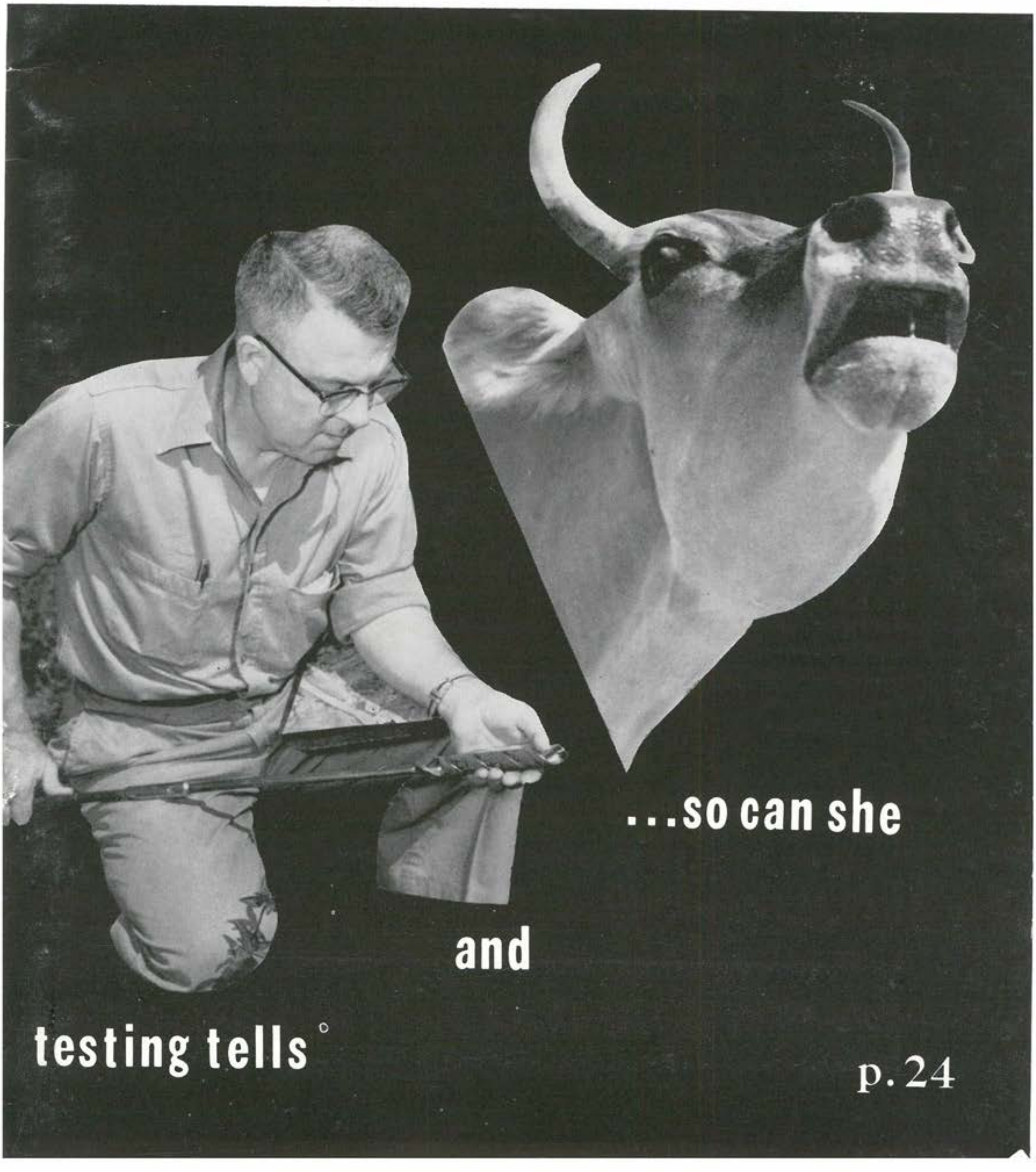
Better Crops WITH PLANT FOOD

September-October 1962 | 20 Cents



testing tells

and

...so can she

p. 24

Better Crops WITH PLANT FOOD

The Whole Truth—Not Selected Truth
$1.00 for 6 Issues, 20¢ Per Copy

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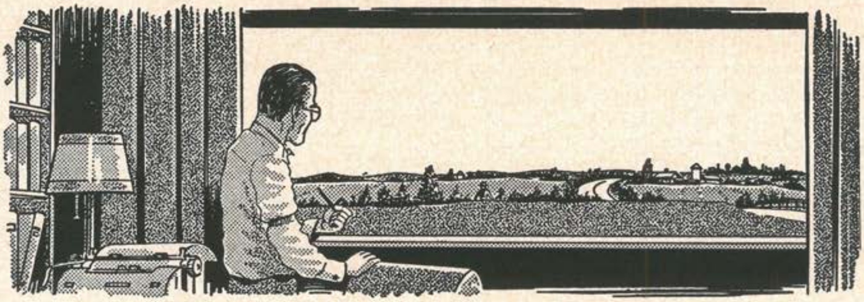
ON THE COVER

. . . we have tried to symbolize an idea basic to successful forage farming. When forage crops have been fertilzed according to official soil test recommendations, the farmer is not the only one who can tell the difference, so can the livestock—not only in the increased yields, but often in the improved palatability of the forage feed that can mean more milk and beef per animal, often more dollars returned per acre. Turn to page 24 to see how Oregon used forage crops to prove that soil tests pay.



On the threshold of scientific wonders . . .

Our Kinfolk Stood With One Strength No Science Can Replace

By Jeff McDermid
(Elwood R. McIntyre)

THE YEAR was 1900. The local linemen had just installed our first telephone—a wooden box with a hand crank below and a long rubber mouthpiece above.

My Father stood sorta stiff as he turned the crank to route his first call through Central for the voice of his nearest neighbor, Jim Haseltine. Father's hand trembled as he listened, squeezing the earpiece against his head. He said he would not be obliged to stand out in the backyard and holler across the valley anymore.

"I never thought I'd live to see this day," he shouted to the muffled voice that came along the line across the valley from neighbor Haseltine.

Our first electric lights were at the church and in the farmers' store. We all went down to see them—glaring little bulbs.

"Thomas Edison is by far the greatest man who ever lived," exclaimed our county judge, always advanced in his opinions. The folks swelling the little store were too busy starring to agree with the judge—or disagree.

All the forward steps taken before were small by comparison. My folks burned candles and used fireplaces, yoked up oxen and communicated by letter and sparse visiting. The only big forward move into the previously unknown was the Morse telegraph.

It was my pleasant lot to witness some of the delighted wonder evinced by my elders as the stream of momentous discoveries began to flow. But mixed with the wonder was a little conjecture and fear. Maybe we were just moving too fast for our britches.

When that crazy stunt flyer was booked for our county fair, I was working in the print shop. I was also responsible for some copy in the county seat newspaper. Being informed by the proud fair secretary that this wonderful invention from the Wright brain shop was coming, we put reminders in every column to "coax the yokels" of our tribe to forget the silo filling and hurry to the fair.

On the auspicious day, I took Mother and Father in the democrat wagon and paid the gateman 50 cents apiece to drive right in. We found a nice open spot near the dirt track where we could lean against the fence. After a long and expectant wait, we saw suddenly off to the east a yellow crate with what looked like 2 by 4's on it, and right in the center of the rough contrivance sat a lonely man with hands outstretched on a stick. It passed above us about 100 feet with a steely whirr. These bi-planes were often hired out for spectacular flights. Later I learned that this particular flyer was much concerned with wind conditions when he was to begin his 10-mile jaunt but finally proceeded with some foreboding.

I turned from the fence to see Mother weeping softly. Her thin, somewhat forlorn figure was dressed in blue gingham topped by a little black bonnet slightly askew from excitement. She leaned against me saying, "I've lived to see the unbelievable, to see a real Darius Green skimming the sky. My heart goes out to him up there, facing with great courage a threat of falling."

What would Mother have said during John Glenn's flights around our globe?

Then came the auto across our peaceful countrysides. It made all the farm machinery parades of my youth a side issue. I shall never forget the first "horseless carriage" that came to our town. Main street was edged six persons deep, with folks standing on the curb from the courthouse to the red bridge over the canal. The mayor and judge and the sheriff pulled out chairs and sat on the boardwalk at the City Hotel. Looney Lumkin was busy selling his mother's sandwiches to those who were hungry from a long ride.

The equipage we hoped to see in motion was a little buggy run by an electric motor. It headed the parade of Hi Henry Minstrels.

With a blare of trumpets and a roll of drums, the marvel came chugging down Main Street, the black-face minstrel driver in red vest halting at the corners to do a wide circular sweep. Beside him, Hi Henry himself doffed his purple plug hat in happy pride. Uncle Bob and his leggy boys came tearing up to the car, cheering and waving.

"That's a great invention, all right," he shouted. "But I wouldn't ride in one of them sewing machines if you paid me."

My late wife recalled her first glimpse of a horseless buggy. She and her country cousins took stations (or refuge) in a feed warehouse hay mow to see the gas-going gadget tear along rough roads *at 15 miles per hour!*

Rural wants were clamoring to be satisfied also. Farmers wanted labor-saving through the grain binder, the mower, the cultivator, and the sulky plow. In the realm of better farm implements and practices, lay a hint of more and more innovations to make farm chores easier and production greater.

Improved and extended chemistry of plants and soils soon came to be as useful on the farm as the newly designed implements of tillage. By degrees this led to scientific prescriptions for weak soils, to make the investment in mechanical equipment safer and surer. Hauling out manure was not the only trick to fertility.

