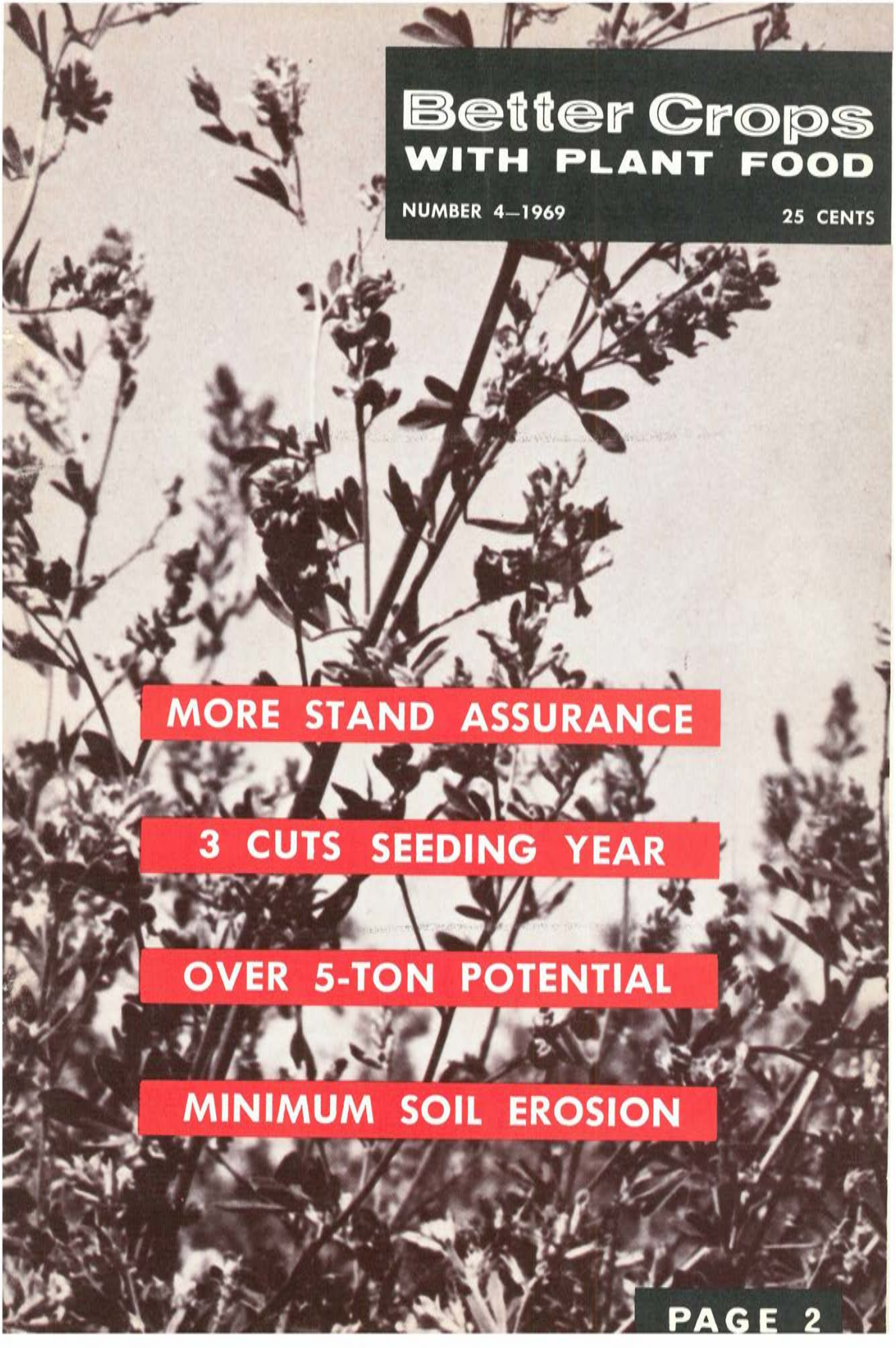

Better Crops
WITH PLANT FOOD

NUMBER 4—1969

25 CENTS

MORE STAND ASSURANCE

3 CUTS SEEDING YEAR

OVER 5-TON POTENTIAL

MINIMUM SOIL EROSION

PAGE 2

Who Will CREATE?

THE FERTILIZER INDUSTRY has done a remarkable job in the technology of production . . . heeding a call that the hungry world would use 135-170 metric tons of plant nutrients by 1980 . . . building nitrogen plants, phosphorus works, and potash mines and refineries—and still building them.

But don't equate need or projected "use" with demand and consumption. Fertilizer markets must be developed and promoted, demand must be created. Don't let this idea trap you: "We can multiply acres of crops by recommended rates of fertilizer—and develop the market that way." That's like multiplying the number of people in the world by 2 glasses of orange juice per day—and planting orange trees to meet the demand.

Don't confuse market *service* with market *development*. It's one thing to test soils, provide credit, supply granular products, offer spreading services. It's quite another thing to prove the need, demonstrate the response, educate the consumer, prove the profit through greater usage.

Can the fertilizer industry afford to spend money for real creative market development programs? Can it afford NOT to? A major airline reports a $14 million loss during a recent quarter—and increases its market development. A major drug firm spends 16% of its $680 million gross sales on market development.

Market development programs of the fertilizer industry could include several avenues:

1—Keeping up the demand on the crops historically fertilized. Often it is taken for granted that farmers have to use adequate fertilizer on corn, grain, tobacco, cotton, vegetable crops. You may even encounter the belief that fertilizer is a universally accepted product and we don't have to keep hammering away at the farmers in this country. What would happen to Coca Cola—to Gillette blades—to Dial soap—if they adopted that approach?

2—Developing greater demand on crops not heavily fertilized. Soybeans receive comparatively little fertilizer. The field is new. How about the newer, high-yield varieties of wheat, rice, etc.? And there always looms the enormous challenge on pastures and forage crops.

3—Creating new usage on crops—such as roadways, parks, forests, fisheries, etc. This means research to prove the need, to get the facts. Should the industry conduct some of this research? Should it assist the official agencies with advice, personnel, and grants? Should it depend on government—public funds? Or should it ignore the need for such research?

4—Developing demand in other areas of the world. Are we interested in potential markets in Latin America? Asia? Africa? Or should these be left to someone else? To accomplish year-round fertilization, acceptance of the facts on fertilizing forage for profit, increased soybean fertilization—all these may take 10 years of **sustained** effort, research, education. But innovation and profitability flourish in such an atmosphere.

Someone must invest in market development. It is only logical to expect the fertilizer industry to spend a certain portion of its gross income or production costs on creating and expanding the market for its product.

It is astonishing that a company will spend $100 million to build the most modern production and administrative facilities and expect the market to expand automatically to accommodate the increased production.

From J. Fielding Reed Speech
To National Fertilizer Conference

Better Crops
WITH PLANT FOOD

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CONTENTS

Going it Alone

Spring Establishment Of ALFALFA Without Companion Crop

D. W. GRAFFIS
UNIVERSITY OF ILLINOIS

ESTABLISHING ALFALFA without companion crop is an alternate method to the small grain-companion crop system. The no-companion crop system has many merits:

1—Greater assurance of a stand. No competition from a companion crop. But weeds can compete unless controlled by a herbicide. Removing competition of a companion crop or weeds enables the forage to develop top potential.

2—High-quality, high-yielding perennial forage. Ready to harvest 60-70 days from an early spring seeding—by mid to late June for early April seedings. From 1 to 1.75 tons/A dry matter per harvest. Up to three harvests seeding year can exceed 3.5 to 5 tons/A dry matter for the season.

3—Minimum soil erosion. Quick cover comes from the rapidly establishing forages and the perennial sod cover of the established crop.

4—A crop important in its own right —not a "catch" crop, but a "cash" crop in the fullest sense of the word.

STEPS TO SUCCESS:

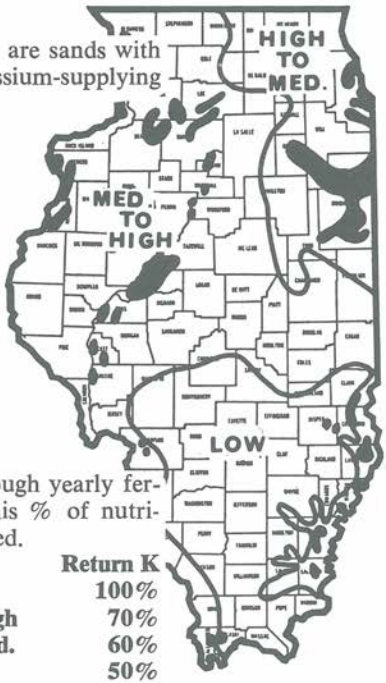
1—Soil Selection: Well drained soils —or poorly drained soils with 2% slope or more.

2—Soil Test: Current estimate of pH, P_1, K and organic matter levels

3—Seedbed: Free of weeds, trash, and

POTASSIUM-SUPPLYING POWER

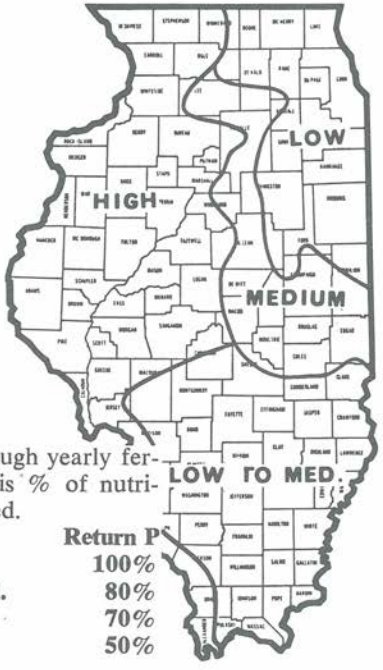
Black areas are sands with low potassium-supplying power.



Return through yearly fertilization this % of nutrients removed.

Soil Power	Return K
Low	100%
Med. to High	70%
High to Med.	60%
High	50%

PHOSPHORUS-SUPPLYING POWER



Return through yearly fertilization this % of nutrients removed.

Soil Power	Return P
Low	100%
Low to Med.	80%
Medium	70%
High	50%

free enough of crop residue not to interfere with seeding and soil compacting machinery.

Primary tillage. Usually plow land previously in corn, possibly in other crops. Disc with certain crop residues.

Secondary tillage. Usually disc and/or harrow.

4—Fertilization: Broadcast before seeding or at seeding.

Lime soil to pH of 6.5. With more than 5-6 tons, apply half before primary tillage, half before secondary tillage. With less than 5-6 tons, apply before secondary tillage.

