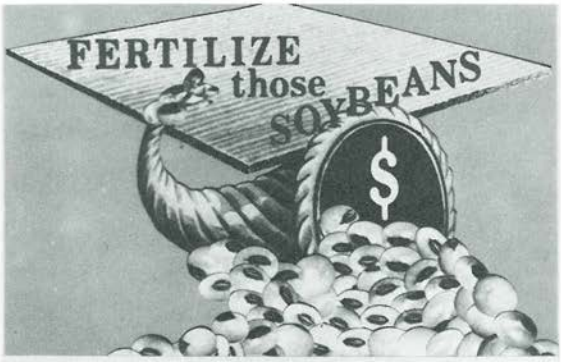
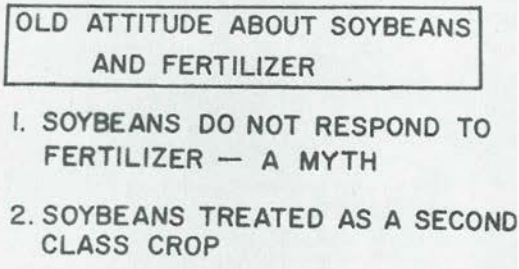
CONTENTS

SOYBEANS . . .
Fertilize Them

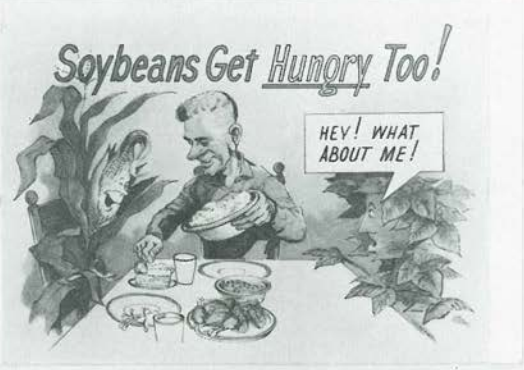
SLIDE 1—The word is out! Soybeans are a first-class crop. They are rows of gold. And top-profit growers can harvest 2 to 3 times more beans than average growers do. HOW? By using a profit-wise combination of soil fertility and management practices. They build UP soil fertility to top-yielding levels. Then they MAINTAIN that fertility with adequate lime and fertilizer treatments.



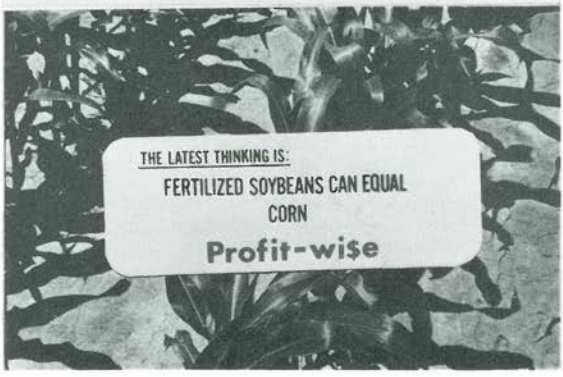
SLIDE 2—Old ideas are being buried. Some growers once thought soybeans would not respond to fertilizer. They rated it a second-class, low-profit crop. Low profits came from low yields, mostly. Low yields came from poor production practices, mostly.

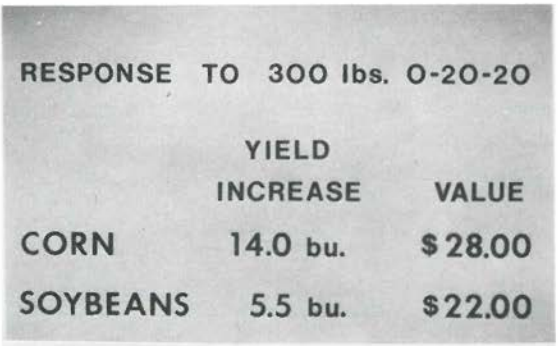


SLIDE 3—Soybeans can get real hungry. Usually because growers don't fertilize their corn or small grains to insure ENOUGH CARRYOVER P and K to meet the demands of high-yielding soybeans. Soybeans DO respond to DIRECT fertilizer applications and to HIGH soil fertility levels. Research shows it!

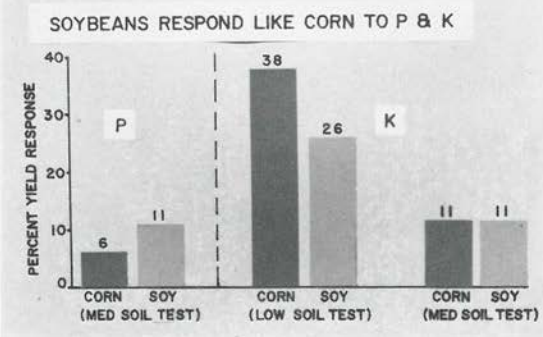


SLIDE 4—Thoughts on soybean fertility are changing. Experts say fertilized soybeans can equal corn profit-wise. Many growers PROVE IT by managing carefully. This includes EFFICIENT phosphate and potash to insure top yields.

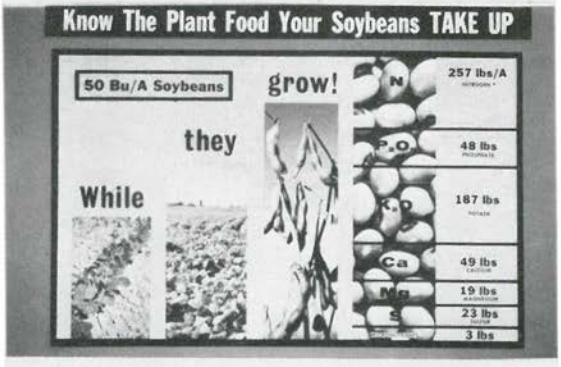




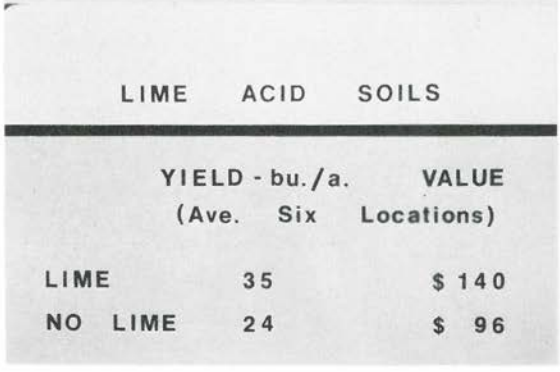
SLIDE 5—How does soybean fertilization compare to corn fertilization? Compare DOLLARS, not bushels—because soybeans normally bring twice the price of corn per bushel. On this low-fertility Iowa soil, 300 lbs 0-20-20 boosted dollar value of soybeans about as much as it improved corn profits.



SLIDE 6—Soybeans and corn like P and K about the same. In this 7-year North Carolina trial, both crops received 80 lbs each of P_2O_5 and K_2O. The soybean yields climbed about as well as the corn percentage-wise.

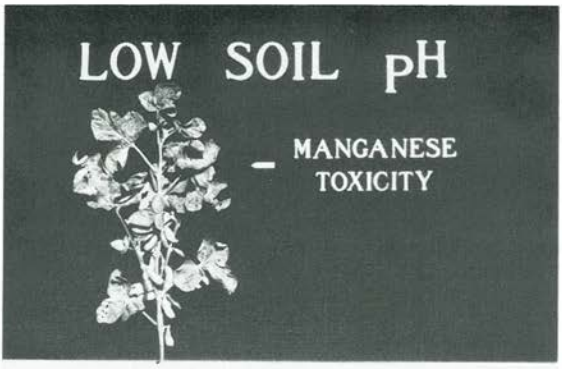


SLIDE 7—A good-yielding soybean crop—like 50 bushels per acre—will contain a whopping 586 lbs of total nutrients PER ACRE. That includes 257 lbs N, 48 lbs P_2O_5, 187 lbs K_2O, 49 lbs Ca, 19 lbs Mg, 23 lbs S, and a total of about 3 lbs micronutrients. The harvested beans take MORE THAN HALF the N, P_2O_5, and K_2O from the field. **EACH HARVESTED BUSHEL** contains about 4 lbs N, 0.8 lbs P_2O_5, and 1.4 lbs K_2O.



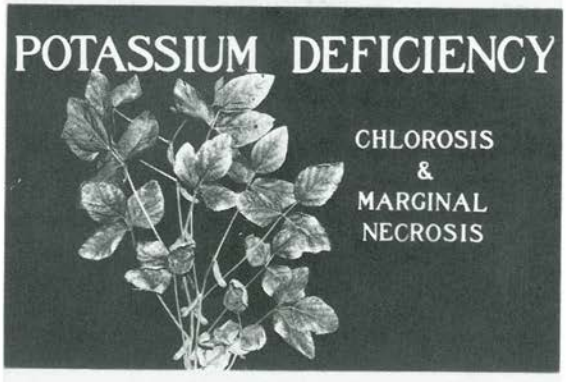
SLIDE 8—Liming can boost yields sharply by reducing soil acidity. Limestone applied by soil test boosted soybean yields **11 bushels per acre** average in 6 Missouri trials. Such yields pay ACID-CORRECTING COSTS out of the first cropping season.

SLIDE 9—Guard against toxic levels of manganese and aluminum on acid or low pH soils. This soybean crop—stunted and crinkled from **manganese toxicity**—could have produced normal yields IF it had been limed right. Aluminum toxicity can hit soybeans even more severely than this in many low pH soils. Liming easily corrects it.