The gasoline power-saw was another welcomed tool—especially to the farm boy who spent long hours bucking up cord wood into stove lengths, when he should have been replenishing the family larder through fishing or hunting—*or so I thought!*

But, sad to say, such discoveries and recipes were slow to lower the load for Mother and the girls. They steamed up the kitchens for threshers, barn builders, and neighborhood parties—and kept the home larder replete. They toted wood and water, helped at butchering time, kept the lamps trimmed and filled, and put the lily white wash flipping on the line every Monday. To do all that took sweat and rare patience, depending altogether too much on the zinc-covered wash board for breaking knuckles and the heavy, sloshy tubs for breaking backs. The automatic electric sewing machine and the handy push-button laundry sets—to mention only two—have come to make the best better in family relations. Would that they could have come to the women of my family! Yet those deprived elders of ours kept on through thick and thin. The barbs of envy seldom pierced them because there was little to be jealous over, few chances at any "druthers."

One of my most poignant hours came when Father was leaving the old place for the last time. All but myself had left, and I was in the background. He sat at the same old drop-leaf table with the cracked ironstone china dishes before him. In the silent room alone, he bowed his head, now gray, to say: "Dear Lord, bless this food for our use and us for Thy service in the name of our Saviour." There was no sudden hoydenish chatter or the eager rattle of dish-ware. It was merely the breaking off point for a brave but finished generation.

We may omit the things that never seemed complete about our many kinfolk. They were no angels. We know it now. They knew it then. They were often narrow and prejudiced, mainly because of scanty schooling. But they did not usually rely upon a professional aura of piety to convince others that they were good neighbors.

Our kinfolks had much spirituality in their make-up. They *had to* have as they fought hard times with weary bodies—for they had no tranquilizing pills, no sleeping sedatives, no fee-heeled counselors, no security crutch but that spirituality: a tired head bowed simply over an old ironstone china dish or beside a splintery fence post overlooking a dry, dry, too dry cornfield. And they slept at night.

Would that we, who have so much else *but*, might learn to develop more.

THE END

99 BUSHELS PER ACRE

WITH <u>ONLY</u> SEVEN AND A HALF INCHES OF WATER!

PRODUCING 99 bushels of corn to the acre in South Dakota with only seven and a half inches of water may sound unbelievable.

But it has been done—though not in a way that as yet is practical for the farmer to use.

Soils Scientist J. R. Runkles, of the South Dakota State College agricultural experiment station, covered corn plots with plastic to obtain these results. By reducing soil moisture evaporation, he was able to get nearly 13 bushels of corn for each inch of water the soil had stored.

Plots that weren't covered took twice as much water to produce a bushel of corn—only 6 bu. per inch. The yield was 87 bushels to the acre on nearly 14½ inches of water.

Where irrigation was used so water wasn't a limiting factor, 109 bushels of corn were produced on nearly 18½ inches of water. Each inch of water produced nearly six bushels of corn.

Runkles is trying to find inexpensive, yet effective, ways to reduce soil moisture evaporation. He says that if evaporation could be controlled, farmers could produce 100 bushels of corn on about eight inches of water.

Practices that may have possibilities, in addition to plastic coverings, include mulch tillage, synthetic sprays, and producing a soil mulch.

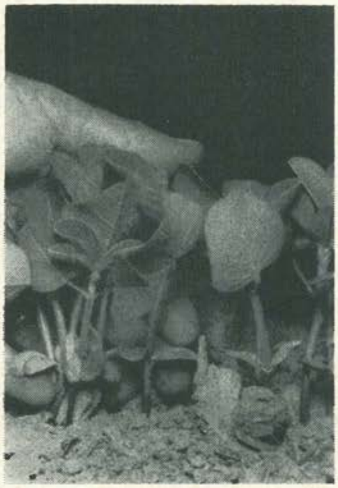
South Dakota News

What happens to the energy . . .

WHY don't soybeans yield as much as corn or cotton? There are some fundamental biological reasons for this difference in yield.

Basic to any intercrop comparison is the composition of the product. A bushel of soybeans has a moisture-free weight of 52.7 pounds, 9 percent more than the moisture-free weight of a bushel of corn, 48.2 pounds. Soybeans are relatively high in oil and protein and relatively low in carbohydrates. Corn, on the other hand, is high in carbohydrates and low in oil and protein.

The average energy contents or caloric values of these three



. . . OF SOYBEANS AND CORN

Robert W. Howell

classes of food materials are: carbohydrates, 1,860 Kcals/lb.; fats and oils, 4,300; and proteins, 2,560. Fats and oils contain two and a third times as much energy per pound as do carbohydrates. Proteins contain one and a third times as much.

Sunlight supplies all of the energy that is ultimately stored in the seeds of corn, soybeans, and other crops. During the season a field of corn and a field of soybeans absorb about the same total amount of light and, therefore, obtain about the same total amount of energy.

But because the soybean concentrates more of this fixed amount of energy into high-energy oil and protein units, it can obviously make fewer pounds.

Some of the energy absorbed by the plant is used to do "work." The first major product of photosynthesis is carbohydrate, which the leaves of most plants store in the form of starch.

This carbohydrate can be considered a starting material for

TABLE I—"WORK" ENERGY REQUIRED FOR PRODUCING SOYBEANS AND CORN

Energy source	Composition % of dry wt.	Dry wt. lb./bu.	Kcals/bu. Stored	"Work"	Total	Equiv. yield (bu.)
			SOYBEANS			
Carbohydrates	33	17.4	32,000	0		
Oil	22	11.6	50,000	40,000		
Protein	40	21.1	54,000	29,000		
Ash	5	2.6	0	0		
Nitrogen fixation	—	—	0	33,000		
Total	100	52.7	136,000	102,000	238,000	45
			CORN			
Carbohydrates	84	40.5	75,000	0		
Oil	4	1.9	8,000	6,200		
Protein	10	4.8	12,000	6,400		
Ash	2	1.0	0	0		
Total	100	48.2	95,000	12,600	107,600	100

SUMMARY

	Total Kcals/bu.	Equiv. yield
Corn	107,600	100
Soybeans	238,000	45

the formation of other products. To make oil and protein, the plant not only must concentrate the energy into tighter units, but also must use a certain amount of energy to build these units.

For example, in making one pound of oil a plant uses nearly five pounds of carbohydrates. About 55 percent of the carbohydrates, or 2.7 pounds, is compressed into one pound of oil. The remaining 45 percent, or 2.3 pounds, is used or "burned" in the process of building the higher energy oil.

The energy represented by the carbohydrate that is "burned" is called work energy. The synthesis of protein also requires work energy, but the amount is somewhat smaller than that for oil. By comparison, the work energy for moving and storing carbohydrates in the seed is very small.

Soybeans and other legumes also acquire work energy for the symbiotic fixation of nitrogen. It is not certain how much energy they use in fixing nitrogen, but information on the metabolism of nodules suggests about 33,000 Kcals per bushel as an acceptable estimate.

Table 1 summarizes the energy components in soybeans and corn. The total is 238,000 Kcals/bu. for soybeans and 107,600 Kcals/bu. for corn. Thus, energywise, 45 bushels of soybeans is equivalent to 100 bushels of corn.

The Illinois average yields for 1948-57 and for the years 1958 and 1959 show a ratio of soybean to corn yields between .40 and .45 in each case, or close to that expected from theoretical consideration of energy relationships.

Illinois Agronomy Facts

By W. G. Blue
and
Nathan Gammon, Jr.

University
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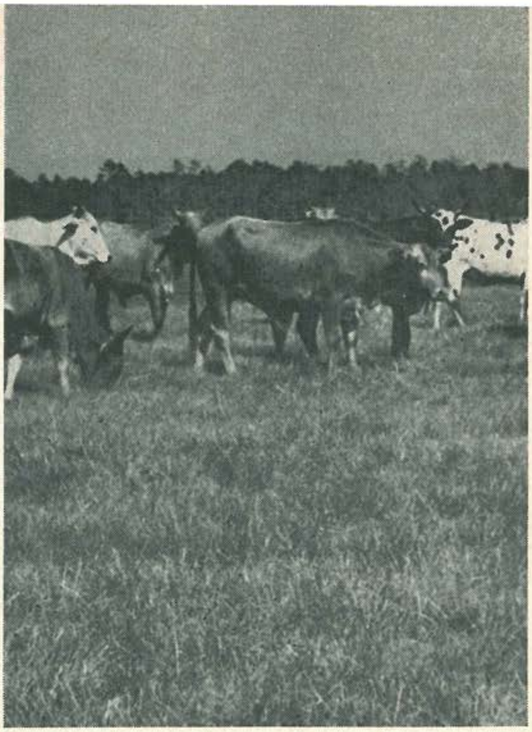
Gainesville



GRASS OR

WHICH MAKES BEST PASTURE...

THE AREA of "flatwoods" soils in Florida has tremendous potential for forage production.