Use 20 lbs. nitrogen/A on soils with less than 2.5% organic matter. If band seeding, apply with phosphorus through grain drill. If broadcast seeding, apply broadcast with phosphorus and potassium.

Apply all phosphorus by seeding machinery or broadcast part with potassium. If band seeding, reserve a minimum of 30 lb. P_2O_5/A for this purpose. If broadcast seeding, broadcast all P with K after primary tillage and before secondary tillage.

Broadcast potassium before or after primary tillage. Plow down rates over 300 lbs. K_2O/A. If band seeding, use a maximum of 30-40 lbs. K_2O/A.

5—Maintenance Fertility: Apply annually after 1st or 2nd year.

Base rate on yields, removal, and soil supplying power. (See P and K maps on page 2). Each ton of alfalfa dry matter removes about 11 lbs. P_2O_5, 50 lbs. K_2O.

In areas of known boron hunger, apply 1 lb/A actual boron yearly.

Suggested Phosphorus Rates[1]

P_1 Test Level	Pounds P_2O_5 Per Acre Broadcast Seeding	Band Seeding
10-15	180	90
20	150	80
30	90	60
40	60	40
60	None	30

[1] High rate option from 1969 Illinois Agronomy Handbook Circular 995, p. 28 and p. 17.

6—Seeding: Firm seedbed with corrugated roller just before placing seed on soil surface. Firm seed into contact with soil by corrugated roller or press wheels. Corrugated roller seeders do all these operations at the same time.

Band seeding with grain drill requires corrugated roller before seeding and either press wheel attachment on drill or corrugated roller to follow seed placement.

7—Put seed ¼ to ½″ deep. A firm seedbed before seeding, placement of seed on soil surface, and firming seed into contact with soil gets this depth for most seeds.

Suggested Potassium Rates for 7-9 Tons/A[1]

K Test Level	Soils Low in Potassium Supplying Power K_2O lb./A. For 1 yr.	For 2 yrs.	Soils Medium to High in Potassium Supplying Power K_2O lb./A. For 1 yr.	For 2 yrs.
90 or less	225	450[2]	200	400[2]
91-120	200	400[2]	180	360[2]
121-150	180	360[2]	160	320[2]
151-180	160	320[2]	135	270
181-210	135	270	115	230
211-240	115	230	90	180
241-300	90	180	70	140

Test every 4 years and adjust annual rates to maintain test level.

[1] Increased 50% from normal recommendations on the basis that these amounts will be used by the crop if 7- to 9-ton dry matter yields are reached.

[2] May cause seedling injury. To avoid risk, incorporate by deep discing or plowing down or use rate for 1 year.

8—Seeding Rate: Alfalfa alone—18 lb/A.

Suggested Mixture: Alfalfa 12 lb/A + orchardgrass 4-6 lbs/A. Alfalfa 12 lb/A + smooth bromegrass 8 lb/A.

9—Seed and Variety: High quality adapted high yielding varieties either Certified or from reputable recognized seed company.

Alfalfa varieties: Select either *Moderate Wilt Resistant* or *Resistant*. Prefer Moderate Wilt Resistant if available because of more vigor in regrowth, later fall dormancy and higher yielding.

Orchardgrass varieties preferred: Boone, Potomac, Napier or Sterling.

Smooth Bromegrass varieties preferred: Achenbach, Baylor, Saratoga, Southland, or Lincoln.

10—Seeding Date: As early in April as possible.

11—Weed Control: Preemergence (for alfalfa seeded alone)

Eptam—3 to 4 lbs/A active ingredient incorporated within minutes of application by double discing according to label directions.

Balan—similar to Eptam. Follow label directions.

OR Postemergence (for alfalfa seeded alone *or* alfalfa grass mixtures)—

4,2-4 DB—¾ to 1 lb/A active ingredient according to label directions. Prefer application when alfalfa 3 to 4 inches tall and weeds 2 to 3 inches tall.

(Do not apply before alfalfa emergence.)

12—Harvest Date: 1st cutting in early bloom stage, usually 65 to 70 days after seeding.

13—Insect Control: Year of seeding—observe all recovery growth carefully for leafhoppers. Apply insecticides when populations begin to increase or when leaflet tip yellowing from leafhopper feeding is first detected, whichever comes first.

Insecticides: (a) Carbaryl (Sevin) I lb/A active ingredient. (b) Methoxychlor 1 lb/A active ingredient.

Years after seeding—Apply alfalfa weevil and leafhopper control measures suggested in University of Illinois Cooperative Extension Service Circular 899 or its revision.

14—Harvesting Frequency: Seeding year—30 to 35 days. Years after seeding—35 to 40 days.

15—Last Harvest of the Season: *Seeding Year*—Sept. 1 in Northern Illinois, Sept. 10 in Central Illinois, Sept. 20 in Southern Illinois.

Years After Seeding—Oct. 25 in Northern Illinois, Oct. 30 in Central Illinois, Nov. 5 in Southern Illinois. (No harvests during late Sept. and early October.)

16—Grazing Option Suggestions: to replace hay production.

Variety choice—low crowned alfalfa variety. Examples are Vernal, 525, 522, DeKalb 123, Progress, WL 202. Consult reliable seedsmen for other low crowned varieties with high level bacterial wilt resistance.

Grazing schedule: Rotate grazing, 7 to 10 days grazing, 30 to 35 days rest.

Avoid grazing when soils are wet.

Begin grazing cycle at sign of first flower buds in the alfalfa or when grass is in the boot stage. **THE END**

"K absolutely required !"

SCIENTISTS HAVE FOUND a missing link to the question of HOW potassium influences opening of stomata on leaves, vitally affecting plant growth. In the Fall 1969 SOIL AND WATER, University of California (Davis) scientists G. D. Humble, R. A. Fischer, and T. C. Hsiao identify for the first time a detailed physiological process in which potassium is absolutely required and cannot be replaced by other ions normally found in plants.

They explain, "We have long known stomata open by inflation of guard cells through absorption of water. The inflation results osmotically from the buildup of solutes in guard cells. What had not been resolved in more than a half century of research is what the solutes are and how they are built up to cause stomata opening.

"We have found strong evidence that solutes build up for opening through uptake of potassium by guard cells in osmotic amounts. Potassium is specifically required for opening brought about by light--no other physiological ion can substitute for potassium in this crucial role.

"We managed to obtain strips of epidermis from leaves of broadbeans (Vicia faba) with their guard cells still functioning as in intact leaves. Such strips eliminated complications caused by the rest of the leaf in stomata studies. Effects of ions and other chemicals were tested by floating the strips on solutions. Using solutions of various ions at dilute and physiological concentrations, only potassium (and rubidium) allowed full opening of stomata in light. Ions such as sodium, ammonium, magnesium, and calcium permitted little or no opening. We used radioactive isotope to determine total potassium taken up during opening process. From these data we found sufficient amount of potassium was absorbed to act osmotically to produce opening.

"Energy for potassium uptake came from light, probably via the process called cyclic photophosphorylation. Closing of stomata in the dark is apparently brought about by the reverse process--a loss of potassium from the guard cells, followed by loss of water and deflation. We have demonstrated that potassium in epidermal strips and guard cells drops in the dark when stomata close."

HIGHER Alfalfa Yields mean P-K Removal

ROBERT J. BUKER
FARMERS FORAGE RESEARCH

ALFALFA YIELDS mean more when expressed as both dry matter and crude protein.

As protein percentage increases, so does TDN and net energy. Protein is positively correlated with energy so this analysis can be used as an estimate of feeding value—protein and energy.

Going from three to four or five cuttings a year may improve dry matter yield very little, but it can greatly increase protein and energy production per acre by improving quality.

The more alfalfa yields climb the more nutrients they remove, especially potassium. At two tons per acre, each ton contains about 30 lbs. K. But at six ton yields, each ton contains about 50 lbs. K. Potassium is concentrated in the rapidly growing parts of the plant, so early cutting and high yield both increase K removal.

Too little potash often limits alfalfa production, especially at high yield levels.

Data were collected on dry matter yields from nine variety trials seeded from August 15, 1963 to April 11, 1968 at Lafayette, Indiana. In some nurseries, only one variety was studied chemically. In others Scout, Tempo, Vernal and DuPuits were each analyzed.

TABLE I shows that the dry matter yields ranged from a high of 16,240 lbs. for Tempo in Nursery 7 to a low of 8,040 lbs. for Scout in Nursery 9, the only seedling year nursery included. Nurseries 3 and 8 were harvested five times in 1968. All others were cut four times except the seedling year nursery (No. 9) which was cut three times.

The nine nurseries averaged 2,509 lbs/A

Table 1. Dry matter and protein production plus the P and K removed from nine alfalfa nurseries in 1968.

Nursery	Seeded	Variety	Production		Removed	
			Dry Matter	Protein	P	K
			lbs/A	lbs/A	lbs/A	lbs/A
1	8-15-63	Scout	12,850	2,050	41	307
2	4-14-64	Scout	14,850	2,370	44	336
3	4-08-65	Scout	14,240	2,910	57	354
		Tempo	14,340	2,820	50	287
		Vernal	14,120	2,690	58	366
		DuPuits	12,410	2,290	53	444
4	4-22-65	Scout	15,420	2,780	54	418
5	8-19-65	Scout	13,850	2,210	36	316
6	3-16-66	Scout	14,290	2,320	41	375
7	3-17-66	Scout	15,140	2,510	51	440
		Tempo	16,420	2,570	56	520
8	5-23-66	Scout	14,730	2,730	59	409
		Tempo	15,610	3,070	65	409
		Vernal	14,030	2,940	58	418
		DuPuits	15,540	2,230	64	390
9	4-11-68	Scout	8,040	1,660	36	294

crude protein in 1968. Tempo produced 3,070 lbs. protein in five cuttings in Nursery 8. Protein percentage averaged 18.1, ranging from 14.4 for DuPuits in Nursery 8 to 21.9 for the fourth cutting of Scout in both Nursery 8 and Nursery 3.

HIGH NUTRIENT REMOVAL. Phosphorus content of the forage averaged .36% ranging from .20 to .47%. TABLE 1 shows the harvested forage removed from 36 to 65 lbs/A of phosphorus for the season.

The forage removed an average of 380 lbs/A potassium. K content averaged 2.62%, ranging from 1.76% in the fourth cutting in Nursery 4 to 3.66% for Scout in the seedling year nursery. Potassium hunger (white spots in rows along the edges of the leaflets) showed up where forage tested 1.76% K.