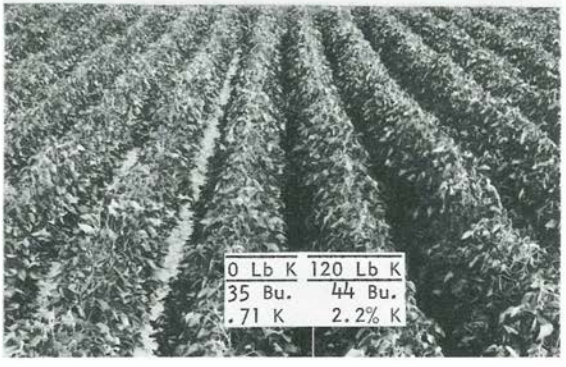


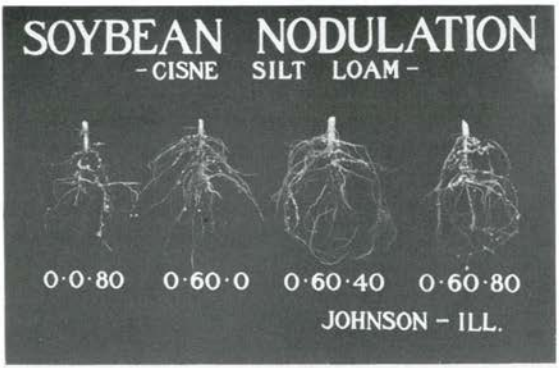
SLIDE 10—Guard against phosphorus hunger. It means stunted plants with little branching . . . small leaves that do not fill in the rows . . . and low yields. High yields ALWAYS go with high available phosphorus.

SLIDE 11—Guard against potassium hunger. Firing or scorching begins on outer edge of leaf . . . usually on lower leaves first . . . spreading to upper leaves as the season progresses. When leaf tissue dies, leaf edges become broken and ragged. The potash hunger then delays maturity, slows defoliation, and leads to shriveled, much less uniform beans, many worthless. Soybeans take MUCH potassium from the soil. It must be put back to avoid K hunger.

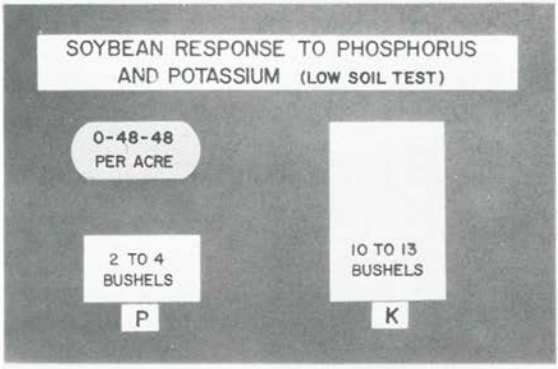


SLIDE 12—The soybean plant uses applied potassium well. When this crop got 120 lbs potassium (145 lbs K_2O), it gave the grower 9 bushels per acre MORE beans—plus three times more health-building potassium in the leaves.

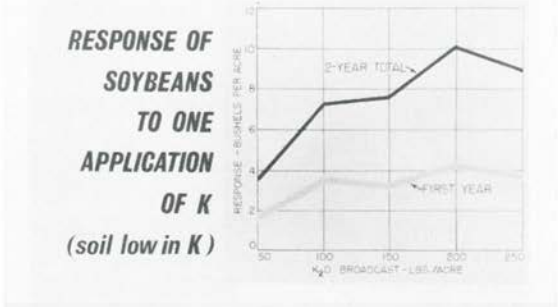




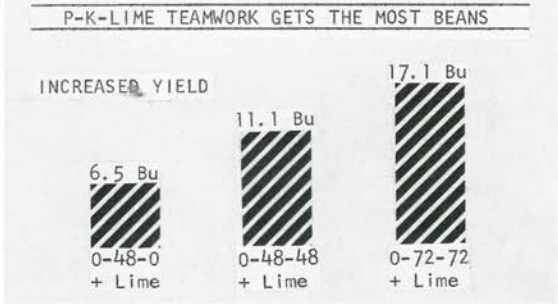
SLIDE 13—Applying potassium with phosphorus can improve SIZE and NUMBER of nodules on each plant, Illinois studies showed on low-K soils.



SLIDE 14—Soybeans usually respond better to K than to P . . . 8 to 9 bushels MORE per acre in Arkansas tests. For some years, yields rose 10-13 bushels per acre with 48 lbs K_2O on low test soils . . . 2-4 bushels per acre with same P rate.

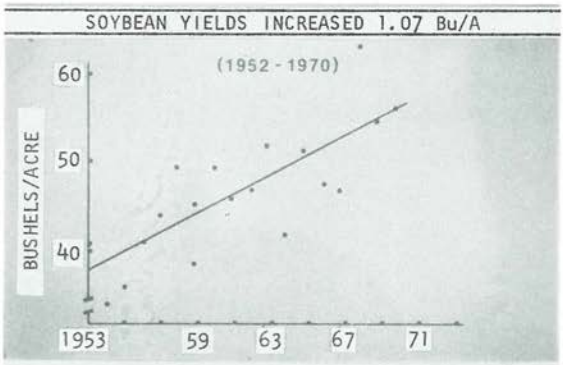


SLIDE 15—Heavy broadcast potassium can give carry-over insurance . . . maybe paying for initial application and **then** some. After this low-K Iowa soil got 200 lbs K_2O per acre, bean yields jumped 4.3 bushels first year, 5.9 bushels **second year.**



SLIDE 16—The LPK team (lime-phosphorus-potassium) gets most beans because many soils are low in all three. The TEAM got best increases in Louisiana tests.

SLIDE 17—How much P and K fertilizer should you use? Here soybean yields increased a little more than **1 bushel** PER ACRE PER YEAR over an 18-year rotation-fertility study. This GOOD MANAGEMENT included fertilizer applied on corn and wheat in the corn-soybean-wheat rotation.



SLIDE 18—What about nitrogen fertilization? Properly inoculated soybeans get most of their N from the air through nodule bacteria. Soybeans can occasionally show N hunger in cool, wet spring soil not favorable to bacterial activity OR on low-lime soils where nodulation is poor.

Fertilizer Recommendations

CHANGE

WITH →	SOIL TEST LEVEL & YIELD GOAL			
	30 - 40 Bu/A		50 - 60 Bu/A	
	P_2O_5	K_2O	P_2O_5	K_2O
High	20 lb.	30 lb.	30 lb.	60 lb.
Medium	30	50	60	90
Low	45	80	80	120
Very Low	60	100	100	150

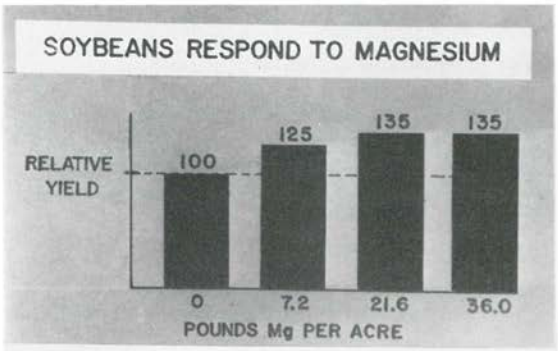
SLIDE 19—Nitrogen response is possible in three situations: (1) Low fertility, acid soils. (2) Newly cleared land often strongly acid and devoid of legume bacteria. (3) Soybeans that follow small grain where straw is plowed under, tying up all available N in the soil.

WHAT ABOUT N FOR SOYBEANS

PLANTS MAY RESPOND...IF NODULATION IS POOR

- ON HIGHLY ACID SOILS
- ON NEWLY CLEARED LAND

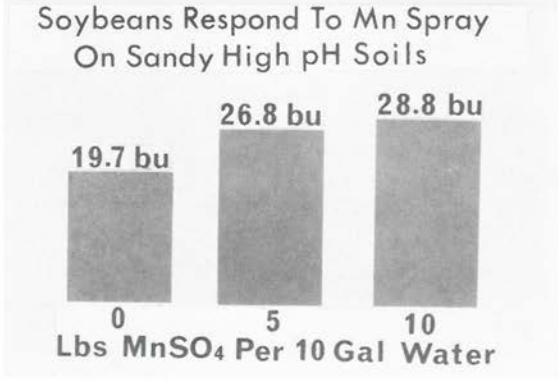
SLIDE 20—Magnesium hunger strikes acid, sandy soils especially . . . like this . . . with a pH of 5.2 and 5 lbs available magnesium per acre. It can be corrected with dolomitic limestone or magnesium fertilizer materials.



SLIDE 21—On soils inherently low in Mg, magnesium fertilizer can give a big boost to soybean yields . . . 35% boost . . . as these North Carolina trials did.

SLIDE 22—Calcium hunger strikes on coarse textured, low pH soils especially. The leaf on the right came from a plant growing on a soil with pH 5.2 and just 36 lbs available calcium per acre. Note how young growing buds crave calcium. **Sulfur** applications are stimulating yields where no sulfur has been added for many years or where soils are very coarse and deep.