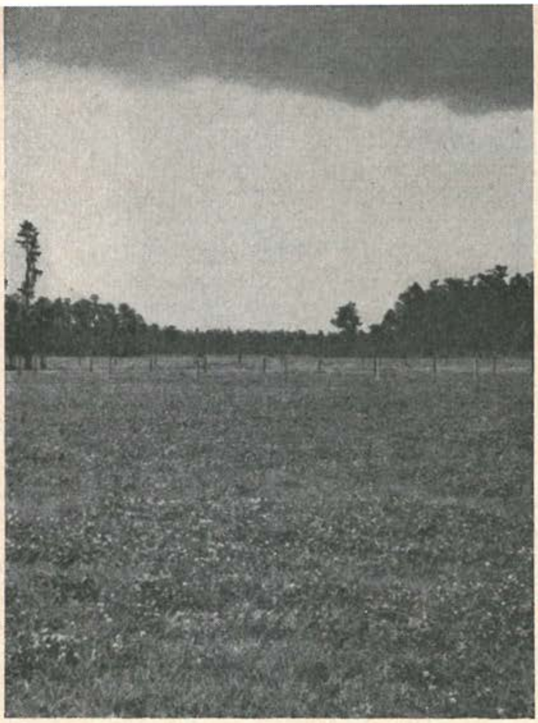
Representing important areas in all Coastal Plains States, these soils comprise more than 15,000,000 acres in Florida, with about 2,000,000 acres already in improved pastures.

Through a joint study of soil, plant, animal, and economic problem started in 1952 at Florida's Beef Research Unit near Gainesville, the forage potential of these soils is being uncovered. This report covers the first phase of this study which terminated in 1957.

The "flatwoods" area is relatively flat and poorly drained, the soils sandy, extremely acid and highly leached. Leon fine sand predominates. Native vegetation consists largely of long leaf pine, wiregrass, saw palmetto, gallberry, runner oak, and cypress.

THE ROUTE OF STUDY

The average pH of the virgin soil (0-6") utilized in this experiment was 4.9. The pH varied from about 4.5 to 5.2 and was inversely related to the soil organic matter content. Ammonium acetate (pH 4.8) extractable soil nutrients were: P_2O_5, 14; K_2O, 54; Ca, 140; and Mg, 100 pounds per acre. Total phosphate was 140 pounds per acre.



Long-range tests show differences . . .

- in annual forage yields
- in forage composition
- in weaning percentages
- in beef production

GRASS-CLOVER ➚

. . . ON FLORIDA FLATWOODS SOILS?

Table 1 shows the eight pasture programs established with fertilization.

TABLE 1—TYPES OF FORAGE PLANTS AND FERTILIZATION RATES FOR THE 8 PASTURE PROGRAMS

Program Number	Forage Plants	Annual Fertilization in Pounds per Acre		
		N	P_2O_5	K_2O
1	Grass	34	18	18
2	Grass	68	36	36
3	Grass	120	72	72
4	2/3 Grass	68	36	36
	1/3 Clover-grass	0	72	72
5	Clover-grass	0	72	72
6	Clover-grass*	0	144	144
7	Clover-grass	0	144	144
8	1 acre clover-grass	0	72	72
	2.5 acres native	0	0	0

* Irrigated.

TABLE 2—POUNDS OF OVEN-DRY FORAGE AND CRUDE FORAGE PROTEIN PER ACRE FOR FIVE YEARS

Program Number	Forage Plants	Annual Fertilization			Years*				
		N	P_2O_5	K_2O	1953	1954	1956	1957	Avg.
		(lbs./A.)			(lbs./A.)				
					Oven-dry Forage				
1	Grass	34	18	18	5,240	4,350	3,650	5,410	4,660
2	Grass	68	36	36	8,460	4,190	6,050	7,150	6,460
3	Grass	120	72	72	9,170	7,810	9,090	8,330	8,600
5	Clover-Grass	0	72	72	8,680	5,280	10,570	10,500	8,760
7	Clover-Grass	0	144	144	10,760	6,610	9,800	10,070	9,060
					Crude Forage Protein				
1	Grass	34	18	18	314	291	227	363	299
2	Grass	68	36	36	618	314	375	493	450
3	Grass	120	72	72	670	586	664	650	642
5	Clover-Grass	0	72	72	729	565	1,322	1,879	1,124
7	Clover-Grass	0	144	144	792	687	1,126	1,601	1,052

* Data for 1955 were omitted because half the pangolagrass pastures were plowed up and planted to Coastal Bermuda grass.

Major findings can be discussed by considering only Grass Programs 1, 2 and 3 and Grass-clover Programs 5 and 7.

After pulpwood and debris were cleared from the virgin area, one ton per acre of high calcium lime was applied to the grass pastures and 2 tons per acre to the grass-clover pastures. The lime was worked into the soil in an effort to maintain the pH above 5.0 for grass pastures and above 5.5 for grass-clover pastures.

Minor elements—including copper, manganese, and zinc as sulfates and boron as borax—were uniformly broadcast over all pastures at the rate of 15 lbs. per acre of each of the sulfates and 7.5 lbs. of borax just before seeding. And 350 lbs. per acre of 5-7-5 was also broadcast ahead of planting on Program 1 and 600 lbs. per acre on all other programs.

Pensacola bahiagrass was planted in one-third of each program in the spring of 1952 and pangolagrass on the remaining two-thirds during that summer.

Pastures to be seeded to clovers were mowed or grazed before October seeding. Grass-clover pastures received 600 lbs. 0-12-12 fertilizer per acre immediately before seeding the clover. A mixture of 1 lb. Ladino, 3 lbs. each of Nolin's Louisiana white, Kenland red and Nolin's red, and 7 lbs. of Hubam sweet clover was broadcast seeded on undisturbed sod during late October. An excellent stand resulted.

The pastures were grazed with cows and calves. The initial cow herd consisted of relatively poor quality Brahman—native crossed heifers, systematically bred to bulls of 4 breeds: Angus, Brahman, Hereford and Shorthorn. Cows were culled the second time they failed to conceive. Cows similar in breeding and age to the original experimental cows were maintained to replace animals that died or were culled.

THE FORAGE RETURNS

In the all-grass programs with low and intermediate fertilization rates (Programs 1 and 2) deferred grazing made roughage for grazing possible at all

TABLE 3—SOIL pH AND POUNDS OF AMMONIUM ACETATE (pH 4.8) EXTRACTABLE CALCIUM PER ACRE FOR FIVE YEARS

Program Number	Forage Plants	Annual Fertilization N	P_2O_5	K_2O	Years 1951	1953	1954	1955	1956	1957
		(lbs./A.)								
					pH					
1	Grass	34	18	18	4.9	5.3	5.3	5.7	5.7	5.7
2	Grass	68	36	36	4.9	5.3	4.9	5.4	5.3	5.3
3	Grass	120	72	72	4.9	5.3	4.9	5.0	5.1	5.5
5	Clover-Grass	0	72	72	4.9	5.4	5.4	5.4	5.4	5.3
7	Clover-Grass	0	144	144	4.9	5.7	5.6	5.7	5.6	5.5
					Calcium (lbs./A.)					
1	Grass	34	18	18	200	520	550	840	700	1,110
2	Grass	68	36	36	200	710	750	1,070	860	1,420
3	Grass	120	72	72	200	690	720	920	700	1,190
5	Clover-Grass	0	72	72	200	740	1,050	870	840	1,060
7	Clover-Grass	0	144	144	200	1,060	1,190	1,280	880	1,060

times. But protein supplement was fed for approximately 100 days per year.

Although carrying capacity per acre was higher in Program 3, it was not possible to maintain a constant number of cows on the program. Sufficient forage reserved for winter grazing resulted in lodging, smothering of sod, and excessive forage loss from trampling and contamination. After the first year, silage was harvested during the summer months and fed back to the cows as necessary.

Satisfactory year-round grazing was achieved in most of the grass-clover pastures. Less reserve grass was required than in all-grass programs, since clover production came about 6 weeks earlier than grass in the spring. Also no protein supplement was necessary. However, there was some risk with the grass-clover program in that adverse weather conditions during early spring could result in a forage shortage. Consequently forage from these programs was stored for emergency feeding.

Table 2 compares the oven-dry yields and crude forage protein produced per acre by Programs 1, 2, 3, 5, and 7 over a 5-year period, 1953-57.

Although forage yields varied somewhat from year to year, due to weather, 1957 yields were approximately as large as 1953 yields. Yields from the grass-clover programs averaged slightly higher than the most highly fertilized grass program.

The persistence of clover through the summer months improved each year of the experiment, *emphasized by protein production levels.* While the total protein production of grass pastures was about the same in 1957 as in 1953, protein production of grass-clover pastures had more than doubled by 1957. All clovers did well during the first years. But special grazing management is apparently needed for sweet and red clovers, since white clover had become predominant by 1957.

Pangolagrass gradually deteriorated from winter killing in the more heavily fertilized grass pastures (programs 2 and 3) and in the grass-clover pastures.

TABLE 4—POUNDS OF AMMONIUM ACETATE (pH 4.8) EXTRACTABLE SOIL PHOSPHATE AND POTASH PER ACRE FOR FIVE YEARS.

Program Number	Forage Plants	Annual Fertilization N	P_2O_5	K_2O	Years 1951	1953	1954	1955	1956	1957
		(lbs./A.)			(lbs./A.)					
					P_2O_5					
1	Grass	34	18	18	14	11	8	15	10	25
2	Grass	68	36	36	14	17	15	20	13	45
3	Grass	120	72	72	14	29	29	34	32	53
5	Clover-Grass	0	72	72	14	16	12	18	15	27
7	Clover-Grass	0	144	144	14	31	22	46	41	76
					K_2O					
1	Grass	34	18	18	54	26	31	33	41	52
2	Grass	68	36	36	54	40	33	40	54	64
3	Grass	120	72	72	54	48	59	63	59	70
5	Clover-Grass	0	72	72	54	37	52	37	60	60
7	Clover-Grass	0	144	144	54	53	54	56	76	110

Although half the pangolagrass area was replanted with Coastal Bermuda grass in 1955, Pensacola bahiagrass had invaded all pastures and was the dominant grass species by the end of the experiment.