HIGH FERTILIZER NEEDS. Our average annual application of 52 lbs. P and 345 lbs K/A in 1966-68 (TABLE 2) is much higher than most recommendations. In 1968 we removed an average of 51 lbs. P and 380 lbs. K in the forage—or 114% of the P, 152% of the K applied.

The extra P and K removed by alfalfa must, of course, come from the soil. Some soils may have a good reserve of P and/or K. They can stand mining, at least temporarily.

But other soils do not have a reserve. Attempts to increase yields through good management are doomed to failure unless we use improved varieties and sufficient fertilizer.

Is it realistic to fertilize at a rate where all the applied fertilizer is removed in the harvested crop? Where would corn yields be today if we had insisted on 100% recovery of the applied fertilizer in the harvested crop?

FERTILIZER RECOMMENDATIONS are frequently based on results from obsolete varieties and antiquated cutting practices. In turn, fertilizer prices have dropped while other cost inputs have increased. Maximum profit is obtained at a higher yield level than in the past. Fertilizer recommendations should be revised upward.

IS HIGH FERTILITY profitable? Tempo produced 15,610 lbs. of dry matter containing 3,070 lbs. of protein in Nursery 8. This equals the TDN and protein in 125 bu. of corn plus 2¾ tons of soybean oil meal or about $400 worth of feed nutrients per acre.

Our average annual fertilizer application of 52 lbs. P and 345 lbs. K cost less than $25.00. So, we estimate the feed value totaled $375/A above fertilizer cost!

We will try even higher fertilizer rates to insure that fertility does not limit yield and profit. Will you?

Also—have you considered adding forage analysis to your programs? Forage analysis is a useful tool in evaluating fertility programs and designing feeding programs! **THE END**

Table 2. Annual fertilizer application—lb/A

Nursery	1966			1967			1968		
	N	P	K	N	P	K	N	P	K
1	0	42	266	0	45	249	0	45	249
2	0	42	266	0	45	249	0	45	249
3	0	33	199	0	82	458	0	45	249
4	0	33	199	0	45	249	0	45	249
5	6	51	282	0	45	249	0	45	249
6	20	73	361	0	82	458	0	45	249
7	20	73	361	0	82	458	0	45	249
8	0	33	199	0	82	458	0	45	249
9							0	45	249

WITH CLEAR SEEDING . . .

A NEW Day for Alfalfa

R. R. SEANEY
CORNELL UNIVERSITY

ALFALFA HAS long been a victim of the "hay crop philosophy" which accepts low yields and poor quality as par for the course.

The "hay crop doctrine" says best profits come from lowest investments in seed, herbicides, and fertilizer, and from long-term stands of 6 to 8 years.

No wonder New York State averages only 2.3 tons per acre yearly. But the future looks brighter. Farmers are taking a new look at alfalfa. They are moving fast toward high-yield management.

CLEAR SEEDING—seeding without companion crop—has taken hold fast in New York in the past 2 or 3 years. It guarantees thick, vigorous stands needed for top forage production.

Cornell University research has pointed the way toward more intensive alfalfa management, demonstrating the potential for high yields in the seeding year. Tests show best alfalfa stands can come from seeding without a companion crop.

CONTROL WEEDS with herbicides when establishing clear alfalfa stands.

New York recommends EPTC for controlling nutsedge, annual grasses, and some broadleaved weeds, and DNBP or 2,4-DB for broadleaves.

Combination treatments with these chemicals—EPTC plus DNBP or EPTC plus 2,4-DB—have given excellent control of *both* grasses and broadleaved weeds.

SEEDING RATES necessary for top yields in the seeding year and later were tested in cooperative research between New York, Illinois, and Ontario, Canada.

Increasing the rate to 18 lbs. per acre boosted yields and added extra profits for additional seed cost.

New York, Illinois, and Pennsylvania now recommend 18 lbs. of alfalfa seed per acre for early-spring clear seedings.

HARVEST FIRST year alfalfa stands when and how often? For the past three years at two locations, New York has tested eight different cutting treatments on Iroquois and Saranac varieties. They involved four dates of first cut and two intervals between cuts. All plots were harvested uniformly for two years to test residual effect of first year cutting management.

Results are encouraging. Good production comes in seeding year. Over a three-year period (1967-1969), seeding year yields have ranged from 2.5 to 5.3 tons per acre. The 5-ton mark demanded three cuts per year.

"On-farm" measurements show farmers also pushing 3.5 to 4.5 tons in seeding year with such varieties as Iroquois and Saranac. Top yields the first year depend on good environment, especially moisture.

SECOND YEAR yields do not suffer from high first-year yields. Cornell plots returning 4 to 5 tons in seeding year are coming back the second year with 6.5 to 7.5 tons per acre.

Top alfalfa production does not come from right seeding, weeding, and cutting management alone—but also from best varieties, good insect control, and high fertility.

Varieties that take off early in spring and recover rapidly after cutting give highest yields in seeding year.

WEEVIL CONTROL, not needed for first year stands in most New York areas, takes right timing and use of recommended insecticides.

In a way, the alfalfa weevil has promoted more intensive management, causing many growers to reduce acres and *increase* yields to meet their forage needs. Spraying fewer acres makes weevil control easier and more economical, they have found.

It pays to keep a sharp eye for potato leafhopper buildup. This insect can severely stunt new seeding growth. It must be controlled to prevent yield loss.

HIGH FERTILITY helps insure high yields in seeding year. Without a companion crop, we are no longer talking about just "getting alfalfa started" the first year. We are asking for rapid plant growth and high yields.

Plenty of phosphorus and potassium must be available to produce thick vigorous stands. **Potassium is the key to persistence and continued high production of such stands.**

Vigorous, high-yielding alfalfa stands can be yours when seeding without a companion crop. Cornell research and farmer experience have shown four advantages from clear seedings of alfalfa:

1. Better probability of successful establishment.

2. A potential of 3 to 5 tons per acre in seeding year.

3. Even higher yields in second and third years.

4. Mid-July harvest in safer weather.

THE END

10-Ton Alfalfa Place Mat

A real challenger for your dinner meetings

Tells 'em how to shoot for . . .

more energy

more protein

more profit

Your organization's name can be imprinted on quantity orders. Check your needs on the soybean coupon on page 30

From $7,000 to $12,000 . . .

Pay Up OR Plow Up

1966

N - 4,800 lbs

P_2O_5 - 8,060 lbs

K_2O - 6,200 lbs

S. H. DOBSON

HE WAS SERIOUSLY considering plowing up his pastures and disbursing his beef cattle herd in the fall of 1966.

Zeno Ratcliff's 151 pasture acres were not competing with his 100 bu/A corn yields and 35 bu/A soybean yields. His pasture acres were some of the poorest drained. But by completing a large drainage canal, he would convert them to corn and soybeans with minimum additional ditching, land clearing and leveling.

Before converting, he decided to give the pastures three years to "pay up or get plowed up."

The trial period lasted only two years. By the end of 1968, Ratcliff had figures and money in the bank to reach his decision. He would improve pastures further. He would add cattle for fuller use of current acres. He would turn more land to pasture as numbers climbed.

What changed? Price? No. But price changes will greatly help the 1969 financial sheet. Then what made the difference?

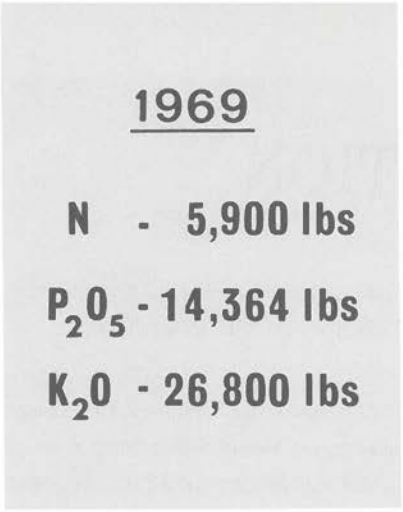
A PLAN FOR PROFIT. Mr. Ratcliff first contacted his county forage livestock agent, Bob Pilch. They then called in University production-management specialists to help draw up plan for profit.

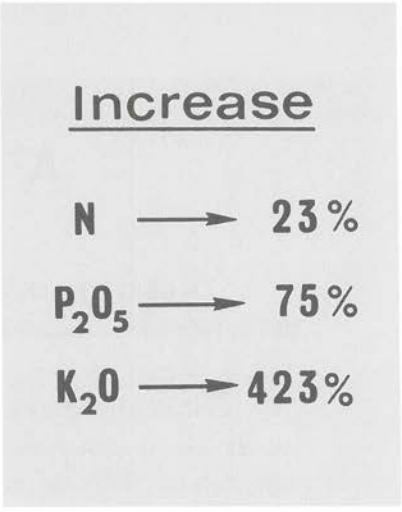
Mr. Ratcliff made two points very clear: (1) The pasture acres must pay out, (2) The system must be practical enough to fit into the other farm enterprises.

In other words, he did not want the forage-beef enterprise to compete for labor or require too much additional management. He wanted to program his entire farm business together, and he has pretty well done it. It's just as easy to do the job at a profit as at a loss, he now says, and a lot more fun!

Mr. Ratcliff has nearly completed his 3rd year of the plan. He learned some lessons that apply to many other farm situations:

- He started with a soil test. Strangely enough, he was following the soil test on his other crops but had not applied it to his pastures. **He found all 151 acres of old fescue pastures too low in potash to support good clover.**





N.C. STATE UNIVERSITY

• He changed his fertilizer practices almost completely. He had been using 5-10-10 fertilizer and some additional nitrogen. He began putting all his nitrogen, and a little more, on fewer acres. He stepped up phosphate and potash on all acres.

• He plowed up some of the poorest fescue pastures and planted summer annual grasses—pearl millet and sorghum-sudan hybrids to help in the summer.

• He retained his wintering program of corn silage combined with field gleanings and winter cover.

Let's compare his 1966 animal numbers and fertilizer practices with 1969:

• In 1966, he carried about 75 cows with calves. He grazed 50 yearling animals during summer, finishing in feed lot on grain during the winter.

• In 1969, he carried 104 cows and bred heifers and 75 calves. In addition, the yearling number was stepped up to 75, converted to a grain-on-grass feeding program and sold from the pastures.

• In 1966, on 151 acres of pastures, 15 acres of seed rye, and 15 acres of silage corn, he used 4,800 lbs. of nitrogen, 8,060 lbs. of P_2O_5, and 6,200 lbs. of K_2O.