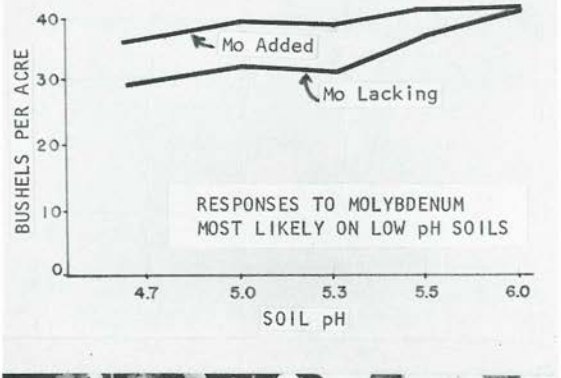
SLIDE 23—Manganese hunger strikes on poorly drained, high organic fields . . . often appearing on upper leaves of soybeans grown on soils above 6.3-7.0 pH. Soybeans demand more manganese than most crops.



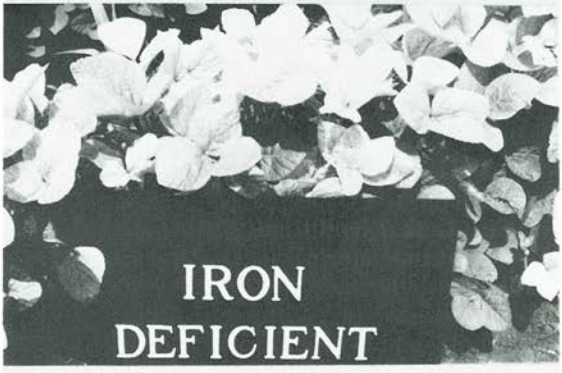
SLIDE 24—Mn spray solutions or Mn fertilizer applied to the soil can correct manganese hunger. This Illinois crop responded well to manganese sulfate spray ($MnSO_4$). Apply Mn fertilizers by planting time for best results.

SLIDE 25—Molybdenum may give a great boost to soybeans . . . as it did when added to soybean seed in these Mississippi trials.

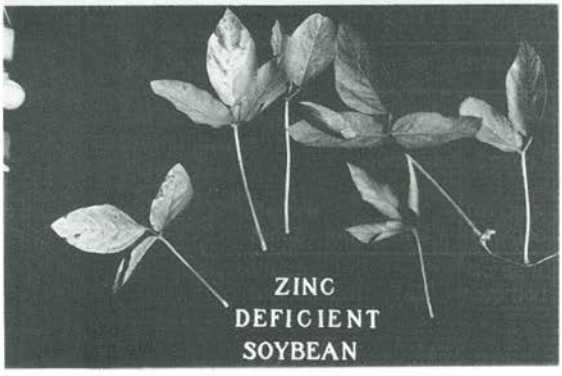
SLIDE 26—Molybdenum boosts yields on soil testing below pH 6.0-6.5, after liming makes it more available. This Mississippi work showed how soybeans responded to molybdenum with and without lime.



SLIDE 27—Iron hunger strikes generally where soil pH is 7.0 or above . . . as yellowing on younger leaves, with chlorophyll fading between the veins. Detected early, it can be corrected by spray or soil application with regular fertilizer.



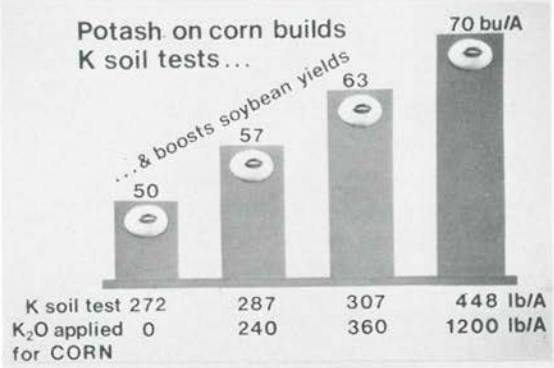
SLIDE 28—Zinc hunger can also appear on high pH soils.



DEEPEN THE ROOT ZONE FOR FULLER CONTROL
(Norfolk sandy loam)

TREATMENT*	YIELD--BU PER ACRE (5 Yr. Ave.)
UNDISTURBED CHECK	34
DISTURBED CHECK	43
DISTURBED + 1 T LIME + 160 LB P_2O_5	48

*Planted with 300 lb/A 0-10-20 banded



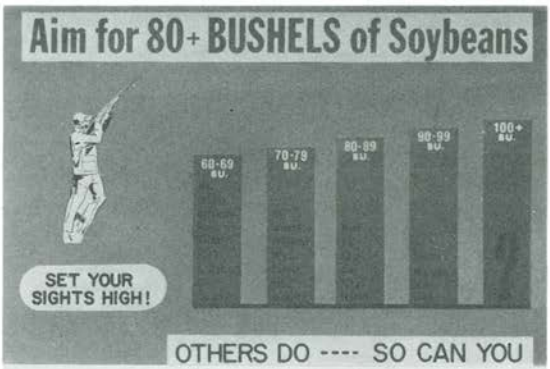
SLIDE 29—Top farmers now plow twice as deep as they used to . . . for better insurance against nutrient stress. This deeper plowing usually demands more nutrients to build up the expanded plow layer. Low subsoil fertility has long hampered many soybean yields. This profile was disturbed to 16 inches . . . then fertilized and limed WELL to boost yields in South Carolina.

SLIDE 30—Build up your soil fertility for TOP yields. Bean yields had increased 20 bushels per acre by the end of this rotation study. In a 2-year rotation such as corn and soybeans, phosphate and potash can be applied to the corn for BOTH crops. Add ENOUGH to take care of removal from both crops PLUS losses from **fixation, soil losses,** and **inefficient uptake.**

SLIDE 31—Broadcast your fertilizer for fast soil BUILDUP or MAINTENANCE. It's safe. It's quick. And it gives best results when plowed down.

SLIDE 32—Boost yields with fall-winter fertilization . . . as Arkansas tests did. They got nearly 7 bushels MORE per acre from 45 lbs P_2O_5 and 60 lbs K_2O. More fertilizer at planting might pay on this soil which tested very low K and low P in the beginning.

SLIDE 33—Shoot for high yields . . . 80+ bushels per acre. The U. S. record exceeds 90 bushels. Many growers get 50-60 bushels. Top management plus FULL fertility does it.



SLIDE 34—High fertility . . . ENOUGH lime and nutrients from start to maturity . . . build lush, top-profit plants that FILL the rows with a FULL-FEED canopy.

This slide set, FERTILIZE THOSE SOYBEANS, contains 36 color slides (35 mm). Order set below and booklet script on page 15.

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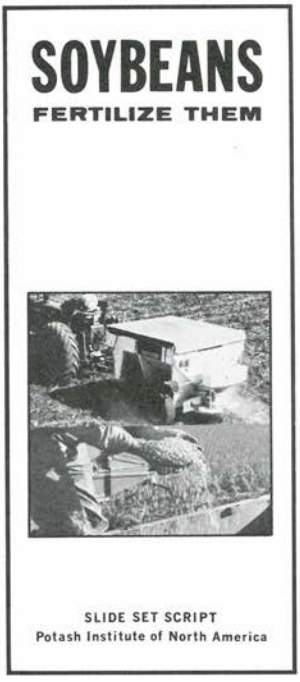

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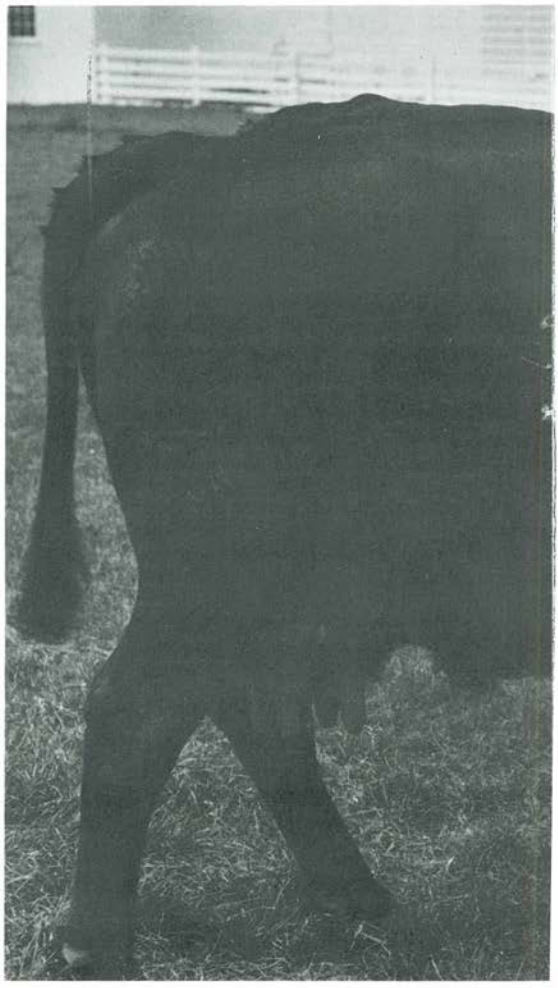
TETANY

A poorly understood condition in cattle demanding attention to magnesium (Mg) in the diet . . .

D. J. HORVATH
WEST VIRGINIA UNIVERSITY



TETANY IS MORE LIKELY to occur on soils low in magnesium (Mg). Availability of soil Mg varies among soils. Pennsylvania now recommends exchangeable Mg occupy at least 10% of the cation exchange capacity of a soil.

Different plant species vary in their ability to take up Mg from a given soil. For example, tetany is rare when legumes are a major part of the ration.