THE SOIL CONDITIONS

Table 3 shows the amount of extractable calcium in the soil over a 5-year period.

After the first lime application before establishment, one ton of high calcium lime per acre was applied to the grass-clover pastures in July, 1954, and to the grass pastures in March, 1955. An additional ton was applied to all pastures in the summer of 1957.

Generally the minimum pH was above 5 for grass pastures and slightly less than 5.5 for grass-clover pastures. Calcium was maintained at a sufficiently high level. Laboratory studies showed satisfactory nitrification rates on all programs.

Table 4 shows the amount of extractable phosphate and potash in the soil over a 5-year period.

The extractable phosphate levels generally increased as the experiment progressed. Determination of total phosphate showed that all applied phosphate was accounted for in the surface 6-inch soil layer from Programs 1 and 2, about one-third from Programs 3 and 5, and about one-fourth from Program 7.

The extractable potash levels increased only slightly in the surface soil during the experiment. Forage yields were not increased in Program 7 over Program 5 so that *approximately 72 lbs. per acre of potash applied annually are apparently adequate for grazed grass-clover pastures.* Increasing levels of all applied nutrients in Program 1, 2, and 3 prevent separation of the nutrient effects.

TABLE 5—POUNDS PER ACRE OF AMMONIUM ACETATE (pH 4.8) EXTRACTABLE POTASH IN SOIL FROM PROGRAMS 5 AND 7 IN OCTOBER AND FEBRUARY

Sampling Dates*	Rainfall During Interval	Programs 5	Programs 7	Average
	inches		(lbs./A.)	
October, 1953		37	53	45
February, 1954	14.9	64	124	94
October, 1954		52	54	53
February, 1955	11.3	101	158	130
October, 1955		37	56	47
February, 1956	7.4	85	119	102
October, 1956		60	76	68
February, 1957	1.2	127	228	178
October Average		47	61	54
February Average		94	158	126

* Six hundred pounds of 0–12–12 was applied to both programs in October immediately following sampling. An additional 600 pounds was applied to program 7 after the February sampling.

Table 5 compares the amount of extractable potash in fall and spring samples of Programs 5 and 7.

Although potash did not accumulate from year to year, the 72 lbs. applied each fall following soil sampling was retained rather efficiently from October to February.

Precipitation during this period varied from 1.2 to 14.9 inches. This undoubtedly is one reason for the lack of response to additional, spring-applied fertilizers used in Program 7 as compared to Program 5.

ANIMAL-AND-ECONOMIC RETURNS

Table 6 shows the performance of the cows, the value of the beef, and the cost per program.

Acres Per Cow-Increase With Fertilization

Pasture carrying capacity ranged from 2.67 acres per cow for the grass pasture with least fertilizer to 1.23 for the grass-clover pastures with highest fertilization rate—or nearly an acre and a half per cow *saved* on highly fertilized grass-clover pastures.

Weaning Percentage—Sharp Contrast

On grass pastures, weaning percentage for cows was nearly 20% less than on grass-clover pastures, especially during the first two years while the cattle were young and before any had been culled. During the first two years, no nursing cows grazing grass pastures calved the following years. So, the combination of higher weaning percentage and higher stocking rate on grass-clover pasture caused much higher beef production from these pastures.

TABLE 6—PRODUCTION PERFORMANCE OF COWS, VALUE OF BEEF AND PRODUCTION COSTS BY PROGRAMS, 1953–57.

Program Number	Acres Per Cow	Average Weaning Percentage	Weaning Weight of Calves	Beef Production Per Acre	Beef Production Per Cow	Slaughter Grade of Calves	Value of Beef Per Pound	Value of Beef Per Acre	Value of Beef Per Cow	Net Cost Per Pound of Beef
			lbs.	lbs.	lbs.		Dollars			Dollars
1	2.67	63.1	417	99	263	9.3	.153	15.15	40.24	.279
2	2.00	63.8	423	135	270	9.3	.153	20.66	41.31	.292
3	1.33	66.1	408	202	270	8.8	.148	29.90	39.96	.310
5	1.33	85.0	443	282	377	9.7	.157	44.27	59.19	.129
7	1.23	81.8	421	280	344	9.3	.153	42.84	52.63	.185

Beef Production—Per Acre and Cow

Beef production *per acre* increased markedly on grass pastures as fertilization rates were increased. Production *per cow* was approximately the same for all grass pastures but considerably below grass-clover pastures, due largely to differences in weaning percentages.

Beef Value—Per Pound, Acre, Cow

Value of beef *per pound* did not differ greatly. But value of beef *per acre* from grass pastures increased with fertilization rates, due largely to increased stocking rates. Value of beef per acre from grass-clover pastures was much higher than the best grass pasture due to *higher stocking rates* and *higher weaning percentages.* Value of beef *per cow* reflected largely the difference between weaning percentages on grass and grass-clover pastures.

Cost Per Pound of Beef

Cost *per pound* of beef reflects production costs of land, cattle, labor, materials, etc. Cost per pound of beef on grass pastures was relatively the same since Program 1 had a large quantity of land and little fertilizer and Program 3 used little land but large expenditures for fertilizer. *The cost per pound of beef for grass-clover pastures was much less than for grass pastures.* Since Program 7 received twice as much fertilizer as Program 5 but produced no more, the cost was almost 50% higher for Program 7.

Program 5 was the only one of the five discussed under the cow-calf system on which beef was produced profitably.

IN SUMMARY

1 In annual forage yields, the grass-clover pastures exceeded the straight grass in each case: Grass (programs 1, 2, 3) producing 4,660, 6,460, and 8,600 lbs. forage per acre; Grass-Clover (programs 5, 7) producing 8,760 and 9,060 lbs. forage per acre. (Forage from grass-clover came about 6 weeks earlier than grass pastures each spring.)

2 In composition of forage, the grass-clover programs averaged 12% forage protein content on oven-dry basis, compared to 8% for the grass programs Although forage composition of the grass programs varied widely with season and proximity to fertilization, the crude forage protein of the grass programs *with highest fertilization* was only half that of the grass-clover program *with lowest fertilization.*

3 Satisfactory soil pH and extractable calcium were maintained in the surface soil (0-6") by these liming programs: (1) Grass—one ton per acre at establishment, one ton about 3 years later, one more ton in 1957; (2) Grass-Clover—two tons per acre at establishment, one ton about 3 years later, one more ton in 1957.

4 Total phosphate and extractable phosphorus increased with years, with the amount retained inversely related to the amount applied.

5 Total potash accumulation was small, but potash retention during the 4-month winter period was relatively efficient each year.

6 In weaning percentages, the three grass programs averaged 20% less than the two grass-clover programs—or just above 60% weaning for grass to just above 80% for grass-clover. (Average weaning weight of calves did not differ greatly between the programs.)

7 In beef production, the grass-clover programs showed very important advantage in reproduction efficiency, a slight advantage in weaning weight of calves, and less demand for supplemental feed.

8 Program 5—the grass-clover pasture—fertilized with 600 lbs. 0-12-12 per acre—was the only program to produce beef profitably under the cow-calf program, a relatively low margin operation.

THE END

OFFICIAL ADVICE ON FLATWOODS SOILS

As a result of this Florida study and supplemental work, the official recommendations for grazed grass-clover pastures on "flatwoods" soils are now these:

LIME

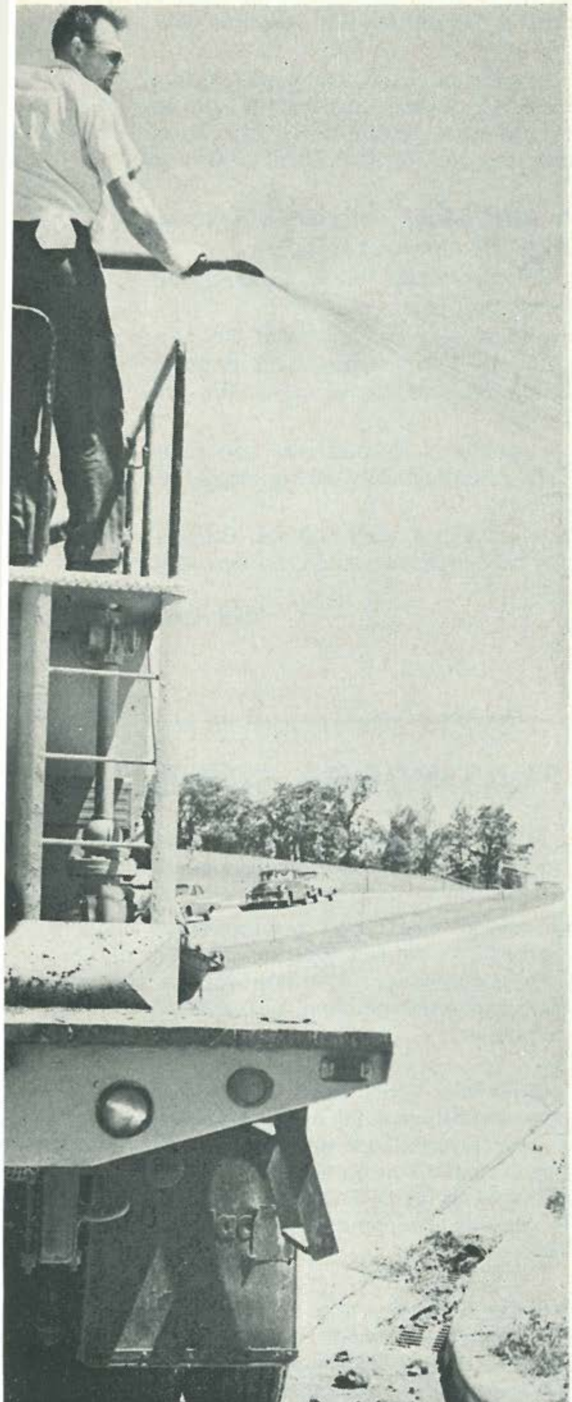
Two tons of high calcium lime should be applied to virgin areas and worked into the soil. One ton applied every three years for maintenance. Alternate applications of high calcium and dolomitic lime advisable to insure adequate magnesium.