• In 1969 on these same acres, he used 5,900 lbs of nitrogen, 14,364 of P_2O_5 and 26,800 of K_2O—a 23% increase in nitrogen; 75% in P_2O_5; and 432% in K_2O.

These high phosphate and potash rates were partially catch-up applications. But Zeno does not plan to let them get low again. A strong maintenance program will insure that.

Anyone can spend more money and grow more grass and cattle, but does he have any more left at the end of the year?

In 1966, Mr. Ratcliff had a $7,050 return to land, labor, and management. In 1968, he had $12,212.52 return. And the 1969 figure should be considerably better, due to increased animal numbers and prices.

Zeno Ratcliff is so sure of it that he plans to increase pasture acres and expand his beef cattle business. **THE END**

A CITATION

IN GRATEFUL RECOGNITION of a small group of men who have served mankind through the organization known as the AMERICAN POTASH INSTITUTE.

BE IT KNOWN by all who read this Citation that these men, through research and education, in cooperation with Land Grant colleges, the United States Department of Agriculture and private industry have prompted sound soil fertility practices throughout the world. These efforts have greatly increased the efficiency of agricultural production, resulting in massive increases in the world's food supply.

ALL THIS HAS BEEN ACCOMPLISHED through sustained leadership by these men in:

- enhancing soil and plant analysis
- organizing plant food conferences
- supporting state plant food associations
- serving as officers in organizations and societies at all levels
- contributing to thousands of plant food demonstrations
- publishing Better Crops with Plant Food and other high-quality publications
- providing grants of money to cooperating agencies for research
- encouraging young scientists and educators
- serving in countless other activities.

AND BE IT FURTHER KNOWN that the highly ethical manner in which these activities have been carried out has set a standard for the industry and has served as an inspiration for those with whom men of the American Potash Institute have worked. Much of the Institute's work has been done quietly in the background, resulting in little or no recognition.

THIS CITATION of appreciation is presented to the American Potash Institute on this eighth day of November in the year 1969 by a group of men who chose to call themselves "POTASH ALUMNI." While these men have never worked for the Institute, their lives have in some way been touched by the Institute, as students, struggling young scientists or educators.

Stan Mikes

CHAIRMAN OF THE COMMITTEE

Committee Chairman Ivan Miles **Institute President J. F. Reed**

A Surprise Outpouring

PROMINENT AGRONOMIC scientists from 39 state universities, the U.S. Department of Agriculture, and industry have issued a "citation of appreciation" to the American Potash Institute for standing by agricultural science in good and bad times.

More than 80 of the scientists—many department heads, some deans, some university provosts—wrote personal letters documenting how "their lives had been touched by the 34-year-old Institute, as students, struggling young scientists, and educators."

One said, "The current leadership positions of those who have been touched by Institute research aid is truly remarkable."

Citation Committee Chairman Ivan Miles of Olin Corporation presented the citation and letters to API President Fielding Reed at an Institute staff conference during the American Society of Agronomy meetings in Detroit.

The citation spoke of the Institute's close work with land-grant universities, U.S. Department of Agriculture, and private industry to improve soil fertility efficiency. It said such cooperative research and educational efforts have resulted in "massive increases in the world's food supply."

It cited eight areas of leadership by Institute men, ranging from soil and plant testing to research grants for worthy projects. It said these activities had been conducted in "a highly ethical manner . . . quietly in the background, with little or no recognition."

The Potash Institute has granted more than $2 million to cooperative investigation projects at state universities and experiment stations throughout the U.S. and Canada since 1936. These projects have helped some 300 research leaders and graduate students develop more efficient plant nutrition for the farmer. They have also enabled many young men to continue their training for leadership in agricultural science and industry.

Companies supporting the services of the American Potash Institute are: Cominco American Incorporated, Duval Cor-

poration, Great Salt Lake Minerals & Chemicals Corporation, International Minerals & Chemical Corporation, Potash Company of America, Potash Company of Canada, Southwest Potash Corporation, Texas Gulf Sulphur Company, United States Borax & Chemical Corporation.

The 94-page volume of letters reveal many reasons for the surprise outpouring of appreciation by the university scientists.

Some said Institute grants had been "the difference between advanced training and no training" in their lives. A top administrator of one of the nation's largest Experiment Stations said it had been essential to him, "if a poor country boy was to continue his education in days of lean support."

Some said the growth of soil and crop nutrition knowledge—and the plant food market with it—would have been much slower without Potash Institute grants and encouragement from what they called "the Institute man."

They described "the Institute man" as "a quiet, unobtrusive" adviser often considered a "co-professor" or "fellow staff member" as he shared their successes and problems. Many pointed out the personal interest Institute staffmen have always shown in graduate workers, "a stimulation graduate students in many areas rarely get beyond financial help." Such interest led to "award-winning research," they said, and to "high-yield thinking among more experimental workers."

MANY SPOKE of "the Institute man's" concern. They called it "total concern" for ALL agriculture, "far beyond his own product." They said they had never hesitated to invite him to participate in their educational programs, often to discuss practices not related to potash, because he would bring them "authentic ideas."

Some called him "a catalyst" in getting ideas adopted, in carrying new techniques across state lines. Several said Institute-sponsored forums for leadership groups have had "a major impact on program development in many states."

The comments can be summed up by the scientist who said, "As a rookie soils specialist some years ago, I learned from the Institute man many lessons that were not in the books."

The citation described the Potash Institute as "a small group of men who have served mankind." This group of 39 men, some now retired or deceased, served American agriculture a total of 609 years through the Institute.

Such service caused a veteran university official to conclude: "No organization in the history of this country has been more dedicated to the discovery of new knowledge, improved technology, and the betterment of agriculture. It is not possible to measure all its contributions and influence. But it is appropriate to say neither the fertilizer industry nor the farmer could maintain his rightful place in our economy without such organizations as the American Potash Institute." **THE END**

In Gratitude...

The American Potash Institute is very grateful for the interest and respect expressed by many agronomic scientists, reported above. After several references to what they called "the Institute man," it struck us that the person pictured on the next few pages may well typify such a man. He, too, received from a major university a Potash Institute grant to continue important graduate training.

The Willing RURALIST

...who has seen many sides of nature (plant, animal, and human) since he charged out of the family outhouse screaming FIRE at the top of his 6-year-old voice one Sunday afternoon in the great depression.

SANTFORD MARTIN
ATLANTA, GA.

A MAN NAMED Harris moved his family from a small town in Georgia to Philadelphia last summer to give his kids "a better break."

Six weeks after the family arrived in Philadelphia, a neighborhood gang gunned down his 18-year-old pride and joy, Larry: basketball star and graduate of a rural Georgia high school who had hoped to start working his way through college this year.

Larry's 15-year-old brother, John, told the Associated Press his slain brother refused to join neighborhood gangs after they arrived from rural Georgia. Not long before he was killed, Larry had started talking about the family returning to Georgia. He didn't like city gangs and violence.

About the time this country boy was being shot down, his native state was quietly launching a program to help stem the tide of rural refugees to big city streets —to train and retain, not discard, rural talents.

Some of the Georgians supporting the idea have long been labeled "red necks" by self-styled sophisticates—but, probably, less often in the ghetto that killed young Harris than in Ivy League clubs on the other side of town toward Valley Forge, once saved by "red necks" bleeding through the winter with a Virginia farmer named Washington.

Georgia's new rural development program could become a model for other states suffering from "creeping ruraltism": a disease diagnosed by once-proud red brick buildings crumbling in vacant silence along farm town streets, while big city bus terminals deposit unskilled people lugging cardboard suitcases toward odd-job lives.

If it works, the new Rural Development Center going up at Tifton could help build rural Georgia into a "promised land" of skillful production and prosperity—so prosperous the coming generation couldn't care less about rushing to cities approaching New York's suffocating density of 15,000 people in every square mile.

There is no "IF" in the mind of Dr. S. E. Younts, director of the new center and Associate Dean of the University of Georgia College of Agriculture.

"There can be no place in our minds," he says, "for the three worst words in the English language: 'It won't work.'

"It must work. The alternatives are too costly. Costs to the cities make daily headlines. Costs to our rural communities —in lost purchasing power, leadership shortage, weak public facilities, and declining opportunities—make few headlines."

Not too many miles south of Georgia, men now go to the moon—and back. But out of the vast rural areas served by the

"History...celebrates the battle fields whereon we meet our death, but scorns to speak of plowed fields whereby we thrive; it knows the names of the king's bastards, but cannot tell us the origin of wheat. That is the way of human folly."

--J. Henri Fabre

new Rural Development Center, thousands go to big cities—but seldom back.

"What a waste," Dr. Younts exclaims. "A great and good people. Generous and kind, not crowded and desperate. Very favorable climate. Plenty of fresh water. Very responsive soils. Labor that can be trained in modern techniques. Much capital investment and know-how, often untapped.

"Look at your map. All this sits in a triangle formed by three population centers with big appetites for our products: the Atlantic Coast, the Gulf Coast, and the teeming Piedmont.

"New methods of production, transportation, and communication have given most communities 100 times more economic muscle—reaching out muscle—than they had 50 years ago."

And that's what the new Rural Development Center is all about: to put more muscle into rural Georgia's agricultural and forestry production, into the marketing and use of these products.

Georgia farmers average 57 bushels of corn per acre their best year—23 bushels below the national average. They ship away much of their grain, meat, fruit, and vegetables to be processed somewhere else. And many small rural towns slowly wither.

Why?

Younts does not have the answers. He has some ideas—and much hope.

"We know drouth can hit us some hot summers on sandy soils," he says. "We'll start learning to irrigate and control drainage.

"We know we haven't done much processing or marketing beyond two or three county lines. We'll try to grow beyond this piecemeal approach.

"We know people make a community. When they leave, it slowly withers from lack of exchange between people—exchange of money, of products, of services, of ideas. The last one is the big one—ideas. Ideas of how to increase job opportunities, how to train and plan—plan for housing, health services, water and sewer programs.

"Most people leave when they have no work. Streamlined farming uproots them. They don't understand new ways or equipment. No farm owner wants an ill-trained operator using his $12,000 piece of equipment.

"Farming efficiency increases every year. Our RDC must help retrain and sometimes relocate workers displaced by this efficiency. Most people want to be useful. We must help them learn to be. Instead of 500 unskilled folks costing some county $500,000 a year, why not train them to pay the county $3 million or more?"