For any given soil Mg level, increasing soil N, K or Ca may change the plant Mg level. British and other European workers have suggested adding nitrogen (N) fertilizers to pasture for "early bite" grazing and delaying potassium (K) application until early spring tetany season passes.

Generous applications of poultry manure have been associated with increased tetany. Dry poultry manure may contain 6% N, 2% K, ½% Mg, and 3 to 9% Ca. Layer manure has higher Ca values than broiler manure.

FACTS ON Mg FERTILIZATION increasing yields of forage crops are limited—so, it has been a rare practice outside of areas where dolomite is applied.

In West Virginia, dolomite increased early season Mg levels in orchard-grass more than calcite did. There were fewer cases of low blood magnesium with dolomite liming treatment.

In **Figure 1,** the difference between dolomite and calcite declines as the grass reaches the hay stage. Magnesium is less available in lush grass than in more mature grass. The soils were acid

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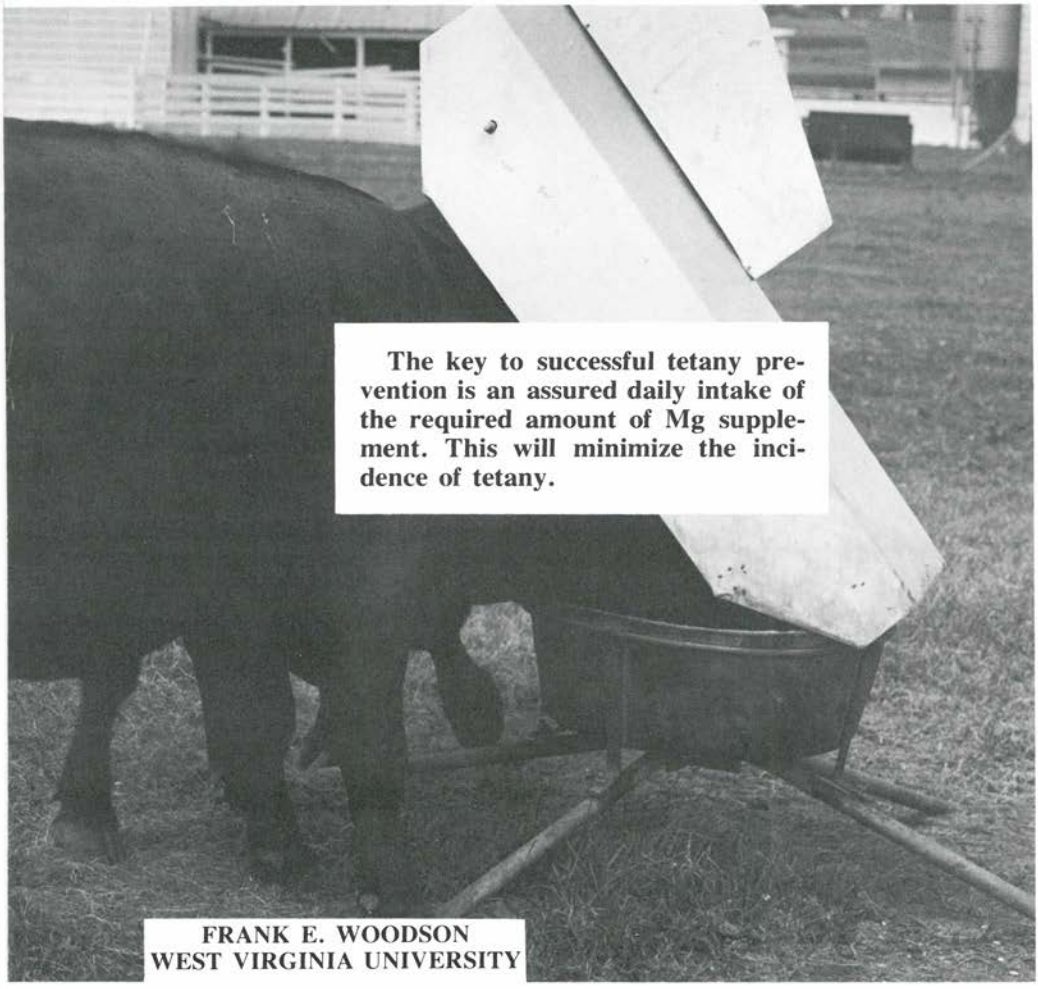


The key to successful tetany prevention is an assured daily intake of the required amount of Mg supplement. This will minimize the incidence of tetany.

FRANK E. WOODSON
WEST VIRGINIA UNIVERSITY

LOW BLOOD MAGNESIUM (hypomagnesemia) is a poorly understood metabolic condition in cattle, aggravated by physiological stresses such as lactation, weather, fatigue, or excitement.

Consuming forages in which magnesium is low or largely unavailable to the animal can reduce blood magnesium and precipitate the overt, highly fatal crisis called tetany.

MAGNESIUM (Mg) NEED. The average lactating beef cow must consume 22 to 25 grams of Mg daily to supply body needs. The amount of Mg in forage varies greatly. But on a dry matter basis it should be 0.2% or more for minimum tetany risk. Mg levels between 0.2% and 0.1% indicate low to moderate tetany risk. Below 0.1% indicates high tetany risk.

If forage is not analyzed, **every** herd in a tetany area must be assumed low to moderate risk even if tetany has not previously occurred in the herd. If tetany has been an annual occurrence, a herd must be assumed to have a high

TURN TO PAGE 19

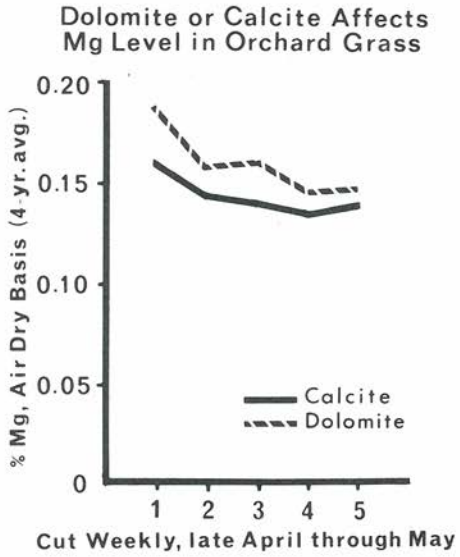


FIGURE 1

clay loams with C.E.C. values of 14 to 18. British work indicates dolomite or other Mg sources will serve acid sandy soils more effectively than fine textured soils.

The Regional Pastures Lab at University Park, Pennsylvania, found different forage species respond differently to fertilizer Mg. Mg level in Kentucky bluegrass increased appreciably with as little as 56 kg Mg/ha applied principally as magnesium sulfate. But the Mg level in orchardgrass increased only about half as much as it did in bluegrass when each forage received 112 kg Mg/ha.

Mg IN FORAGE PLANTS may actually be higher in early spring, when tetany can be most severe, than when the forage matures. But this early forage Mg is less available to the animal, perhaps 5% compared to 20% later on.

Although legumes contain more Mg than grasses, they begin growth later in spring than grasses. So, spring tetany can be a problem in cattle grazing mixed stands. Among the grasses, timothy and smooth brome have been rated low Mg accumulators and red top and tall fescue high Mg accumulators. Unfortunately, field experience in the Southeast suggests fescue Mg may be largely unavailable, especially when abundant poultry manure is used as fertilizer.

THE ANIMAL RESPONDS to many influences—weather, age, genetics, and especially lactation. Lactation increases the cow's output of Mg. A 22 lb (10 kg) milk flow would contain about 1½ g Mg. This compares to a total Mg content in the extracellular fluid of the cow of about 1¾ g Mg. Since skeletal and intracellular fluid Mg are not easily mobilized, a cow can largely deplete its extracellular fluid Mg in 24 hours if adequate Mg isn't available in the diet.

There are different ways to prevent Mg depletion or increase Mg intake:

1—Use adequate dolomite after soil tests. Don't expect dolomite effect to be immediate—but look for long-range benefits. Topdressed dolomite may boost the magnesium in your forage significantly **the next spring** on sandy acid soils, **in 2 or 3 years** on a clay loam soil. Plowed down dolomite may reach the root zone faster. When plant nutrients are out of balance, add magnesium rather than reduce fertilizer rates. Other Mg fertilizer practices may come in the future from experiments now going on at several locations in the United States.

2—Apply potassium on grass pastures in late spring, **not early spring,** and apply it to satisfy soil test needs.

3—Apply Mg directly to the grass. MgO dusting of foliage at 25-30 lb/A (11 kg/ha) has been developed so each bite of pasture adds available Mg. In

northern Ireland, this lasts until the grass is grazed short. Georgia workers recently developed a rain-resistant bentonite-Mg slurry to spray on foliage. Both methods offer **immediate** protection for grazing animals.

4—Use Mg licks or supplements that contain a tasty additive, like molasses. Magnesia is palatable when mixed with a variety of feeds, but it's hard to get cows to eat a supplement when first turned out on spring grass. Molasses will attract the cows to the magnesium supplement.

West Virginia workers have used liquid mixes, loose dry mixes, and compressed blocks. The blocks must be softer than usual mineral blocks because each cow should consume 1 to 2 ounces (30-60 gm) MgO per day. This requires about 6 ounces of block consumption. The blocks may be too hard if the tip of a penknife won't penetrate them about ¼".

Remove all other salt sources from the pasture if the blocks contain high salt levels, say 20% or more. Place the blocks away from mud and manure. Scatter them out so "boss" cows can't keep timid cows from getting their share. Use 1 block for each 5 cows. Observe cattle frequently and weigh a few blocks (with a milk scale) for acutal consumption.