PHOSPHATE AND POTASH

Phosphate and potash in a 1 to 1 ratio is preferable for several years after establishment. Six hundred pounds of 0-12-12 has been satisfactory. If soil pH is held above 5.5 by proper liming this ratio can be changed to 1 to 2 at which time 400 pounds of 0-10-20 per acre will more economically provide maintenance amounts of phosphate and potash.

MINOR ELEMENTS

Boron and copper are necessary after several years for optimum clover production. About 10 pounds of borax and 15 pounds of copper sulfate applied every three years will help insure clover production.



THE latest, most modern method of growing grass quickly has been applied to the lawn area of the new American Society of Agronomy Headquarters in Madison, Wisconsin.

In the demonstration before city, state, federal, and ASA officials, "Turfiber"—wood cellulose fibers developed and produced by International Paper Company—was combined with seed and fertilizer and mixed with water and then sprayed by a Finn Hydroseeder over the one-acre area around the building.

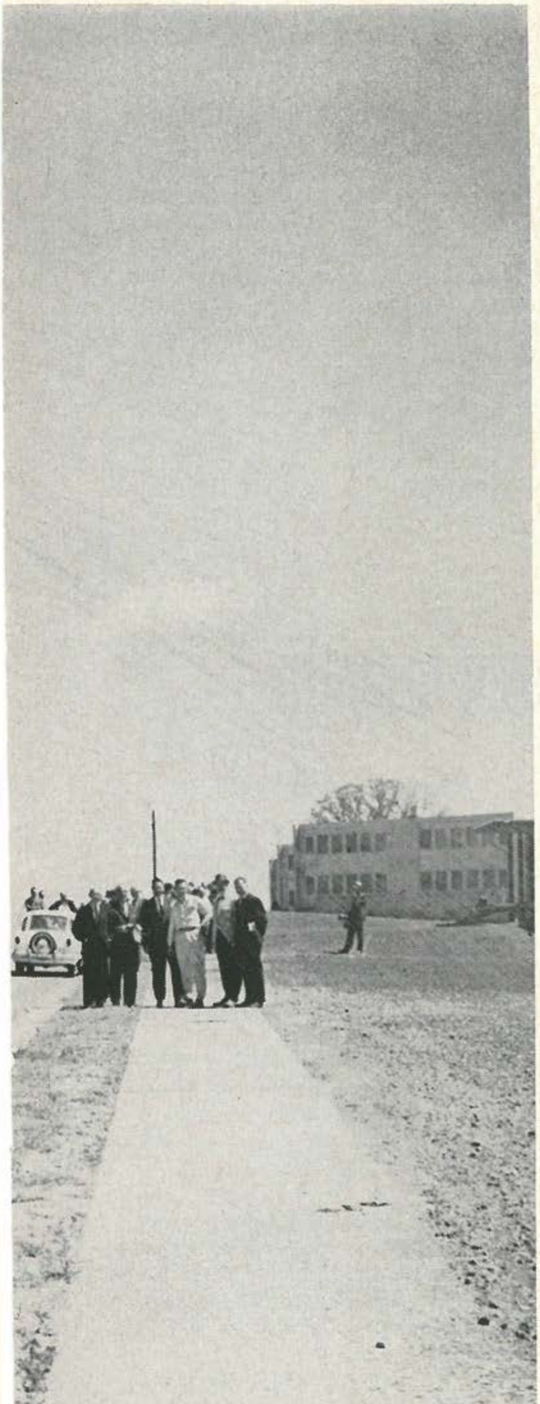
When it dries, "Turfiber" forms a thin, protective mat over the ground, locking the grass seed and fertilizer in place, even on embankments and slopes. The blotter-like characteristic of the "Turfiber" permits rain to percolate slowly to the soil, reducing loss of seed by wind and water erosion.

At the same time, the protective mat encourages germination and growth by maintaining a favorable moisture-temperature relationship between seed and soil. Once its job is done, the "Turfiber" disappears, becoming organic matter in the soil.

Developed primarily for use along

QUICK

A slurry of fertilizer, grass seed, and "turfiber" starts on its way toward the lawn area of the new American Society of Agronomy Headquarters, pushed there by hydraulic spray equipment. The demonstration was conducted for state, university, and ASA officials on the new acre lawn in Madison.



highway right-of-ways, "Turfiber" has also proved effective on golf courses, airports, housing developments, industrial sites, ski slopes, and recreational areas.

Present for the demonstration were members of the Madison (Wisc.) Park Department, the USDA Soil Conservation Service, the State Highway Commission and Conservation Department, the University Agronomy, Soils and Horticulture Departments, and the Red Clay Interagency Committee, as well as members of the ASA Building Committee and Central Office Staff.

The new $150,000 building around which the demonstration was made now houses the publication and membership activities of the 5,000 members of the American Society of Agronomy, the Crop Science Society of America, and the Soil Science Society of America.

The Finn Equipment Company of Cincinnati and International Paper Company of Mobile, Ala. are Sustaining Members of ASA, along with almost 100 other business firms throughout the country.

THE END

AND EASY

"Turfiber" is a wood cellulose fiber produced from virgin pulp. It is mixed with fertilizer, grass seed and water to form a blend that can be sprayed on the soil easily, economically to promote quick grass establishment while resisting seed loss from wind and erosion.

CHANGES IN LAND USE AND FERTILIZER DEMAND

By K. L. Robinson

Cornell University

THE AREA planted to grains and mixed hay has declined dramatically in the Northeast during the past decade, while plantings of alfalfa hay have nearly tripled.

These trends are likely to continue and may even be accelerated during the next few years. The Administration is now giving high priority to supply-management programs designed to reduce the acreage planted to grains. If these programs are continued and strengthened as now proposed, grain production will decline and feed grain prices may rise.

Such trends will give farmers in the Northeast even more incentive than at present to improve hay and pasture production. For these reasons, the demand for fertilizer to be used on grains is not likely to increase and may even decline during the next few years while the demand for fertilizer to be used on forage crops, particularly alfalfa hay, will undoubtedly continue to expand.

Each Census Since 1900

Land retirement in the Northeast is by no means a new development, though decline has been particularly rapid during the last few years. Each census since 1900 has shown a decrease in the area of land in farms in the New England and North Atlantic states. Unfavorable prices between World War I and World War II and more profitable alternatives during the 1940s contributed to the decline.

Since 1950, land use changes have been even greater than in the two preceding decades. The area of land in farms and the total harvested acreage declined about one-fifth between 1950 and 1960.

Most acreage decline has been due to economic forces, though government programs unquestionably have reinforced the downward trend, particularly since the Korean War. At first, allotments on wheat, then the Soil Bank program, and more recently the emergency feed grain and wheat programs have taken cropland out of production.

Under the wheat allotment and wheat diversion programs, Northeast wheat acreage has been cut more than half during the past decade, declining over 700,000 acres. Much of this land has been shifted to other uses, but frequently to a less intensive use than formerly.

Under the Soil Bank program, other large areas of land have been taken out of production. Total acreage in the Conservation Reserve in the Northeast was recently as high as 1,000,000 acres. During 1961, corn acreage, previously showing rather slight declines, was reduced by about 350,000 acres—with even larger cuts possible in 1962 if farmers take out as much acreage as has been signed up under the program.

Thus, roughly 2,000,000 acres out of a total cropland area of 15 million acres in the Northeast have been diverted to other crops, retired, or kept idle under government programs during recent years.

Toward More Alfalfa

While acreages planted to grains and vegetables have declined in the Northeast, the area planted to alfalfa and alfalfa-mix hay has tripled, rising from 800,000 acres in the late 1940's to nearly 2.5 million acres in the late 1950's. This increase in alfalfa hay has been more than offset by reduced areas of timothy, clover, and mixed hay, causing a decline in *total* hay acreage.

Clearly, the trend is toward more intensive use of the better land which can be used to grow alfalfa.

... IN NORTHEAST

". . . where the demand for fertilizer on forage crops, particularly alfalfa hay, will undoubtedly continue to expand . . . as the trend clearly moves toward more intensive use of the better land for alfalfa."

Until the mid-50's, total Northeast fertilizer usage continued to increase despite acreage reductions—but since then, growth has been relatively small. Between 1955 and 1959, total U. S. fertilizer usage increased about 20 per cent, while Northeast usage was increasing about five per cent—or one-fourth the Nation's growth.

With government programs reinforcing the persistent downward trend in acreages of harvested crops in the Northeast, there is likely to be relatively little scope for increased fertilizer usage on grains in this area during the years immediately ahead. Though smaller acreage can be partially offset by increased fertilizer per acre, even the opportunity for this is probably less than a decade ago. Farmers have learned to use more nearly optimum quantities of fertilizer in recent years, causing much less gap between recommended rates and actual practices.