The new Rural Development Center will complement, not supplant, the hard-working teams long serving rural Georgia through the University system: the Coastal Plains Experiment Station and Abraham Baldwin Agricultural College at Tifton,

"...the great cities rest upon our broad (plains) and prairies. Burn down your cities and leave our farms, and your cities will spring up again as if by magic. But destroy our farms and the grass will grow in the streets of every city in the country."
--Wm. Jennings Bryan, 1896

the Agricultural Extension agents in each county, and the Area Planning Commissions. These teams have successfully attacked many community, county and multi-county problems. The RDC will coordinate state-wide attacks not practical in the past.

Such coordination recently began at the Center's ground breaking. Hands on the shovel symbolized Georgia's determination to lick "creeping ruraltism" with teamwork: Georgia University President F. C. Davison, Agriculture Dean H. W. Garren, Abraham Baldwin President J. Clyde Driggers, University Chancellor George L. Simpson, Regents Chairman Pat Pattillo, Vice Chancellor H. F. Robinson, Station Director F. P. King, and Younts.

RDC headquarters will house offices, conference rooms, mass communication studios, data storage libraries, classrooms, and an auditorium.

Out of it, some 40 specialists will eventually serve. Not a single county or group of counties, but the whole rural life of Georgia. Not crops and soils alone, not market and process problems alone, but also the talents of the people. Talents for community building, for industrial output, for better understanding across county lines.

They will use the latest communication tools: streamlined publications, radio-TV, visual teaching aids, and practical short courses.

And adjacent to their center, the specialists will maintain a 100-acre test field—a demonstration "park" where the "loftiest scientific dreams" can be applied to see if they are ready for rural Georgia to use profitably.

"Most people can get along fine as neighbors when they get what they feel is a fair return for what they do for a living," Dr. Younts said. "That's what our program boils down to: sharpening our rural talents to create better products for broader markets that bring fair returns to everyone *willing to work for them.*"

Younts is no stranger to work—or *the willingness to work*. His 39 years prove it all the way back to Pounders Fork Creek in Davidson County, North Carolina. There, before he was tall enough to reach the plow handles and talk sense with the mules, he would often watch his dad and older brothers wrestle the weeds with heavy cultivators in bottomland corn patches.

His turn seemed a long time coming. When it did, he learned the world's greatest lesson in humility: laying out straight corn rows behind a stubborn mule not a bit interested in cornfield architecture.

Hard work, a bright mind, a strong character from salt-of-the-earth parents, and a fair share of luck have placed Younts where he is before his 40th birthday.

He has seen many sides of nature—plant, animal, and human—since he charged out of the family outhouse

screaming FIRE at the top of his 6-year-old voice one Sunday afternoon during the great depression. He has never tossed a match in unlighted places or taken a step he didn't carefully plan since then.

The desire to achieve may have been born in the Carolina farm boy. But it took a 5th grade red-headed school teacher to light the fire. Miss Tippett wrote one sentence on his first report card: "Eugene could do better if he would."

The 10-year-old boy slept fitfully that night. He reached the barn to start chores earlier than usual the next morning. Since then, his physical and mental coattails have rarely hung straight down.

From the 8th grade on, Younts entered nearly every speaking contest that came along. He spoke on everything from good health to soil erosion. And like an older brother, Bryce, now Alumni Director of N. C. State University, he reached the state finals. He will never forget that night in the state capital's finest hotel ballroom.

His Vo-Ag teacher had honed him to a fine edge. Younts had labeled his speech, "North Carolina's Number 1 PROBLEM, Soil Erosion." Being a real diamond-in-the-rough country boy, with a booming voice, he could crack plaster with that word, PROBLEM.

The ballroom was full. He rose slowly after the contest chairman introduced him, trying to breathe deep enough to relieve the tension. Then he saw his mother and high school principal for the first time, smiling from the rear of the packed ballroom.

He has always been close to his mother. He had no idea she would come to such an event in such a setting. Mrs. Sanford Younts, Rural Route 2, Lexington, N. C. is a humble lady of plain manners and dress.

Any honest reporter soon senses she has walked closely with Someone who convinced her the humble will inherit the earth—in due time. The characters of seven successful children reflect a sturdy little country mother studying her Bible by the fireside every Saturday night for 30 years in order to teach a meaningful Sunday School lesson at her rural church the next day.

A flicker of a smile crossed her young son's face as he virtually shouted his speech title across that grand ballroom: "North Carolina's Number 1 NEED, Soil Erosion."

His Vo-Ag teacher flinched. Low chuckles rippled across the room. His mother smiled. It was out before he realized what he had said. He quickly stammered, "Number 1 PROBLEM," and went on with his talk.

He placed second, a position many observers said would have been first if he had not stumbled on his title. But no award could equal the country boy's pride in seeing his mother in the elegant Virginia Dare ballroom that night. America, so far, has depended on such women to produce much of its leadership.

When S. E. Younts reached N. C. State University in west Raleigh, he was the greenest of the green.

"They mentioned logarithms in algebra and I thought they were starting on forestry or something," he laughed recently. "We were tested every two weeks, and my paper was always handed back last, the F, at the bottom of the pile—in the beginning."

He had been a star at little Davis-Townsend High—valedictorian of 19 graduates in a 6-teacher high school. But at N.C. State, he found himself competing with students who had led metropolitan high schools under teachers with Master's and sometimes Doctor's degrees. Most of them were ready, with training and money from home.

Younts was not ready—really. He faced four years of college with limited training and even less money—$600 he had earned during his last high school year, $300 Sears-Roebuck had awarded him for FFA achievements.

But he had an ace up his sleeve—a clean 18-year-old body and mind in top shape from hard work, long hours, and firm discipline by a father whose interest in personal integrity and family character far exceeded his concern for material accumulations.

His legacy to young Gene entering N. C. State mostly on faith proved far more valuable, in the end, than a bank full of

money and a fraternity lawn full of convertibles. The legacy, quite eloquent from the lips of a man who talks little, kept ringing in Gene's mind that first quarter at State, especially at dawn while looking west toward the hills of home after feeding the college cows.

Many mornings he wondered if he could make it another week. And each time his answer seemed to come from a voice out of the bottomland along Pounders Fork Creek, an image with salty sweat around the galluses and real man-hands around the plow: "Good men never fall short of their best, son, even behind a plow."

The strength he inherited from such a father and mother propelled Younts forward until his algebra papers, for example, started leading the class. The same thing happened in his other classes.

To pay for all this learning, he worked 50 hours a week outside classes. Managing a dorm paid his room rent. Feeding the cows every morning and night paid for his meals. Tutoring a blind student 3 hours a night, until 1 a.m. many mornings, paid for his tuition and laundry.

He added two other jobs his senior year: editor of the School of Agriculture magazine and instructor in the visual aids lab. By then he had worked out such a system of jobs that he could figure his senior year income closely enough to buy a new car and not miss a payment to the dealer or to the college that would graduate him with honors and 12 extra hours of academic credits.

The Davidson County farm boy managed to find enough extra hours—beyond studies and jobs—to accept invitations into groups with such names as 30 & 3, Alpha Zeta, Blue Key, Phi Kappa Phi, and Golden Chain. The names never meant much to his parents or most reporters, but they knew it was raking good hay to be 1 out of 12 among 6,000 students.

Golden Chain, the University's top senior leadership society, tapped him along with another country boy named Scott, now Governor of North Carolina. The Chain always added 12 new links each year from the seven schools of the University. They named Younts their president in 1952—a long distance from those "F" algebra papers four years before.

The $1,200 grant he received to start graduate work in agronomy at N. C. State would not meet all expenses. He knew this. So he hit the road for the Columbia River Valley to work on a 15,000-acre ranch in Douglas County, Washington in the summer of 1952.

Rancher Oliver Dezellum found the young Carolinian the only one in his crew who had ever shocked oats. Younts shocked 50 acres for him in 4 days, showing off a little Tar Heel muscle. Dezellum then assigned him to a wheat truck to work 7 days a week for two months on the 3,000 acres of wheat.

He earned $15 a day, saved $600 of it to start graduate work, and returned right after Labor Day telling his folks, "I didn't know Sunday from any other day. "

Younts was raised in the church and has remained loyal to his raising. He found his wife in a Raleigh church during his first year of graduate work at N. C. State.

Like Younts, Ruth Wilson knew what it was to make much of her own way early. Her father had died in the depression. Her mother had moved the family from rural Chatham County to Raleigh to support herself and her two children through seamstress work.

Ruth had helped put herself through a business course at Peace Junior College so she could go to work full-time as soon as possible. She had neither the time, the funds, nor the inclination to ride the social merry-go-round often operated by the more affluent students at such all-girl schools.

So, her election to their May Court came as a great surprise to Ruth and her mother. But it should not have surprised them, former teachers contend, because Ruth Wilson possessed natural poise even in her late teens, a sense of dignity that no wardrobe or family income can furnish.

What she could not afford to get through limited college study, she more than got by reading most of the great books taught in many university classes that circumstances had denied her. They made their mark.

In the often-pushy whirl of some aca-

demic wives, observers find a calm, unpushing simplicity in Ruth Wilson Younts —a sort of serenity.

Some old friends, not on display, but tucked in quiet corners of her home, seem to explain the poise: Emerson, Dickens, Sandburg, Faulkner, Cronin, Lee, Lincoln and by a special night lamp, The Nazarene.

It was not for interior-decoration-display that this daughter of a North Carolina seamstress went out of her way many bitter-cold Ithaca afternoons to check out classics from the Cornell University Library while working to help put her husband through graduate school.

When Younts joined the University of Maryland faculty in 1957, he possessed nine years of intensive training, three university degrees, or $25,000 worth of education on that day's market—depending on your point of view. Into that investment he and Ruth had put $17,000 of their own "earn-while-you-learn" efforts. The $8,000 balance had come from scholarships.

Younts brings balanced experience to Georgia's new Rural Development hope. About half his career has been in university work, half in agricultural industry. As vice president of the American Potash Institute, he learned why industry thinks and acts as it does. As associate professor of soil science at N. C. State University, he learned why university scientists think and act as they do.

"And I came out of this decade," he explains, "with a deep respect for the industry man who works not for personal recognition or professional standing, but for the best results by the farmer—and almost always in anonymous service. Few people realize industry's capacity for assimilating useful information. I know. And I will forever respect them."

His work with America's potash industry carried him into many parts of this country and South America. He administered Institute programs in 13 southern states and Latin America. He worked with university officials, local state advisers, and industry leaders on many projects to try to get better crop returns for the farmer.

Such trouble-shooting work caused Younts to wonder if the terms "basic" and "applied" should ever have been tacked on research.