5—Supplement silage as it is ensiled or fed to prevent winter tetany. As the silage is fed, sprinkle it with 1 to 2 ounces MgO per cow. Soft blocks and loose mixes can also be provided, though they cost more than dusting silage as it is fed. Have your hay and silage sampled and tested for Mg. If Mg exceeds 0.2% (dry basis), your tetany risk is very low. If Mg tests below 0.1%, you may even see tetany in an occasional dry cow—nervousness and awkward gait, followed by muscle tremors, rapid breathing and collapse. Supplement Mg immediately. Hay and silage that tests between 0.1 and 0.2% should start receiving Mg supplements about two weeks **before** the first calf is due.

6—Keep a close eye on what YOUR cows are consuming—because liquid protein supplements used in winter may cause less Mg supplement to be consumed. Also the phosphoric acid in liquid supplements prevent manufacturers from adding much Mg supplement, since Mg phosphate is relatively insoluble.

For details on testing your soil and crop for magnesium level, contact your county advisors. And call your veterinarian promptly at the first signs of tetany.

THE END

FROM PAGE 17—WOODSON ON TETANY

tetany risk.

Herds with low to moderate tetany risk should be routinely supplemented with at least 1 oz of magnesium oxide (MgO) or an equivalent amount of Mg from other sources per cow day. Herds with high tetany risk should get 2 oz MgO or equivalent per cow day. In low to moderate tetany risk herds, begin supplementing Mg 2 weeks before cows are due to calve. In herds at high risk, even dry cows in advanced pregnancy are susceptible, so begin supplementing Mg 4 to 6 weeks before calving.

In both cases, continue supplementation until 3 to 4 weeks after turning out to pasture. **REMEMBER! Lactating cows, shortly after calving and/or grazing young succulent grasses are at highest tetany risk.**

The key to successful tetany preven-

tion is an **assured** daily intake of the required amount of Mg supplement. This will minimize the incidence of tetany. But since prevention depends on voluntary intake by every susceptible cow, **anything** which interferes with access to or consumption of the Mg supplement can precipitate tetany.

Management, cow health, and supplement palatability all promote voluntary intake. Herdsmen must recognize and compensate for digestive disturbances or other diseases that cause a cow to go "off feed," calving cows that isolate themselves from sources of supplemental Mg, and weak or shy cows that do not get an adequate share due to feeding competition.

IN CHOOSING A METHOD to supplement Mg, consider **effectiveness** and **adaptability** to feeding/management system. Cost, within reason, is of secondary importance. Here are 4 methods to supplement Mg:

METHOD 1—Topdress silage by uniformly sprinkling 1 to 2 oz of MgO or equivalent per cow daily on silage as fed. It eliminates many intake problems associated with other methods and has the lowest cost at about 1 cent per cow per day.

METHOD 2—Fortify grain by mixing 1 lb MgO or equivalent in 15 lbs of corn and cob meal or other grain mix and feeding 1 to 2 lbs per cow per day. In high risk herds fed only 1 lb per cow per day, the mixing ratio should be 1 lb MgO to 7 lbs grain. This method is very effective and costs 3 cents or more per cow per day depending on grain cost.

This method demands adequate trough design and space to permit **all** cows to feed without disturbance at one time. Otherwise, shy or weak cows will not take in enough.

METHOD 3—Use magnesium feeding blocks . . . in recent years, several brands of compressed blocks with high Mg content have been marketed. BUT BEWARE! Not all brands are equally acceptable. The most successful blocks are **soft and palatable** enough to allow adequate daily consumption. They contain 14% to 15% Mg, 19% to 32% salt, other minerals and vitamins and variable feed ingredients.

Such blocks provide an attractive alternative method of Mg supplementation because they can be used in most winter feeding systems and even on pasture.

Soft blocks have been widely used by beef producers in the mountainous tetany area of east-central West Virginia for the past three years, mainly to prevent tetany during winter feeding.

During this period producer block usage has steadily increased and numerous suggestions to correct or improve block feeding management have been made. Over 3,100 cow-case opportunities have been followed.

In 1971-72 and 1972-73, most tetany cases occurred before producers ac-

EFFECTS OF Mg BLOCK FEEDING ON "WINTER" TETANY INCIDENCE

	1971/72			1972/73			1973/74		
	Total cattle observed	Cases	Deaths	Total cattle observed	Cases	Deaths	Total cattle observed	Cases	Deaths
Before blocks fed	525	No data recorded	11	362	13	10	92	1	0
When blocks fed	782	No data recorded	0	1169	5	3	1294	3	1

cepted block feeding or started feeding blocks too late. When tetany occurred in herds on blocks, it was usually possible to pinpoint a specific, often correctable factor preventing that individual cow from consuming the required minimum daily quantity of block.

Wrong feeding management can markedly reduce block consumption in entire herds or in individual cows. Successful tetany prevention with magnesium blocks depends on careful feeding management:

- **—Provide one block for each 5 cows.**
- **—Remove ALL other salt sources.**
- **—Place blocks in different places frequented by cows—feed troughs, mangers or other feeding area, loafing area, watering point, gateway where cattle pass, etc.**
- **—Prevent block soiling and wastage by placing in boxes, preferably covered to protect from precipitation.**
- **—Constant observation to find ways to promote consumption.**

Manufacturers recommend an average daily block intake of 8 oz (containing 2 oz MgO) per cow. But in observed herds, it has not been possible to get any average herd intake above 4 oz per cow per day. Even at this level, tetany prevention has been good—even in high risk herds. Four oz of block costs about 2½ cents.

In one herd, average consumption has been as low as 1 to 2 oz per cow per day, and this herd has had an occasional case of tetany. So far, the reason for these consumption variations has not been determined. Consumption of a new block with lower salt content is now being evaluated. Other factors to be examined are different aspects of feeding management and forage mineral content, especially sodium.

Magnesium feeding blocks can provide effective tetany prevention in most herds where silage is not fed, or where grain is considered too troublesome or expensive to feed. Soft block formulation may likely be improved to get higher, more uniform consumption. Block manufacturers and beef producers should work together toward this goal.

METHOD 4—Use Mineral Mixtures. Many formulations of loose minerals containing various combinations of salt, MgO, and different feedstuffs (molasses, wheat, bran, soybean meal) have been tried as free choice sources of supplementary Mg.

Consumption between herds has varied too much to recommend any standard mixture as a dependable method of supplementing Mg. In certain low-to-moderate risk herds with adequate consumption, such mixtures may provide useful protection.

MANY POTENTIAL SOURCES of Mg marketed are not equal in supplementation value. Producers should remember this.

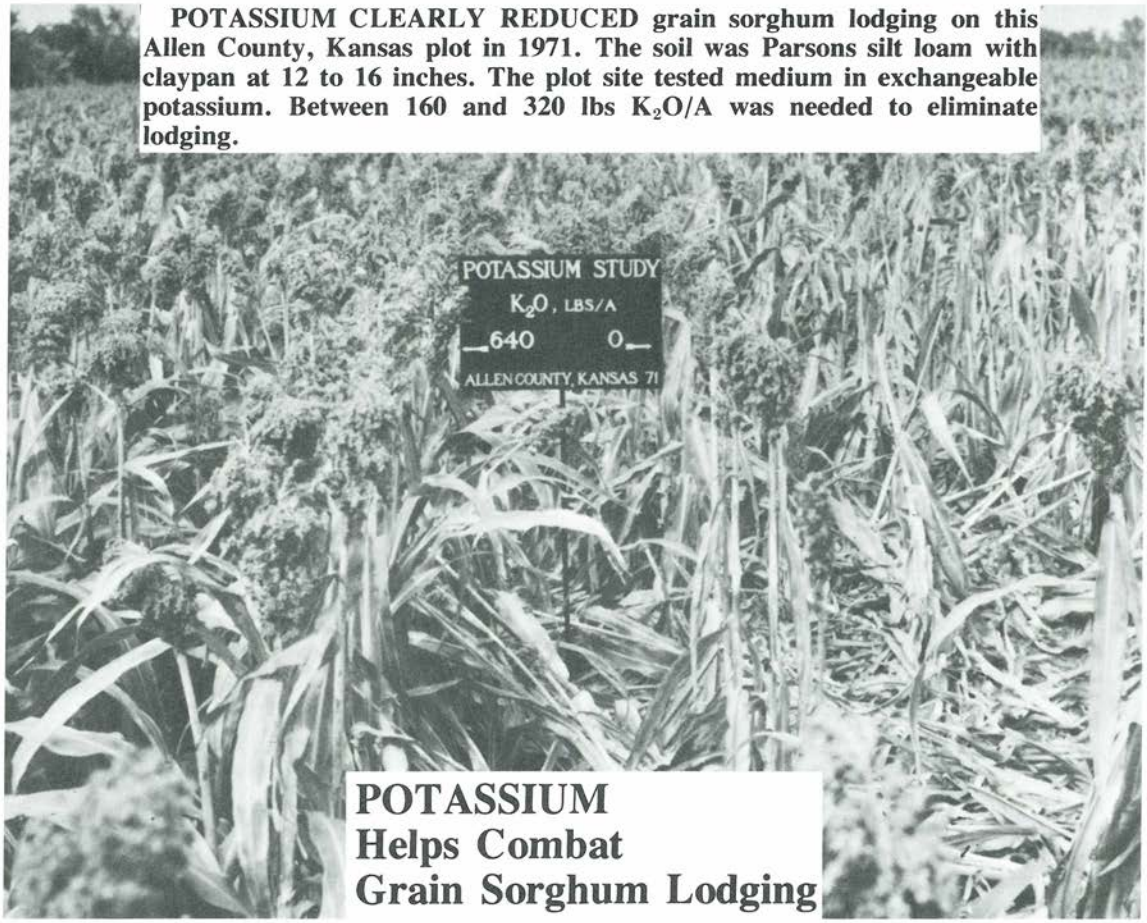
Magnesium oxide (magnesia) contains 60% Mg. It is the most widely used and cheapest source.