Why Home-Grown Feeds?

Both the Secretary of Agriculture and Congress are concerned about the quantity of grain in storage and the costs associated with maintaining and disposing of these stocks. For this reason, there is little prospect of removing acreage restrictions on wheat.

The Secretary of Agriculture also would prefer to introduce compulsory acreage allotments on feed grains as well as wheat, but Congress has been reluctant to approve such a program. As an alternative, Congress is considering an extension of the present emergency rental programs for wheat and feed grain under which farmers are paid for reducing the acreage planted to wheat and feed grains and keeping an equivalent amount of land idle.

But whether the program ultimately adopted involves compulsory acreage reductions, as with wheat, or remains voluntary, as with feed grains, the result is likely to be a smaller acreage of grains than was customarily planted in the recent past.

Thus far, the Administration has prevented feed grain prices from rising significantly, although the support price available to those participating in the emergency feed grain program has been increased. Thus, there has been little incentive for farmers to cut back on purchased feed during recent months and to substitute more home-grown roughages.

If a compulsory acreage allotment program were adopted on feed grains, however, an increase in feed prices would become more likely. In this event, Northeast dairymen would be forced to pay even greater attention to home-grown feeds, particularly forages. This would reinforce the present upward trend in the use of fertilizer on forage crops.

THE END

AN ACRE OF CORN

. . . In Hardly Two Hours

A LOT has been spoken and written about the technological revolution in agriculture, about the increases in production per acre, per worker and per animal unit.

But we get a better picture of what all this means to the farmer himself if we measure the change by a standard frequently used in industry—*production per hour of work*.

Take corn production, for example. In 1860 an American farmer, using the best equipment available at that time, could grow an acre of corn with about 30 hours of hard work.

In 1920 a farmer using a gang plow, a four-section harrow, a two-row planter and a two-row picker, the best equipment then available, could grow an acre of corn with about eight hours of work.

Today, using the latest power equipment and chemicals for weed control, a farmer can grow an acre of corn with about two hours of work.

Similar statistics could be given for almost every other crop.

As for exactly what this progress means to the consumer, we can get a pretty good idea of that by taking a look at what the average factory worker can buy with one hour's work as compared to what he could buy only a few years ago.

Today, according to recent USDA figures, the average factory worker can buy 2.2 pounds of steak with one hour of work as compared to only 1.2 pounds in 1929.

He can buy 3.5 pounds of bacon with one hour's work, as compared to 1.3 pounds in 1929; 17.6 pints of milk, as compared to 7.8 pints in 1929; or 3.1 dozen oranges, as compared to 1.2 in 1929.

Similar comparisons could be made in the case of most other foods.

LSU News Editorial

HOW MUCH IS PROFIT?

HOW MUCH of a farmer's cotton is profit?

The answer to this question depends on price, yield, and production costs. Most costs other than fertilizer, harvesting, and ginning are approximately the same regardless of yield. Consequently, low yields mean high production costs per pound of lint and little or no profit.

Farmers in Mississippi would increase total profits from cotton by 32 million dollars by reducing production costs four cents per pound of lint. Fertilizer is a major item in lowering unit cost of production.

Soil tests show a range of almost no need for fertilizer in areas of the Delta to an absolute necessity for high applications in our hill counties. It is very profitable to use recommended amounts of fertilizer. A loss can result when less than recommended amounts are used. However, the above-average farmer may profitably use higher applications than are recommended.

In Table I (Cotton Costs Per Acre), experiment station yield data were taken and production costs, net operating return for fertilizer per 100 acres were calculated. The fertilizer costs were not listed because they varied according to the fertilizer treatment.

However, the costs were included in the final calculations in Table 2. A price of 32¢ per pound of lint and a price of $40 per ton of seed were used.

TABLE 2—FERTILIZER INCREASES COTTON PROFITS

Fertilizer Treatment	Yield Seed Cotton	Cost Per Acre	Cost Per Pound Lint	Net Operating Return Per Acre	Profit From Fertilizer Per Acre
Location I					
0–0–0	1746	$164.33	$0.25	$ 40.99	
60–30–30	2421	$204.41	$0.22	$ 80.56	$39.57
Location II					
0–0–0	1374	$151.01	$0.30	$ 11.83	
72–48–48	2610	$217.01	$0.21	$ 90.97	$79.14
Location III					
0–0–0	1558	$157.67	$0.27	$ 26.41	
60–30–30	2746	$216.63	$0.20	$107.28	$80.87

The costs are based on actual expenditures of good farmers and data collected by experiment stations. In some cases the costs may seem high, but the farmer who can cut them and maintain high production will receive a greater net return than shown in Table 2, which will be to his advantage.

When the costs of fertilizer, picking, and ginning are added to the costs listed in Table I, the saying by farmers that "it takes the first bale of cotton to pay the costs" is usually correct. However, in some cases, the costs are greater than the returns for the first bale of cotton.

Table 2 gives some results of fertilizer applications. Each farmer will have to take a soil test to determine the rate necessary for maximum profit.

In conclusion, the future of the cotton industry depends on the proper use of fertilizer to cut unit costs of production and to increase net returns. The farmer who does not use the proper balance of fertilizer in the amount needed will be the farmer who goes out of cotton production.

The farmer who uses good production practices including the needed fertilizer can grow cotton in competition with the synthetics of today.

Fertilizer pays its costs, insures other costs, and returns large profits to the farmer for its use. Use more, not less, and stay in the cotton business.

Mississippi Farmer

TABLE I—COTTON COSTS PER ACRE

Cutting Stalks	$ 0.75
Land Preparation	5.50
Seed	2.00
Fertilizer	—
Fertilizer Application	—
Planting	2.00
Pre-Emerge	4.00
Post-Emerge (2)	3.00
Cultivations	7.50
Flaming (3)	6.00
Hoeing	3.00
Insect Control	25.20
Defoliation	6.00
Miscellaneous	5.00
Interest on Land and Equipment	30.00
Picking Per Bale $40.00	—
Ginning Per Bale $15.50	—
Total Fixed Cost per Acre	$99.95

Soil Fertility

Newspaper

Mats

Page 32

VPI Off-Beats Buzz Busy Brains

WANT to lose friends and alienate people? One efficient way to do it is to send a questionnaire, the purpose of which is not immediately apparent, to a group of busy scientists.

What is a scientist? Who is he? Does he have a sense of humor? Does he object to wasting time occasionally? Is he really an ivory-domed individual residing in a tower of the same construction? Has he forgotten, as some people claim, the longing of the layman to understand the world in which the scholar reigns?

In an attempt to arrive at the truth of the situation, at least as it is in the VPI School of Agriculture, a questionnaire was prepared and sent to 37 scientists, selected by appropriately

WHO ME?

scientific random means. (Actually, by throwing dice and taking it from there according to random sampling techniques. "Little Joe" showed up—in case you care.)

Since the samplers (a group of slightly off-beat people in the information department) had no particular hypotheses to begin with, they are not bothered with the fact that their questionnaire neither proved nor disproved anything. The "truths" that emerged cannot be proved statistically, although the psychologists might have a field day.

Seven of the scientists replied within the specified time limit of three weeks—not a notable response—but then, there was no real incentive in the deal. One of them used an angry pen to note that he "has no time for such nonsense." The others tried, with varying degrees of success, to answer the questionnaire—which they were asked to approach in a not-too-serious frame of mind.

The questionnaire? The first question was "If you had no restrictions on time, money, or field of investigation, what project would you initiate and what question would you investigate?"

One researcher replied matter-of-factly that he would like to do more work on sheep problems, but was hampered by lack of time and money. This respondent (text-book term for people who respond to questionnaires, interviews, etc.) also was matter-of-fact when it came to rewriting certain clichés. "A bird in the hand is worth two in the bush," he translated as meaning "Something accomplished is worth more than something envisioned." The phrase "He who dances must pay the fiddler" was interpreted as meaning "If you take short cuts you will pay the penalty."

Another respondent said he would like to investigate biochemical events which would help define the process of "getting old." Studies on longevity require environmental control and lots of space, even with small biological systems, he noted. The samplers unscientifically interpret this as meaning that this scientist, at least, still dreams of the fountain of youth. This respondent mused over the phrase "Birds of a feather flock together," and concluded that "Togetherness is one of the characteristics which least describes a true investigator. Hence I don't know what to do with this one." The phrase "He who dances must pay the fiddler," prompted him to note "I am responsible to society for what my discoveries might do . . . to the life of biological and physical systems." He delved into whimsy briefly to rewrite, as requested, in scientific and/or scholarly language the story of Goldilocks and the Three Bears. "Keep your cotton-pickin' fingers out of my porridge"—proving, he said, that scientists can be less wordy than story writers.

One scientist soared off onto some suspect cloud to describe his "dream" project. After some pondering, it was possible to follow him, but conclusions of the study were that the "dream" project had better stay way out where nobody can see it. He did a laudable job of putting the phrase "Birds of a feather flock together" through the scientific mangle. "Individuals of certain avian species exhibit intraspecific cooperative behavioral tendencies as evidenced by the phenomenon of nocturnal gregariousness."

Another scientist wants to investigate the isotopes contained in the bodies of meat animals, by which the composition of muscle, bone, fat, fluids, etc., could be accurately predicted while the animals are still alive. The composition of live animals must be determined somehow, he noted. Of course, animals can be slaughtered and their body composition determined—but at that point they've passed their usefulness as breeding stock. Lack of money deters this project. The machine needed to make preliminary investigations would cost perhaps $300,000.