"Sometimes the scientist in me tends to think more about the professional recognition than the usefulness of our research," he confessed. "You'd be surprised how many think fundamental research (dream and theory work) is for the brilliant boys and applied research (put-it-to-use work) is for the drudgery boys.

"Of course, theories lead to discoveries. But I believe it takes special brilliance to discover ways to put the 'fundamental discovery' to general use. Nothing is more useless than a discovery raved about in scientific circles and left there.

"That's why our Rural Development Center will emphasize useful research—whether you call it fundamental or applied. Dream—all right—so long as we can make many of the dreams come true in the lives of our people."

Younts is a highly trained scientist. He was recently named a Fellow by the American Society of Agronomy, the nation's highest body of crops and soils scientists. Research he did with micronutrients in North Carolina's Coastal Plains affected thousands of farmers.

But this work was dwarfed by his guidance of University students, many struggling to stay afloat. None he advised ever flunked out. One boy working his heart out, with limited talent to help that heart, got many hours of the young professor's best teaching efforts long after quitting time. Another lad, with much native ability but short on English, turned Younts into a grammar teacher after hours. That student graduated with honors and went on to get his own doctor's degree.

Younts has never forgotten his own early struggle out of little Davis-Townsend School. Nature had given him a mind that soon outran the competition. As a professor, he seemed to hunt for similar strugglers to help.

Whatever the motivation, his capacity to awaken students caused N. C. State University to name him Outstanding Teacher his third year on the staff. He was only the third man so named, the record shows, following the former chancellor, Dr. Carey Bostian. University sources say even oldtimers covet this award.

But Younts does not seem to crave the so-called honors many scientists seek as surely as they seek food to survive. The Farm House fraternity elects him their national president, a church board names him chairman, a new Who's Who directory tags him—but unless you dig it up, you won't know it.

Any searching reporter must conclude S. E. Younts was tailor-made for Georgia's new rural development hopes. He is authentic—a real ruralist, but especially a willing one.

He is willing to work in mud up to his chin, if need be, to get a job done. He would be as good a carpenter or plumber or tenant farmer as he is associate dean.

He does not wear titles heavily. Why—in such a status-conscious age?

Maybe because he can remember his boyhood pride in a new pair of overalls, wearing the bright label until the old ringer Maytag chewed it off in the first wash.

Maybe because he can remember the warmth of a cow's straw at the fair, sleeping with a blue ribbon winner to calm her amid the city's nervous voices.

Maybe because he can remember the cool well water on parched lips and the metal taste of the old bent dipper at the end of a hot corn row.

Maybe because he can remember the flavor of chicken pie and green beans and fresh tomatoes and chilled milk around the "thrashing table" of neighbors helping his family with their wheat.

Maybe because he can remember the wide-eyed wonder God once gave country boys standing on the A-model floorboard all the way to town Saturday afternoon.

Maybe because he can remember the assembly of free men who met in the store at the forks, over the checkerboard alive with Coca Cola caps—where he learned why this country exists: for a man's RIGHT to his opinion.

Maybe because he can remember Grand Old Opry on Saturday night radio—honest, undepraved country tunes and words, documenting, not flattering or condemning, human life.

Maybe because he can remember the very human mixture of brotherhood and bickering in the country church, singing their nasal-alto hearts out at the foot of an old rugged cross on which history's most eloquent opponent of bigotry was nailed in his 33rd year.

Maybe because he can remember the tight-lip humor of a father staring into a half-dark barn at dawn, wondering if "that boy's loud speech practice" was soothing or spooking the 16 cows he was milking.

Maybe because he can remember a little rural mother learning more from years of searching in one Book than most college kids learn through three degrees.

Maybe because he can remember his first awareness of the way his southern people, in all walks, have long been stereotyped and branded and maligned by those who like to look constantly southward but rarely inward.

If it works, Georgia's new Rural Development Center should give them something to look at tomorrow! New hope not only for rural Georgia, but for rural America.

To a ruralist like Gene Younts, there's no IF to it. **THE END**

CORN GRAIN PROTEIN INFLUENCED BY VARIETY AND FERTILIZER

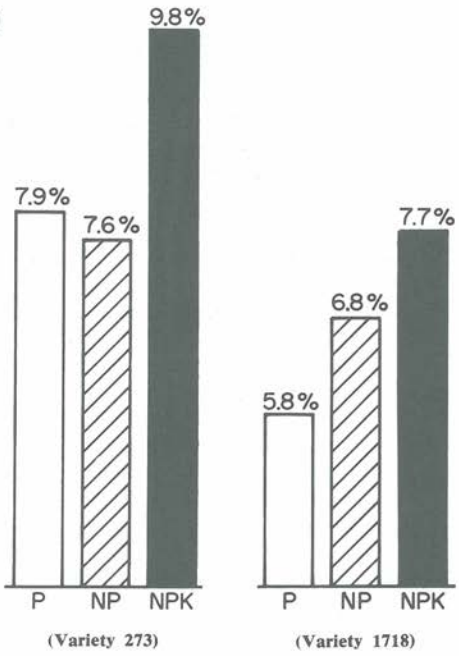


FIGURE 1

Potassium (K) increased protein in two varieties, well over plots receiving NP alone.

Potassium BOOSTS Corn Grain QUALITY

MUCH OF THE CORN grown in the United States is consumed by nonruminant animals. But protein supplements must be supplied.

Besides being low in protein, corn is deficient in certain essential amino acids —especially lysine, methionine and tryptophan, all necessary for the nonruminant diet. Essential amino acids are less important for ruminant animals because of conversions which occur in the rumen.

So, growing higher quality corn grain is a major goal for many agronomists. Workers have realized for several years that N fertilizers increase corn grain protein content.

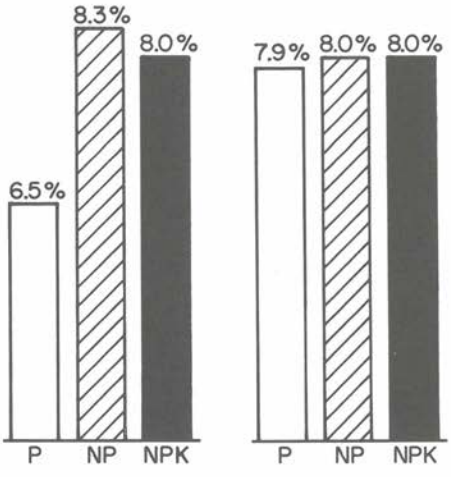
TABLE 1. Nitrogen was clearly needed for yields.

	Treatment		
	P	NP	NPK
	Corn yield, bu/A		
Variety 273	27	130	133
Variety 1694	21	108	116
Variety 1710	10	119	116
Variety 1718	24	117	121
Average	20	118	122

Also, much effort has gone into developing Opaque-2 or high lysine corn with its higher lysine and tryptophan content.

Importance of K in plant metabolism, including protein synthesis, has recently been recognized. Opaque-2 corn contains nearly 40% more K than normal corn, recent research indicates. But the influence of K on corn grain quality has not been widely explored.

THIS RESEARCH PROGRAM grew four early-maturing (80 to 85 days) Wisconsin single cross corn varieties under irrigation on plots treated with 45 lb/A of P[a] (P), 45 lb/A of P and 180 lb/A of N (NP) or 45 lb/A of P, 180 lb/A of N and 250 lb/A of K[b] (NPK).



D. R. KEENEY
UNIVERSITY OF WISCONSIN

a To convert P to P_2O_5 multiply by 2.29.

b To convert K to K_2O multiply by 1.2.

The experiment was conducted at Wisconsin's Spooner Experiment Station, located in northwest Wisconsin.

The soil was a Pence sandy loam, low in organic matter (24 tons/A). It contained 145 lb. exchangeable K per acre.

The corn was planted May 4, with a plant population of 26,000 plants/A.

The work secured corn grain yield, crude protein content (Kjeldahl N x 6.25), and amino acid composition. Dr. R. C. Pickett of Purdue conducted the amino acid analyses.

TABLE 1 shows no yield response to K by three of the four varieties. Obviously N was needed. Nitrogen fertilizer increased the grain yield several fold with all varieties.

FIGURE 1 shows the remarkable finding: Potassium (K) increased grain protein in two varieties, well over that found in corn from the NP treated plots, even though these varieties showed no yield response to K.

Table 2 shows this protein increase accompanied by an increase (as an average of the four varieties) in the concentration in corn grain of the nine essential amino acids measured in this investigation.

Such results indicate corn grown under adequate and well-balanced fertility levels may be nutritionally superior to that grown under conditions of nutrient imbalance. This will be particularly true if the amino acid balance is improved.

Finding that K increases the protein content of corn grain even without yield response indicates more than just yield should be used in evaluating K or other fertilizer needs, perhaps.

Proper fertilization should improve crop yield and quality.

THE END

TABLE 2. Nine essential amino acids increase with adequately balanced (NPK) fertility (average of four varieties).

	Corn grain amino acid content—%								
	Lysine	Threonine	Cystine	Valine	Methionine	Isoleucine	Leucine	Tyrosine	Phenalalanine
P	0.23	0.27	0.11	0.35	0.14	0.24	0.76	0.31	0.32
NP	0.25	0.28	0.11	0.38	0.12	0.26	0.85	0.33	0.35
NPK	0.26	0.31	0.13	0.43	0.14	0.30	1.03	0.40	0.42

Science In The Press

Black-and-White or Gray All Over?

By Leon E. Trachtman and Allan R. Starry

Purdue University

WHEN THE SCIENTIST and the newspaper science writer meet at a panel discussion, usually called "Science, the Mass Media and the Public," the scientists invariably accuse the writers of oversimplifying, distorting and misrepresenting scientific research.

And the writers usually accuse the scientists of being elitist, exclusive and indifferent to the public's stake in their research.

As the discussion progresses, however, both groups discover they have a mutual scapegoat in the editor, the man who sets policies and decides which stories will appear in the paper.

MANY EDITORS invite this sort of attack by insisting that all science news tell, in a lead of 25 words or less, the who, what, where, when and why of the scientific development as well as its implications for the reader and society.

The occasional editor included on a panel defends himself saying that his job is to sell papers and to do that he must print what the public will read, not what some scientist thinks it should read.

The implications of this debate are serious. Public attitudes toward scientific research, which are fostered by the mass media, will ultimately dictate the degree of support government will grant science.