Magnesium carbonate (magnesite) contains 29% Mg. It is also a good source, but it takes twice as much to give equal magnesium.

Magnesium sulfate contains 9% Mg. It is obviously a poor, expensive source.

Several commercial multiple mineral supplements are being advertised as aids in tetany prevention. Beware! Most of these **only aid** in prevention. Their Mg content and/or consumption levels are so low that they help only borderline forage Mg deficiency.

Many liquid protein supplements also contain magnesium sulfate or magnesium chloride. They are advertised as aids in tetany prevention. But they, too, give only small amounts of Mg. **The End**



POTASSIUM CLEARLY REDUCED grain sorghum lodging on this Allen County, Kansas plot in 1971. The soil was Parsons silt loam with claypan at 12 to 16 inches. The plot site tested medium in exchangeable potassium. Between 160 and 320 lbs K_2O/A was needed to eliminate lodging.

POTASSIUM Helps Combat Grain Sorghum Lodging

DAVID A. WHITNEY
AND
LARRY S. MURPHY
KANSAS STATE UNIVERSITY

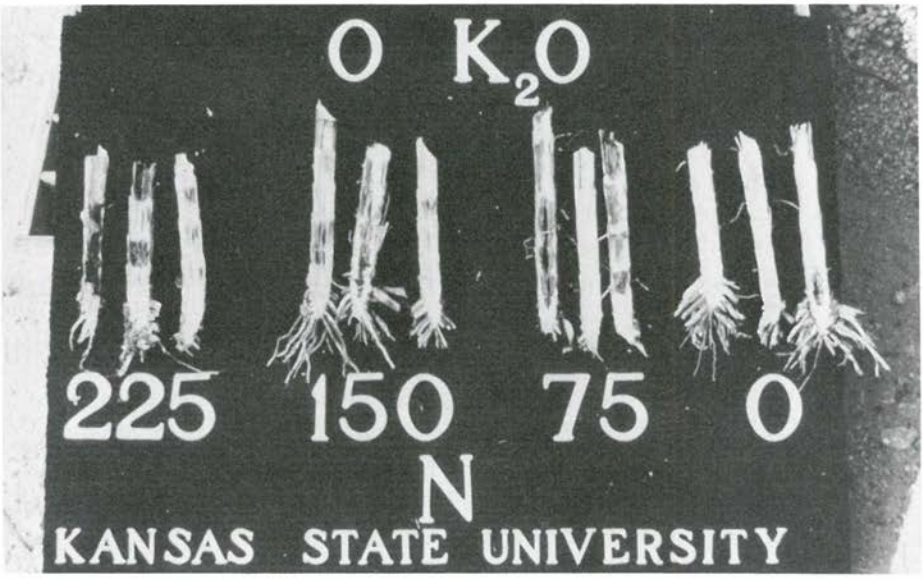
GRAIN SORGHUM LODGING is frequently a problem in southeastern Kansas—slowing harvest and reducing yield.

Shallow claypan or limestone soils restrict rooting depth and the soils are naturally low in exchangeable potassium. The claypan soils are developed from clayey shale and are similar to claypan soils of northeastern Oklahoma, Missouri, and southern Illinois.

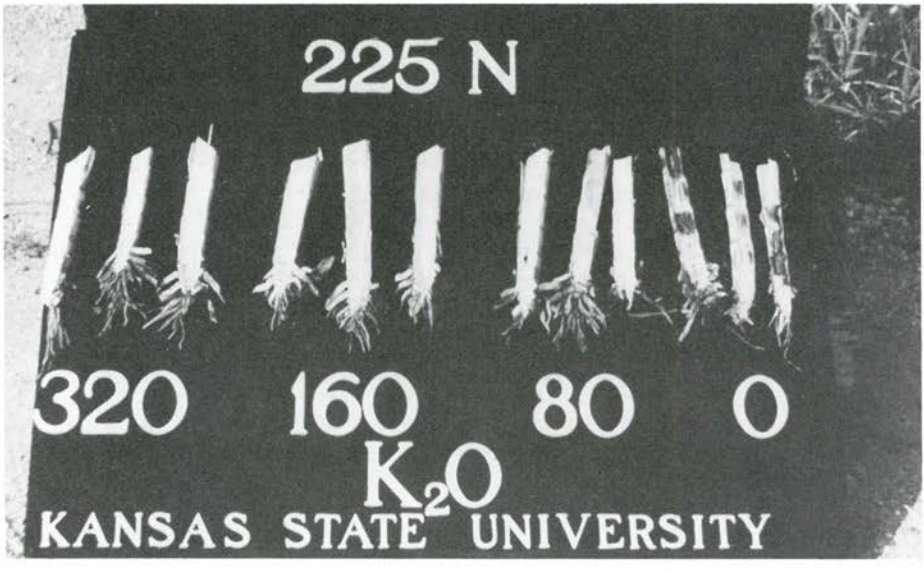
Ten days to two weeks without rainfall in mid-summer can lead to severe moisture stress on such soils—often in late July or early August when sorghum head emerges.

Why stalk deterioration occurs with sorghum lodging is not clearly understood. But several factors seem to go with it:

- **Usually a period of moisture stress occurs during the flowering stage.**
- **In some cases, charcoal and Fusarium root and stalk rot diseases add to the weakness.**
- **Variety differences, planting rate**



WITH NO POTASH (K_2O) APPLIED, stem tissue deterioration (dark areas) increased as nitrogen (N) rates increased on this Crawford County, Kansas, sorghum.



WITH HIGH N APPLIED (225 Lbs/A)—stem tissue deterioration (dark areas) decreased as potash (K_2O) rates increased on the Crawford County site.

effects, and nutrient imbalances are sometimes factors.

- **Excessive N and low K have been suggested as factors.**

Soil tests show 70% or more of the samples from the southeast Kansas area are medium (161-240 lb K/A) or lower in exchangeable potassium—based on Kansas State Soil Test Lab results and test interpretation.

From 10 to 15% of the soils tested are very low in K (less than 80 lb/A exchangeable K by NH_4OA_C). Potassium fertilizer is used extensively in the area. Yield responses occur frequently on soils testing low or very low in K.

PAST RESEARCH ON K fertilization of grain sorghum in southeast Kansas has been limited. Fertilizer recommendations have been based partly on corn research results. Current research is seeking to learn potassium's role in reducing grain sorghum lodging and optimum potassium rates for grain yield.

Lodging does not occur with the same severity each season. This suggests climate may help start stalk deterioration. This makes it harder to study potassium fertilization effect on lodging.

Yet, in 8 experiments during 3 years, we have encountered severe lodging at two locations. Moderate lodging was found on three of the other locations.

In all cases, lodging decreased as potassium rates increased. **Table 1** shows the trend at two locations with severe lodging at harvest.

The site for these experiments was chosen for 3 conditions: **(1) Low soil test K, (2) shallow soil, (3) previous lodging problems.**

The Allen County location was a Parsons silt loam soil with claypan at 12 to 16 inches. The plot site tested medium in exchangeable potassium. Between 160 and 320 lbs K_2O/A was needed to eliminate the lodging.

The Labette County location was situated on a shallow silty clay loam soil over limestone testing medium to low in exchangeable potassium. It had a previous history of lodging.

Although the potassium application was not too effective in eliminating lodging, it did reduce the lodging that had occurred by harvest. Potassium also delayed lodging at this location. Two to three weeks before harvest, the plots showed little lodging on K-treated plots while control plots were already lodging.

Individual plants, split on the stalks at several locations, revealed a marked discoloration and deterioration of the pith. But this stalk deterioration had not caused significant lodging at harvest.

Excessive nitrogen rates—beyond the adequate 150 lb N/A—can be as harmful as inadequate K.

WE REALIZED we were observing lodging problems early in the fall harvest period, not allowing time for stalk decay and later lodging to occur after

Table 1. Effect of Potassium Rates on Grain Sorghum Lodging[1]

K_2O Rate lbs/A	Location	
	Allen Co., 1971	Labette Co., 1972
	%	
0	88	78
40	71	—
80	45	55
160	16	50
320	2	48
640	1	—

[1]Plant considered lodged when leaning at greater than 45° from vertical.

Table 2. Effect of Potassium Rates on Grain Sorghum Stalk Deterioration, Grain Yield and Seed Quality in Cherokee County, 1973

K_2O Rate lbs/A	Stalk Deterioration[1] %	Grain Yield Bu/A	Seed Size Seeds/10g
0	22	52	534
40	20	61	524
80	26	72	484
160	16	76	456
320	4	83	446
LSD .05	10	7	18

[1]Based on percent of the stalk showing deterioration at the base one month after harvest.

grain maturity in many cases. So we designed a study in 1973 that allowed part of the plot to stand for a month after normal harvest if lodging had not struck by normal harvest time.