His re-phrasing in scientific parlance of the clichés was a masterly job of objectivity. (Objectivity being one of the battle cries of the scientist). Hence:

"A bird in the hand is worth two in the bush," translated—"One warm-blooded, egg-laying vertebrate in the distal segment of mankind's limb attached to the lower extremity of the forearm would not be equably exchanged because it possesses more value than twice as many such vertebrates in a low, thickly sprawling shrub."

"Birds of a feather flock together," translated—"Avian species covered with similar skin appendages are gregarious."

This anonymous wise man—and the term is used advisedly—noted that "Somehow, it is necessary for one scientist to communicate with another in vague, pseudo-learned or verbose means to avoid additional detailed explanations requiring many more words of explanation of materials and methods. If he doesn't do it in this way—scientist-to-scientist jargon — he is caused to feel as if he had stepped out the front door on a zero morning sans pants."

Goldilocks and the Three Bears? "An immature female Homo Sapiens christened Goldilocks, whose hair color fell into the spectrum between green and orange and extended from wave length .590 to .533 microns, did not yield obedience to the entreaty of her parent who had enjoined her to abstain from penetrating the sylvan area lest she become enveloped in a maze and fail to reissue.

"The parental hypothesis propounded was significant at the .01 percent level of probability. Goldilocks did enter a state of magnum abashment. Reconciliation returned only upon the receipt of asylum in the abode of an unknown quantity of carnivora. Circumstantial evidence placed the family size at three—a single sib and his sire and dam."

VPI Ext. News

THROUGH DEMONSTRATIONS

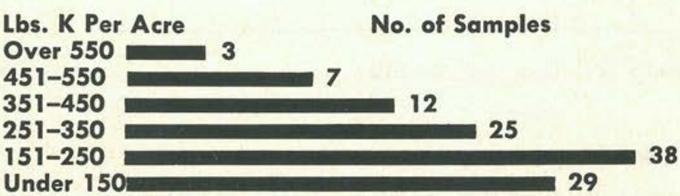
Showing spectacular yield increases—as high as 5,000 more lbs. of hay per acre, 20% more legume over the check.

OREGON's *Testing Tells* program is selling the values of scientific soil tests in terms the farmer (and any other businessman) can understand—more money-making yields and savings per unit (or acre) of work.

It is teaching participating farmers to understand fertility levels and crop requirements—in other words, to know what fertilizer treatments are needed or not needed by specific soils and crops at specific times.

. . . AND JARRING FACTS

When Curry-Del Norte Lilly Growers' Association mass-sampled 114 fields, the potassium picture gave both growers and specialists jarring food for thought—and action!



It showed 29 fields near the bottom of the barrel with less than 150 lbs. available K, 67 fields below the 250 lbs. critical level. Applications should be increased on most of those in the 250-450 lb. range. Only 10 fields above 450 lbs. can get by with maintenance applications.

. . . MASS SC

Stimulating a sharp increas tested, from 4,000 to 7,000

Knowing what is needed *ma* is not needed *saves* the money.

Conceived within the Soil I Pacific Northwest Plant Food A Tells program is a good exampl official agriculture, industry, a cooperation that has made c Programs such a success.

As a cooperative Extension- Tells approach has progressed r Demonstrations to *prove* the campaigns to *find* the need, (3 need.

But before explaining these t ble crop and soil management,

HOW

›IL SAMPLING

e in the number of samples
in one year.

. . . SOIL TEST CLINICS

Inviting the farmer to discuss recommendations, wide variation in fertility levels, and need for frequent testing.

kes the money. Knowing what

nprovement Committee of the ssociation in 1959, this Testing e of 3-way teamwork—between nd the farmer—much like the ther Intensified Soil Fertility

Industry program, the Testing apidly on three basic steps: (1) need, (2) mass soil sampling) soil test clinics to *explain* the

hree steps toward more profita- we should mention the two Ex-

tension-Industry activities that led to our Testing Tells program—"Century Farm Soil Testing" and "Southern Oregon Soil Sampling."

The Century Farm project tested 200 samples from 100 farms, each of which had been operated by the same family for a century or more. And the Southern Sampling project supported (financially and otherwise) Vo-Ag students from six different schools in taking several hundred soil samples in Josephine and Jackson counties.

The two activities had a common goal: to determine the fertility levels on fields and farms representative of the 98% who do not test their soils. The results taught us some valuable lessons:

1 That nutrient levels for areas, cropping systems, farms, or fields do not follow any set pattern.

TESTING TELLS

By Art King
Oregon State University

2 That both boron and potash are near or below restrictive levels in many more fields than once thought.

3 That individual nutrient levels can vary greatly between neighboring farms and even between adjoining fields on the same farm.

4 That a "standard" fertilizer program for any crop in any area is not a realistic approach.

5 That the real potential benefits from fertilizer usage lie not with the 2% who are regular "soil test customers," but with the 98% yet to base their soil management on known fertility levels.

With this evidence, the Extension-Industry Team launched the Testing Tells program in late 1959, based on the maxim that people learn best by doing.

1 DEMONSTRATIONS

. . . to *prove* the need

The first step was to design demonstrations that would prove one point—fertilizer applied according to soil test recommendations pays off in higher yields per acre.

We used pasture and forage crops because they occupy more acreage than any other crop, much of it on soils with low fertility levels.

Our plan was simple: 1/100 acre plots, with one plot fully treated as soil test indicated, an adjacent plot untreated, and often one or two additional plots to show what happens when one or more needed nutrients are omitted. In spring of 1960, we established 60 demonstrations in six counties, 75 by 1961, and even more this year.

Our policy was firm: to test demonstration sites before establishment and if the test did not indicate a phosphate, potash, or lime shortage, to discard the site. This led to a new, more needed clientele of cooperators, as we shall show.

The first step in each county was for the County Agent to form an informal sponsoring committee of fertilizer dealers, farmers, soil conservation district leaders, SCS specialists, ASC, and others. In each county, an industry agronomist was assisted by the local dealers in making the Extension program a complete one. These Extension-industry teams handled all phases of selecting the demonstration site, sampling and testing its soil, fertilizing it, and harvesting the results.

It was only natural for such groups to know and suggest demonstration areas, communities, even specific farms that included the most progressive farmers, the innovators who had followed improved practices through the years.

It was inevitable, perhaps, that most soil tests on such farms showed fertility levels too high for effective demonstrations. The net effect was good: the introduction of a new clientele of cooperators?

Cooperating farmers were not insulted by the standard of selection—low soil fertility. They pitched in all along the line, fencing plot areas where necessary, harvesting or grazing in a way that response differences could be seen and measured.

Some cashed in early on their findings, fertilizing an entire field like the full treatment plot. This often made the fields look as good and produce as well or better than the demonstration area. But the small *check plot* pegged the point of departure.

The Racette Brothers of Marion County are a good example of this spreading influence. Noting marked response to potash in their demonstration plots, they immediately topdressed and revived to full production 200 acres of irrigated ladino clover.

Posted with *Testing Tells* signs, the demonstrations soon attracted daily visitors, sometimes on regularly scheduled tours and field meetings, other times as a carload or two of folk who had heard. Pictures and yield comparison reports were available for the local press and radio.

The yield increases were spectacular. The full treatment plot often yielded more than double the check plot, while the omission of one necessary nutrient invariably spoiled the most profitable top yield. Three examples tell more than words:

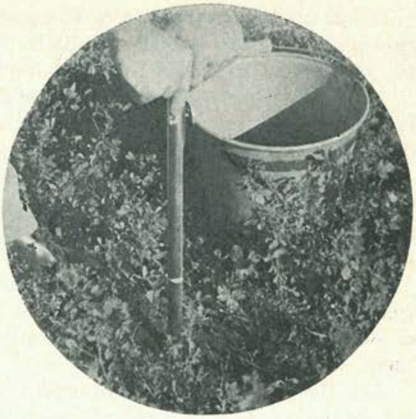
	POUNDS HAY	
Cap Millar, Clackamas County		
white clover and rye grass		
Check	**4,375**	**3,675-lb. *increase***
NK	**6,025**	
NP	**6,575**	
NPK	**8,050**	

Bert Esterbrook, Josephine County		
alfalfa, clover and alta fescue		
Check	**3,255**	**4,182-lb. *increase***
PKS	**6,966**	
PKS+Lime	**7,437**	

Eugene Platt, Lane County		
irrigated grass and clover (one cutting only)		
Check	**3,620—20% legume**	**5,000-lb. *increase***
PKB	**8,620—40% legume**	

With harvest came the close of the demonstration step. Without exception (that we know of), participating farmers, industry, and Extension personnel who followed the plots to and through harvest were sold on the value of basing fertilizer treatment on soil tests—and were more than ready to take the second step, mass sampling.

2 MASS SAMPLING



. . . to *find* the need

As a fall and early winter activity, the mass soil sampling days were organized to fit the needs and opportunities in specific counties. They were held this time of year because both the University soil testing service and the fertilizer industry are in a "slack" period. Two different approaches will illustrate the way the program fits specific needs:

The County-Wide Approach—For two years now, Polk County Agent John Hansen has conducted a soil sampling campaign climaxed by a soil sampling day in early November.

The publicity has run the gamut: letters, posters, radio spots, individual contacts by dealers and others, all climaxed by a special "Soil Management" edition of the Polk County *Itemizer-Observer*. Through such special issues, Extension and Experiment Station specialists have talked to the people about profitable practices, while local dealers have sponsored educational ads. The basic purpose has been to make more farmers soil-test conscious, to encourage them to notify their county agent or a cooperating dealer when they want their soil tested.