Because of this, we decided to study science writing in a cross section of American newspapers. We wanted, first, to get gross figures on the volume and scope of science coverage in the daily press. Second, we wanted to determine whether this coverage accurately reflects the kinds and amounts of scientific activity actually being conducted.

We reviewed every issue of 34 daily newspapers for three months. We clipped, classified and analyzed every article relating to science.

OUR MOST STRIKING finding was that for all 34 papers an average of just under one science story was printed per day. (Papers with over 500,000 daily circulation printed between one and two stories a day, while those with under 40,000 daily circulation averaged only one science story every four days.) By any standards, this is grossly inadequate science coverage for a society as suffused with the attitudes and products of science and technology as ours is.

We first measured the reporting of developments in 10 disciplines in the scientific literature, because progress cannot truly be said to be made unless it is reported. This, to us, was the only objective way of measuring how much return society was getting from its investment in each discipline.

We then thought that there should be

a discernible relationship between society's investment, the results of that investment (as measured in volume of science journal literature) and the newspaper coverage given to scientific achievements.

We used the disciplines that the National Science Foundation uses in its reporting of federal research expenditures: agriculture, biology, chemistry, earth science, engineering, mathematics, medicine, physics and astronomy, psychology and social science. We also used NSF's figures for total dollars obligated for these disciplines.

With help from the Institute for Scientific Information, a Philadelphia publisher of international indices to scientific literature, we developed figures showing the approximate number of scientific articles by discipline that appeared in American scientific journals. We then compared the expenditures and the number of journal articles with our figures on the newspaper reporting of scientific progress.

WE FOUND MUCH disproportion. For example, engineering, where 33 percent of the dollars were spent, had only 12 percent of the scientific articles. Engineering also had a 14-percent share of newspaper coverage.

Medicine, on the other hand, got only 18 percent of the research dollars, but had 34 percent of the journal articles and

SOME SCIENTISTS (excerpts)

J. Alan Heineke, Northwestern University: "There is a big problem with science coverage. They (science reporters) attempt to couch scientific feature material in spot news terminology. You just can't write a feature on a scientific program and make it read like a news flash about Vietnam. You lose the essence of the whole thing. They (the reporters) may not mean to make mistakes, but in many technical areas, no matter how knowledgeable they may be, there are always certain things they are just not aware of."

Barry Commoner, Washington University of St. Louis: "Generally the coverage has been best where the significance of research was self-evident. What we are lacking is journalistic critics of science who would operate as do literary critics. However, it would be even more important for critical discussions to occur within the scientific community. This is also lacking."

Arthur Kornberg, Stanford University: This Nobel prize-winning biochemist feels that "lately the quality of reporting has been quite good," and that most science reporters are well qualified to cover the field. However, he complained about headline writers. He cited a recent biochemistry article that stated, deeply buried, that a discovery might influence the study of abnormal growths such as cancer. The headline read: "Major Breakthrough in Cancer Research."

Robert Dicke, Princeton University: This physicist concedes that reader interest must dictate to a great degree what the newspaper prints but feels that the "better newspapers, as a means of education, should be providing a limited amount of news in certain scientific areas that are important to the formation of national science policy—whether the general public is interested or not."

received 39 percent of the newspaper coverage. Chemistry suffered a graver disproportion in newspaper coverage. Here 8 percent of the expenditures produced 13 percent of the scientific articles but only 2 percent of the newspaper stories.

How do we explain these figures and what do they imply for science and scientists, for the makers of public policy and for the mass media?

First, only 15 percent of the members of the National Association of Science Writers actually work for the mass media. The rest work in public relations and public information offices, producing the news releases and brochures funneled to the mass media. This suggests there is just too much information, a good deal of it self-serving and scientifically insignificant, being sent to science writers and editors and that it is becoming nearly impossible for the media men to make a really balanced news selection.

Walter Sullivan of The New York Times, for example, reports that every day he receives a stack of releases between one and three feet high. Ninety-nine percent of these must be rejected rapidly. The problem of reading, screening and selecting for accuracy, timeliness and significance, in addition to meeting a daily deadline, inhibits the editor from balancing his coverage.

Editors must also decide what really constitutes science news. On one paper, the ATLANTA JOURNAL, city editor John Crown considers the advice-from-the-doctor column the paper's most important science coverage.

MOST NON-SCIENCE news develops in the form of relatively discrete events about which spot stories can be written and on which in-depth feature treatment can be hung. Not so with most science news. Scientific progress is normally made slowly and occurrences such as the first heart transplant are the exceptions.

The science writer, exposed to great doses of inconclusiveness, qualification and reservation, may weary of reporting research in progress and tend to select and emphasize stories that have a sense of completeness. This sort of story occurs with greater frequency in some disciplines than in others.

The scientific meeting is an additional source of many articles on science. But even here the writer is limited in choosing his subjects by screening committees or public relations representatives who preselect for distribution in the press room perhaps 10 percent of the papers being delivered at the meeting.

So, because of great volumes of material available and the special character of science news and its sources and the pressure of time, the newspaper tends to let outsiders select a high percentage of its subjects. Frequently the selection is honest, fair and unbiased. Occasionally, it is not.

Another factor in the imbalance of coverage is that much research today is being done under sponsorship of the Defense Department or private corporations and is restricted from publication. This is particularly true in engineering. Also, the inherent difficulty of explaining certain disciplines undoubtedly inhibits their coverage. Mathematics, for instance, received no coverage at all in our survey.

Another factor is the small number of newspaper science writers. Perhaps half of them are assigned fulltime to medicine and many are restricted by their own inadequate background or special interest in areas they can cover competently.

Finally, editorial judgment about what will appeal to the mass reader is a most important consideration in story selection.

TO WHAT DEGREE is all of this bad? The one real danger we see is that, because of undue concentration on certain disciplines and certain types of science news, the public may get a distorted view of science and of its role in modern life. A public educated to a "Mr. Wizard" concept of science will very likely develop false expectations and be frustrated when they are not realized.

The scientist, we believe, must decide to play a more active role in interpreting himself and his profession to the public through the professional science writer.

He should support a growing trend in some newspapers to print less spot news on science in favor of more interpretive treatment.

Fearing misinterpretation and distortion, he should not, as so many scientists have in the past, shun the reporter, retreat to his laboratory and console himself by saying that his work is simply beyond the average man's comprehension. Much scientific work may be couched in language foreign to the layman, but the scientist should be able to explain the reasons for doing the work he does and the logical structure of that work and some of its implications for society.

Congress continues to question the utility of public support for certain areas of science. Certain newspapers editorialize against the government's supporting projects with apparently trivial or esoteric titles. Commentators criticize whole areas of scientific research as irrelevant to the critical problems of our society and suggest that such areas be less generously supported with public funds.

The scientist cannot continue to justify public support for his work on the faith that, as Murray L. Weidenbaum of Washington University recently put it, "through serendipity . . . it will turn out to be worthwhile after all."

IF SCIENTISTS want public opinion to play a meaningful role in determining public policy toward science, they must actively participate in educating the public. We need a new kind of specialist—a scientist-journalist, who can give the public thoughtful analyses of scientific and science-policy matters.

Not all segments of society will ever be interested in science news. We should certainly not distort or oversimplify information in order to appeal to those segments, just as we do not oversimplify the complexities of the sports page for readers not interested in sports.

But the scientific community must reach the interested layman with thoughtful, critical and well-balanced science information, for it is this layman who is ultimately the prime shaper of our society.

THE END

SOME WRITERS (excerpts)

Gobind Lal, San Francisco Examiner: "Scientists are just as good a news source as any other. It depends on the person. Of course, you must win their confidence if they are to really open up and tell you what they're doing. Some are jittery and want to shrink away."

Jerry Curry, St. Louis Post Dispatch: This reporter said he finds scientists cooperative 99 percent of the time, but likened them to careful politicians, extremely conscious of being misquoted. He said his science beat includes local hospitals, as well as the universities and research centers. Writing in depth is often hampered by lack of time, he said.

Art Snider, Chicago Daily News: This 23-year veteran of science journalism complains that many scientists feel that dealing with newspapers is beneath their dignity. "Then there are the ones that never have the time to talk. They are always filled with excuses and are usually the ones who scream the loudest when they do want coverage and can't get anyone's attention." However, he feels that the majority of scientists believe the public has a right to know what is going on behind the laboratory doors.

With the recent cutback by the government of funds for scientific projects there has been a definite change of heart, a kind of soul-searching by scientists. They feel now that they must cultivate the public's good will. Many also feel that the real future of science will have to be pointed in the direction of solving social problems, not ivory tower ones."

Julie McClure, former science editor, Atlanta Journal: She found some scientists reticent to talk and fearful of misinterpretation and of appearing like idiots to their peers. The scientist, she said, does not mind too much what the public thinks, but he must have the respect of his colleagues.

UNFERTILIZED

37%
Commercially
Poor

60%
Moisture

Low-Yield
Soybeans

FERTILIZED

3%
Commercially
Poor

12%
Moisture

15 Bu. More
Per Acre

Tips for TOP-Profit Soybeans

1—I've heard fertility affects soybean quality. True or false?
True. It has been said that some of the quality can be grown into soybeans by providing proper soil fertility. Full growth, high oil and protein, early maturity command top market. Excess moisture, discolorations, foreign matter cut your price. Tests on an infertile soil have shown unfertilized plants producing 37% commercially poor beans, fertilized plants only 3% poor. Unfertilized beans contained nearly 60% moisture, fertilized beans only 12% moisture. Potash improved size and number of nodules per plant.

2—How do top soybean growers get twice the beans I average?
System! They pull all stops. Many cite fertilization. Others also credit closer rows and weed control. Many cite care in choosing high-yield varieties and preparing seedbed. All use combine carefully to avoid leaving 10 to 20% of their crop in the field. Most believe 50 or more bushels per acre can be accomplished on almost any farm. No one practice will do it. They stress one thing: the higher the yield the more critical the little things become.

3—What is the best time to plant?
Depends on area, of course. Some say early May . . . others May 10-20—some May 20 to June 20. Some say soybean yields start downhill after May 25 plantings. Check local recommendations. Early corn planting permits earlier soybean planting. Safe bet is to plant when soil is warm enough to insure rapid germination. If you plant early, use a herbicide for early weed control. When planting without herbicide, delay planting enough to kill crop of weeds in seedbed preparation.