Lodging did not hit the plot area even with the additional month, so we examined individual stalks for deterioration of the stalk base. **Table 2** shows K application helped reduce stalk deterioration. This location was very low (<80 lb K/A) in exchangeable potassium—on claypan soil with the claypan at 10 to 12 inches. **Table 2** also shows how K applications increased yield and seed size markedly.

Grain sorghum performance tests conducted at Kansas State University have shown that varieties differ in lodging susceptibility. Studies in 1972-73 grew varieties side by side under various K rates to learn if potassium interaction might exist on stalk strength. The results did not show any variety-potassium interaction, but they did show varieties differing in deterioration at the stalk base at harvest.

On 4 of the 8 locations, potassium boosted grain yield significantly. In most cases, the optimum K rate for yield was less than the optimum rate needed to eliminate lodging where it occurred. **Table 3** shows yield results for the two locations having the severe lodging.

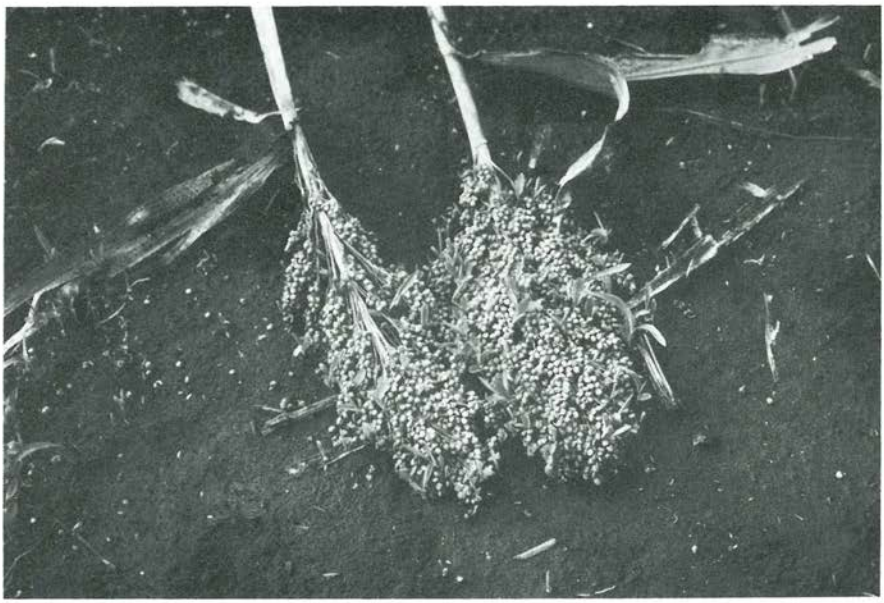
Data from the Allen County location in 1971 suggested 40 lbs K_2O/A as optimum rate. Data from Labette County location suggested around 160 lbs K_2O/A as optimal.

Unfortunately we were unable to measure residual effects from the heavy

Table 3. Effect of Potassium Rates on Grain Sorghum Yield[1]

K_2O Rate lbs/A	Location Allen Co., 1971	Labette Co., 1972
	bu/A	
0	95	64
40	105	—
80	108	71
160	107	75
320	106	82
640	99	—
LSD .05	10	11

[1]Yield results are expressed on a 12.5% moisture basis.



THIS IS LOST MONEY to many growers—lodged grain sorghum heads sprouting from lying on the wet ground before harvest in Labette County, Kansas, 1972. When the combine fails to pick up lodged heads, sprouting and rotting heads reduce grain quality. Farmers try to harvest grain sorghum as quickly as possible after maturity. But delays from large acreages or wet weather accompanied by severe lodging can reduce yields even more.

application rates on grain sorghum the following year due to cropping sequence of the cooperator.

IN SUMMARY, our research on K fertilization of grain sorghum in southeastern Kansas plus additional observations of grain sorghum production practices in the area point toward certain facts:

1—Lodging of grain sorghum near harvest time is a problem in the southeast Kansas area.

2—Lodging results from many interrelated factors.

3—Potassium fertilization will help reduce the amount of lodging on low K soils.

4—Applying potassium just to insure against lodging is not recommended—but a sound fertilization program should include K where soil tests show need.

5—On shallow soils subject to moisture stress, farmers should also consider proper plant populations, variety selection and nitrogen rates for reducing lodging. Little can be done to eliminate moisture stress on these nonirrigated soils.

6—This and other grain sorghum research in the area have led to higher K recommendations by Kansas State University on soils testing low and very low K. The End

Watch it, doc . . .

I'VE FORGOTTEN the scientist's name, but I'll never forget his comment:

Man is the "main problem" in maintaining environmental quality and he will "come of age only when he accepts the fact that he is just another organism."

Just another organism! Now, watch it, doc!

What other organism can boast 200 peaceful years out of 6,000 recorded years . . . and such ingenious ways of destroying its own kind (torture, bombs, brain-wash, etc.) . . . while sailing to the moon.

No sir, doc, I can't believe man is "just another organism" . . .

NOT WHEN we'll pay $121,000 in taxes to learn why people say "ain't" . . . $159,000 to teach mamas how to play with their babies . . . $375,000 to study the Frisbee . . . while millions starve in some parts of the world and thousands search for jobs that will sustain their families.

NOT WHEN we'll support 7 times more generals or admirals *per soldier or sailor* today than we did 30 years ago in World War II . . . and allegedly pay 7 folks tax money to study the impact of horse hoofs on wooden roads. (Of course, that's 7 jobs—hopefully for 7 families.)

Man . . . "just another organism???"

WHAT OTHER creature would call destitute families "welfare cheaters" while allegedly overcharging the government for half-baked products and even less-baked services, if we can get by with it.

WHAT OTHER creature would accept new housing through tax money from the more fortunate and virtually destroy the recreation center with wanton vandalism and blame it on hopelessness . . . or vandalize fine suburban schools that would have dazzled grandparents grateful for one room and a stove.

WHAT OTHER creature would have the ingenuity to put 6-cents worth of mountain water in an 11-ounce aerosol can and sell it for $5 as a "morning refresher, skin stimulator, and complexion relaxer." And what other creature would buy it?

No sir, doc, I can't believe man is "just another organism" . . .

NOT WHEN we'll spend 12 years writing a book on grassland improvement before finishing it in our 78th year . . . and then begin a second edition to bring the first one up to date.

NOT WHEN we'll wake up one morning unable to find 277 railroad boxcars. What other creature could lose nearly 300 items that big?

My late benchleg beagle, Cleopatra Frances Martin, kept a dozen bones buried in her woods . . . but she knew when you headed toward each one . . . and you knew she knew.

Cleo was almost human. Yet, as human as she was, I can't see her ever smoking something that would give her "toxic psychosis" or drinking something that would harden her liver . . . unless she was forced into the habit.

I can't see her ever being snowed by fast-talking, self-serving consultants who would charge her $2 million to prepare a "study" she would not read or heed. But . . .

I **CAN** see her complaining, very humanly, everytime a loaf of bread went up a penny . . . and paying no attention to a paragraph next to the want ads reporting the farmer got 7¢ from the 47¢ loaf.

If Cleo ever returns as a human, I hope to be around . . . to see her trot into some high-paid SAVE OUR GALAXY office and ask for a real live, bonafide, trained scientist . . . for the **FACTS** . . . just for the facts, folks.

They won't know who she is. But something will tell those fund-raising administrators, heavy with legal and "media" backgrounds, to start scratching FAST for a bonafide scientist.

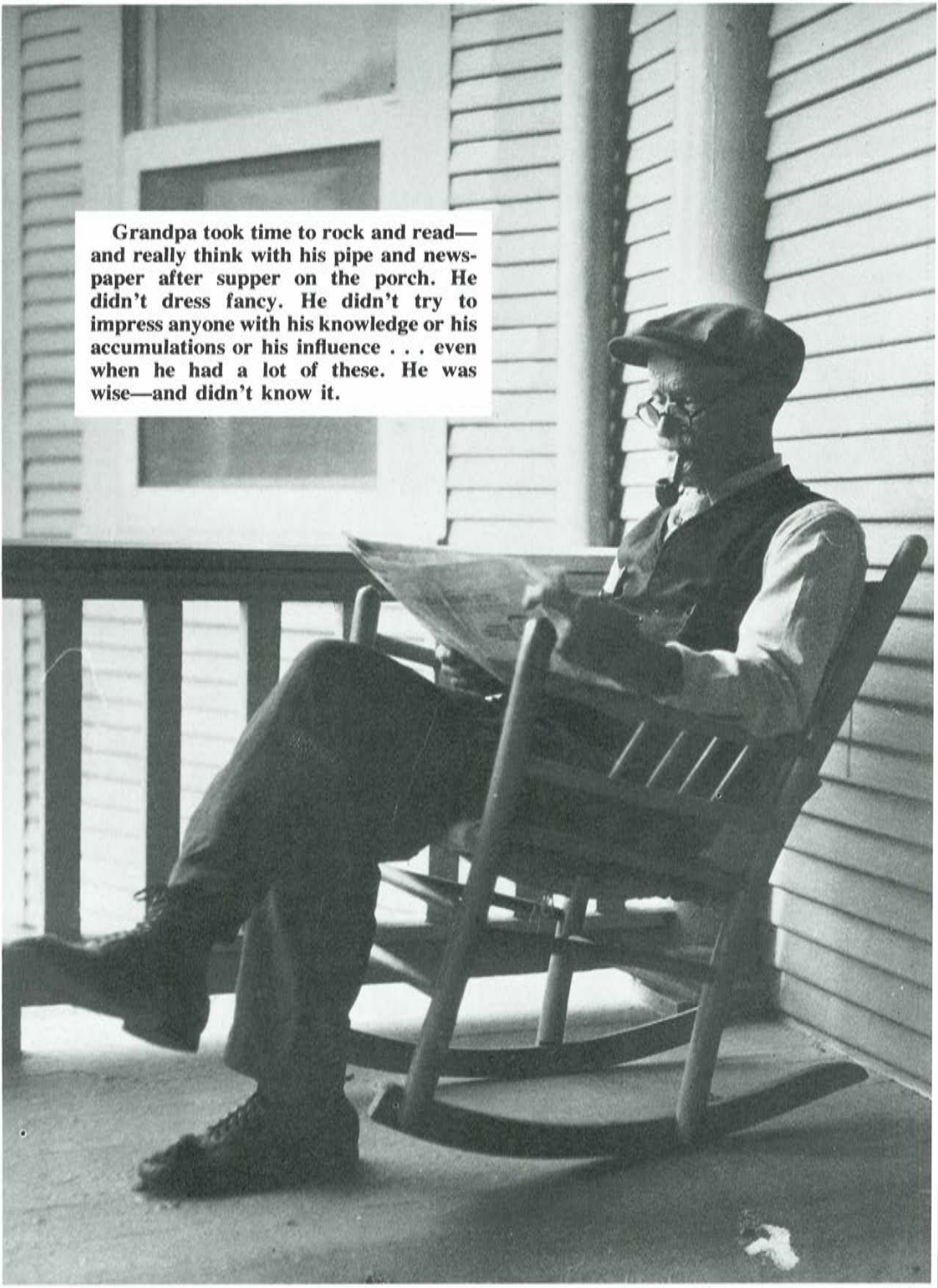
And they'll find one . . . far down the line, no doubt, in a backroom somewhere on their organizational chart . . . not in a Brooks Brothers suit . . . but a creature they had forgotten about.

No sir, doc, I can't believe man is "just another organism." And I can't believe monkeys appreciate the inference—either.

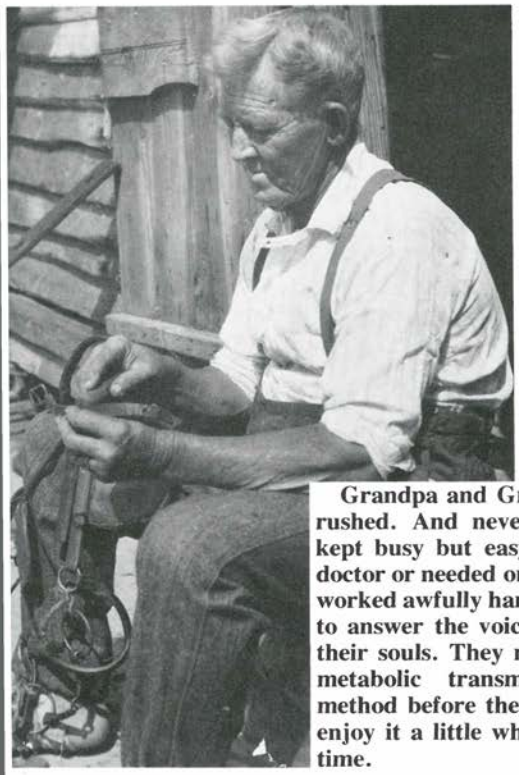
It's not too painful to agree with the monkeys and me when you read your newspaper real early each morning—while all us organisms are waking up.

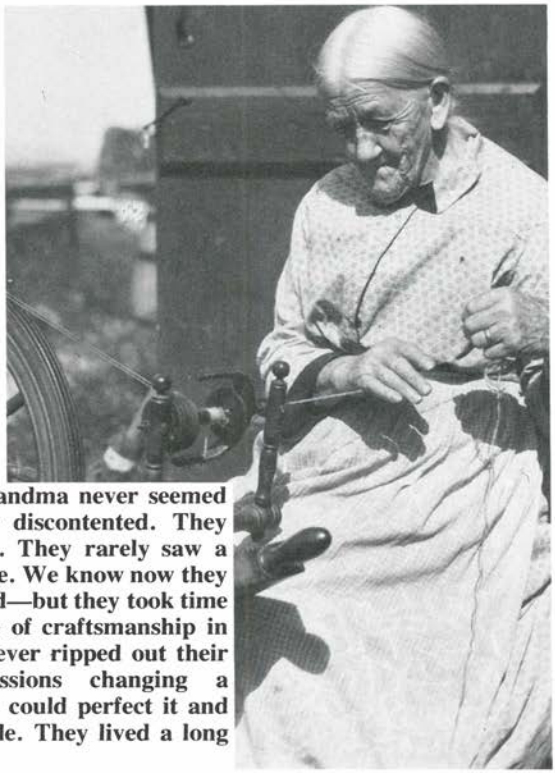
Grandpa was a hero in the early days of BETTER CROPS magazine. A giant smiling through white beard to a namesake who clearly idolized him in the potato rows. The giant also idolized what he saw.

Grandma worked every bit as hard as Grandpa. Then when you needed her and couldn't find her, you knew one place to look. She'd be in the spare bedroom thumbing through letters or cards or something in an old trunk, her face on a long journey back, her soft deep lines telling you she was growing old and closer to her Maker—and knew it.

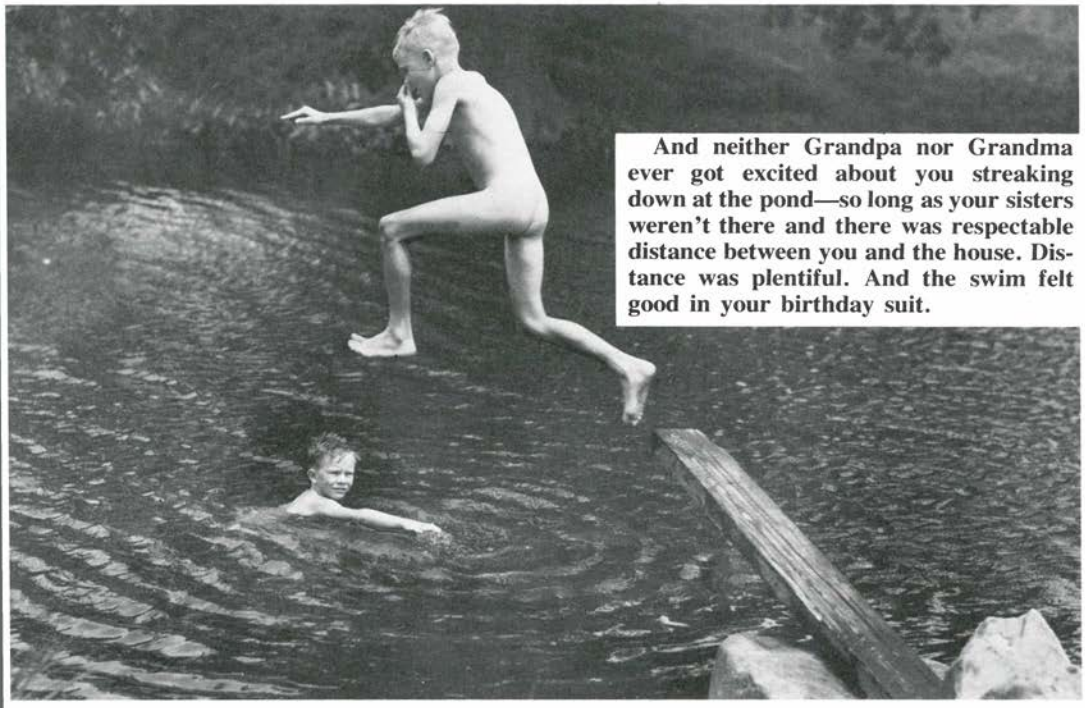


Grandpa took time to rock and read—and really think with his pipe and newspaper after supper on the porch. He didn't dress fancy. He didn't try to impress anyone with his knowledge or his accumulations or his influence . . . even when he had a lot of these. He was wise—and didn't know it.





Grandpa and Grandma never seemed rushed. And never discontented. They kept busy but easy. They rarely saw a doctor or needed one. We know now they worked awfully hard—but they took time to answer the voice of craftsmanship in their souls. They never ripped out their metabolic transmissions changing a method before they could perfect it and enjoy it a little while. They lived a long time.



And neither Grandpa nor Grandma ever got excited about you streaking down at the pond—so long as your sisters weren't there and there was respectable distance between you and the house. Distance was plentiful. And the swim felt good in your birthday suit.

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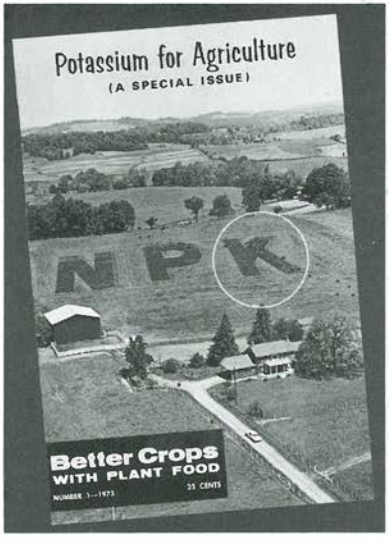

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