4—Weeds give me a fit—but I can't afford new, expensive herbicides.
What if they add more bushels than they cost? You can lower your weed tax with mechanical and chemical tools. Use rotary hoe after planting when weed seeds are just germinating, but before or very soon after weeds emerge. This breaks the crust, gives better stand. Rotary hoe at 8-10 miles per hour. Some say you haven't done much weed killing if you don't knock out 10% of the soybean plants with a harrowing and couple of rotary hoeings. Then one or two shallow cultivations lick the weeds. Use herbicides where harrow, weeder, or rotary hoe is ineffective . . . chemicals carefully chosen for key problem weeds.

5—Is seed selection as important as some folks say it is?
Your choice can **pay** or **cost** you 3 to 10 bushels per acre. Iowa scientists got 20 bushels per acre MORE beans by changing variety—about $50 more return per acre. Use certified seed of adapted variety—high in germination, low in foreign material, weed and other crop seed. Some varieties do better on clay than on sand. Know their traits: (1) maturity to fit your region and planting date, (2) yield potential, (3) standability, (4) ability to resist disease and compete with weeds. Too many farmers still buy beans from the bin, uncertified seed with less potential than new varieties. Too few farmers get professional advice on their seed needs.

6—Will broadcast fertilizer boost soybean yields?
Yes. Profits spurted $11 MORE per acre after 80 lbs. phosphate was broadcast on Illinois soil. Bean yields rose 7 bushels and profits $15 PER acre after receiving 60 lbs. potash on southeast Missouri soils testing 150 lbs. K. Low subsoil fertility has long hampered soybean yields. That may be why a recent contest winner strongly mentioned plowdown, 10 to 12 inches, to deepen soybean root zone for fuller feeding bad spells. Soybean roots go deep. What they find there can affect your yield. Deeper plowing usually demands more nutrients to enrich expanded plowlayer.

7—Is carryover fertility effective?
Yes—if the corn leaves anything. Let's face it—do you **maintain** a real two-crop soil? If you do, the carryover power may pay for initial application and **then some.** After low-K Iowa soil received 200 lbs. potash per acre, bean yields jumped 4.3 bushels the first year, 5.9 bushels the second year. This increased returns an average of $8.25 per acre yearly. Yes, it's effective.

8—Can just 8 beans per square foot on the ground cost me 2 bushels per acre?
They surely can. Too many 40-bushel soybean yields weigh out 30 to 32 bushels because of harvest loss. If you combine carefully with a well adjusted machine, you should lose no more than 2 bushels per acre. Harvest at above 13% moisture. You may be losing $10 worth of beans per acre by wrong combine setting and speed. **Cut'em slow and low.** If you leave a 3½-inch stubble, you leave about 5% of your crop in the field. A 6½-inch stubble leaves about 12% of the crop. Add shattering losses at the sickle bar and you can see the need for careful harvesting.

A complete set of these soybean tips (18 answers to key questions) are available in a kit offered on the next page. Order your soybean telling tools today.

Soybeans DO Get Hungry

Use facts to tell it like it is!

Facts that show soybean fertilization producing **more bushels** per acre, **more nodules** per plant, and **better quality** beans.

Facts that show high yields—**a 60-bushel crop**—draining hard on the soil's nutrient supply, using a whopping 651 lbs. total nutrients per acre.

The aids below feature these and other **facts for efficiency.** They'll help you convince folks well-fed soybeans DO pay off. Order supplies early!

NEWSLETTERS & FOLDERS
(To Reach Extra Thousands Through Fast-Mail Programs)

	Free Copy	Quantity
Southern Area—Fertilized Soybeans Pay Off: S-156-68	_____	_____ 3¢ Ea.
Northern Area—Fertilize Those Soybeans: M-148-68	_____	_____ 3¢ Ea.
Fertilized Soybeans Can Match Corn Profit-Wise —E-4-67	_____	_____ 3¢ Ea.
How Potassium Builds Soybean Quality—B-1-68	_____	_____ 2¢ Ea.

PLACE MATS
(To Pep Up Dinner Meetings With Top-Yield Techniques)

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Grow 10-Ton Alfalfa (Mentioned in this issue)	_____	_____ 2¢ Ea.

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(To Display Hunger Signs & Plant Food Removal Trends)

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Soybeans Get Hungry, Too. Feed Them! (Fact Sheet)	_____ 2¢ Ea.
Plant Food Utilization By 20 Crops	_____10¢ Ea.
Fall-Winter Fertilization Pays	_____10¢ Ea.

EDUCATIONAL KIT
(To Provide Facts Tailor-Made For Newspaper-Radio Use)

Soybean Tips Kit—18 Answers to Profit-Seeking Questions	_____15¢ Ea.

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

Total Payment Enclosed $_____

Name _____ **Address** _____

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American Potash Institute, 1649 Tullie Circle, N.E., Atlanta, Ga. 30329

Then there was the public relations man who wanted to get his message to all the wives in the community. So he sent a perfumed letter to their husbands marked personal.

The county agent received a call: "Sir, for the last few mornings when I go out to the chicken house I find a few of my chickens lying on their backs, all stiff and their feet in the air. What's the matter?"

He replied, "Your chickens are dead."

Two old men were talking about King Solomon.

Said one, "All those wives and concubines; you know sometimes I wonder how he arranged to provide the necessary food for all those women."

The other replied, "How he fed all those women doesn't interest me. I just wonder what he was eating himself."

A murderer had managed to bribe one of the jurors to hold out for manslaughter. Finally a verdict of manslaughter was handed down. The murderer was congratulating the bribed juror.

The juror replied, "Boy, I held out for 24 hours. Everybody wanted an acquittal!"

A youngster waited patiently in line to see Santa. At last his turn came and he walked up and delivered Santa a healthy kick in the shins.

"What's that for?" asked Santa.

"For last Xmas," replied the kid.

A gentleman owned a female parrot that kept repeating over and over, "I'm a prostitute, I'm a prostitute."

Now he had a friend that owned a male parrot that prayed all the time. They decided to put the parrots together for a while to see if they would neutralize their conversation.

After about a week, the owner of the male parrot called and asked how his bird was doing. He was told that now his bird was saying over and over: "My prayers have been answered, my prayers have been answered."

Doctor: "I can't find anything wrong with you. I think it's due to drinking."

Patient: "O.K., Doc, I'll come back when you're sober."

Moving along a dimly lighted street, this man was approached by a stranger who had slipped from the shadows near by.

"Please, sir," asked the stranger, "would you be so kind as to help a poor unfortunate fellow who is hungry and out of work? All I have in the world is this gun."

"Doctor, I'm going into rattlesnake country. What should I do if I get bit?"

"Well, if you get bit on the hand, for instance, you must immediately draw the poison out with your mouth and spit the poison out."

"What if I'm bit where I sit down?"

"That's when you find out who your friends are."

Highly Respected Provost Praises-and Challenges-Industry

WHILE LAND-GRANT UNIVERSITIES are not in the business of selling fertilizer, they have done more to develop markets for this product than any other group including the fertilizer industry itself, Dr. E. T. York, University of Florida Provost for Agriculture recently told a national fertilizer audience.

The internationally respected Provost said fertilizer usage throughout the nation could be increased up to 100 percent if growers used the levels land-grant universities recommended. He cited the tremendous rise in fertilizer usage over the past 30 years, saying the use of some fertilizers in Florida has climbed 350 percent. Research shows NPK usage in Florida could be increased by another 50 to 90 percent if the recommendation of the University's Institute of Food and Agricultural Sciences were fully adopted.

"Of course, I doubt if we can expect to close completely the gap between what is recommended and what is actually used, but it can be narrowed," he said.

While universities should continue to assume primary responsibility for research toward optimum levels of fertilizer usage, the task of closing this gap is and should be up to the industry itself, Dr. York declared. He urged industry to support university research and education programs not possible otherwise. The industry can then use the university findings to create successful marketing programs.

"Frankly, I know of no business or industry that has better product value to sell than the fertilizer industry," he said. "Florida research has shown a return per dollar invested in fertilizer, at average rates of usage, of 100 percent or more with all crops. In fact, with many crops the return was as large as 4,000 percent or better. Nationally, I suspect there is an average of at least 400 to 600 percent for expenditures for fertilizer."

What Is An AGRONOMIST?

WEBSTER DEFINES agronomy as the science of soils and plants. An *agronomist* is one who works in some phase of the development and production of field crops. Never before in the history of the world has there been so much attention to food production, and the agronomist is the leader in this effort.

An agronomist may be a teacher, a research man, or an extension specialist in the university, government, or industry. There are many areas he can work in—plant breeding, plant physiology, biochemistry, soil fertility, soil physics, soil chemistry, soil management—to name a few.

As a teacher, the agronomist trains young men and women to work in various phases of agronomy. A rapidly growing part of his work is to train people from foreign countries so that they can go back home and teach improved methods of food production.

As a research man, he is developing new varieties of crops. All of you are much aware of this as you hear about the new varieties being released by universities and industry. The future of the world is very dependent on the plant breeder. It has been predicted that by the year 2000 we will have 500 bu. corn, 175 bu. soybeans, 300 bu. wheat and 30 ton forage per acre. The breeder is a key man in this tremendous increase.

Another type of research agronomist studies new methods for fertilizing crops in terms of rates, time of application, and placement of fertilizer. Continually we hear about new and better ways to fertilize crops. Fertilizer use in the United States increased 57% from 1963 to 1968—indicating the information is really being used.

An agronomist studies new cropping practices. We have heard much about time of planting, rate of planting, and minimum tillage, for example.

As an extension or an industry specialist, the agronomist passes facts along to the farmer. Never before has the farmer had the opportunity to attend so many meetings, have so many contacts from industry, or hear so much on radio, television, and in the press about improved methods of crop production. This is based on work of agronomists.

Among the sources of food energy in the world, *67%* comes from cereals, soybeans, peas and beans, and *20%* from meat. The agronomist is important in livestock production as well since he must continually look for improved methods of producing forage and grain to feed the livestock. He may work hand in hand with the animal scientists.

The spotlight is on the agronomist and it will be getting brighter. He is a key man as we attempt to meet the rapidly increasing food and fiber needs of the world. You, the American farmer, are part of this agronomic team.

You may have sons or daughters who are interested in making agronomy their career. The world is looking to the United States for leadership in agronomy.

WERNER L. NELSON

Are Your Plans Made?

WHAT'S THE PLACE of forage in American agriculture? Attend the 1970 workshop in Chicago to find out.

The Research and Industry Conference sponsored by the American Forage and Grassland Council will meet January 27 and 28. The place: LaSalle Hotel. The topics: forage production, harvesting, storing and feeding.

This year's program will attract key people—the deciders—folks who are tops in farm management and money management, in research, education, and industry concerned with forages.

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