Early on the soil *Sampling Day*, volunteer samplers—farmers, industry cooperators, Extension and Station specialists—gather to coordinate their schedule. They divide themselves into 2-man crews—a farmer paired off with a so-called pro from the University or industry—and go out to sample 6 to 10 farms each. So far, these crews have completed their assignments, although not on the same day.

The Commodity Approach—Operation "snow storm" illustrates this approach. It wasn't planned that way, but it happened and it added a dramatic dimension to the volunteers' determination.

The object here was to sample fields producing crops under contract for the Stayton Canning Company. Although cannery fieldmen helped organize the project, voluntary two-man sampling teams did the sampling, similar to the successful Polk County approach.

Despite a violent late afternoon snow storm, nearly 200 samples were secured during the day. The workers did not hesitate to name the project "Operation Snow Storm" and to recommend the commodity approach to other processing plants and local commodity organizations.

Such teamwork has increased the number of samples tested from a static 4,000 per year to nearly 7,000 samples annually. They are processed by the Oregon State University's self-supporting Soil Test Laboratory at a minimum charge of $2.50 per sample.

3 SOIL CLINICS

. . . to *explain* the need

To make a mass sampling program effective, you must devise some way to explain the soil test results to the farmer. We used Soil Test Clinics. They are forums, in a sense, through which the soil test convert can ask questions about his test results, about the wide variation in levels, and can learn the need for frequent, thorough testing.

Each participating farmer was invited to attend this Extension-sponsored meeting, to review and discuss the different soil test values from each report, to develop sound recommendations with experienced people. In direct classroom manner, the different soil test values—and there were many differences—were listed one-by-one on a blackboard.

Many of the repeat students in these clinics have learned to make and revise their own fertilizer recommendations, based on yearly fluctuation of test levels. And, like the experience in all teaching fields, the technician-teachers usually learned more than the farmer-pupils at these clinics.

This is not a complete picture of Oregon's Testing Tells program, of course—nor a full look at all the participants, nor a projection of things to come. But we shouldn't conclude without mentioning three outgrowths of the Testing Tells idea:

1. Over 30 recommendation sheets (one per crop) have been issued by Oregon State University, suggesting specific fertilizer rates for each nutrient at different test levels.

2. Extended technical short courses are now emphasizing the important "whys" of soil science to more and more farmers.

3. Fall fertilization has become an important campaign for farmers, official specialists, and industry people interested in easy field applications when weather is perfect.

Fall Push Proves Practical

The last outgrowth, in fact, is a point around which the Testing Tells demonstrations have been re-designed.

Agronomically, forage and other perennial crops in Oregon respond equally well to fertilizer applied either in fall or early spring. But for unknown reasons, attempted spring application is a traditional practice despite uncooperative spring weather that seldom permits total field and farm coverage early enough to be fully effective.

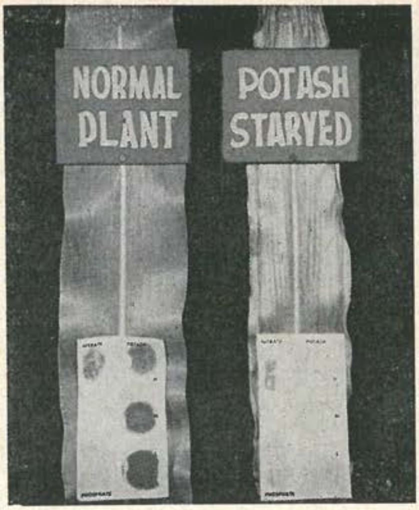
In contrast, fall weather here is perfect for field applications. For that reason, the Testing Tells demonstrations have been re-designed to show the value of fall treatment. To support the movement, the University Soil Test Lab grants discounts to encourage early testing, while the Extension-Industry team develops educational publicity via circulars, newspapers, magazines, radio-TV, and "just plain talking up a good thing."

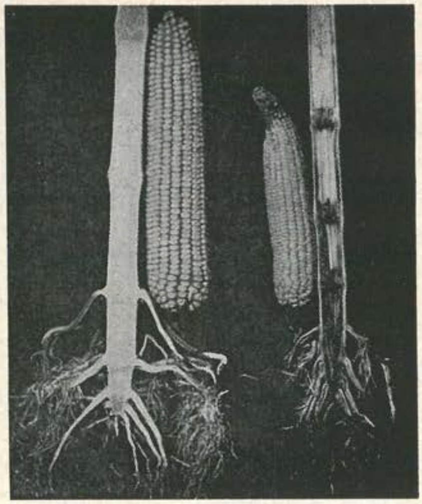
It seems to be paying. In less than a year, signs point to increased fall fertilization and sharp increases in early fall soil testing.

But whenever it is done, soil testing in Oregon can pay real dividends to the farmer wise enough to use this scientific tool.

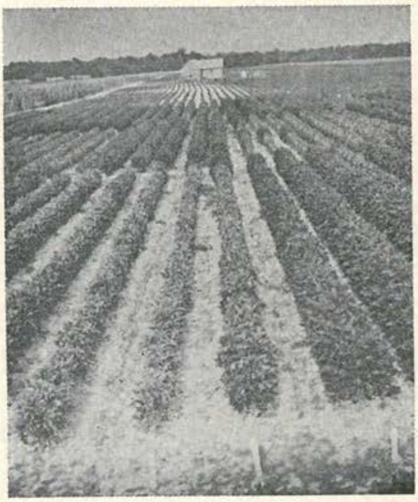
THE END

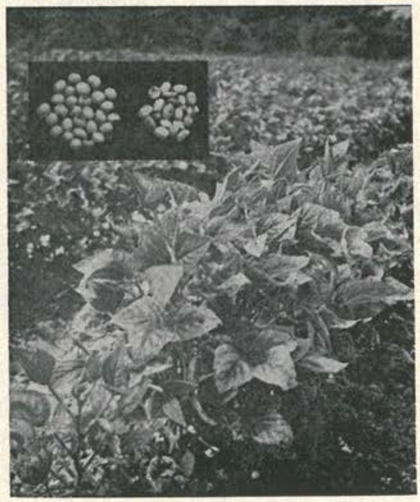
DEFICIENCY FACT SHEET . . .





. . . ON CORN





. . . ON SOYBEANS

Full color fact sheet . . . 9 x 12" . . . with large pictures on each side *showing* potash hunger signs on corn on one side and soybeans on the other . . . with brief text on prevention. Easy for classroom use . . . for office walls . . . for meeting distributions. Order below.

CORN & SOYBEAN FACT SHEET—1-62 **2¢ per copy** **$2 per 100**

Name____________________

Organization____________________

(Agricultural Connection)

Address____________________

City________ **Zone**______ **State**________

Dept. B.C. American Potash Institute 1102 16th Street, N.W. Washington 6, D.C.

Up to 25 copies free official advisors and fertilizer firms.

Please ship______ copies with following fold:
Flat (9 x 12")______
One fold (6 x 9")______
Two fold (4 x 9")______
For quantities above free policy: $______ attached.

Stay-at-home wife: "Darling, how thoughtful. That hotel where you stayed during the convention sent me a blue nightgown."

"Your honor," the man told the divorce court judge, "I was shocked when I came home and found my wife in the arms of another man. That was bad enough. But what really hurt was when she said, 'Well, look who's here, old blabbermouth. Now the whole neighborhood will know!' "

Wife to husband: "Of course I spend more than you make dear. I have confidence in you."

The drunk boarded the crowded city bus and stood facing all the other passengers. Realizing that something was wrong, he finally said: "I suppose you are all wondering why I called this meeting."

"Were any of your boyish ambitions ever realized?"

"Yes, when my mother used to cut my hair I often wished I might be bald-headed."

The Texan was wound up. "And another thing," he said, "in Texas we've got the fastest-running dogs in the world."

"Don't doubt it," replied the listener, "the trees are so far apart."

The surest way to get a job done is to give it to a busy man. He'll have his secretary do it.

Driver: "You can't arrest me! I come from one of the best families in Virginia."

Cop: "That's o.k., buddy. We ain't arresting you for breeding purposes."

The middle-aged farmer came home with a new 18-year-old wife. He asked his eldest hired hand what he thought of her. The old man shook his head slowly. "Well, she's a mighty purty young lady, all right."

"Then what seems to be the trouble?"

"Oh, there ain't no trouble, boss. It's just that I hate to see a man start out on a day's work so late in the afternoon."

Wife: "Wasn't it disgusting the way those men stared at that girl getting on the train?"

Husband: "What train?"

A young daughter watched her minister father preparing his Sunday sermon, with much interest. "Daddy, does God tell you what to write?" she asked. "Of course, dear. Why do you ask?" answered her father. "Well then," she replied, "why do you scratch out so much of it?"

FARMERS who produce their crops on organic soils know the value of carefully planning their fertilizer programs.

In recent recommendations to Michigan muck farmers, there is a trend to broadcast more of the potash and use only high phosphate fertilizers in a band near the seed or plant. Farmers collecting soil samples in the fall should allow about 25% leaching loss for potassium. For example, if a soil test shows 500 pounds of potash per acre, use rates recommended for 300 pounds.

Some growers may want to use 8-32-0, 11-48-0, 13-39-0 or other similar grades in place of 6-24-12. If you use these grades, then increase the plow-down application of potash. Such grades as 11-48-0, etc., are especially recommended for band application if the soil tests medium or high in potassium.

You may wish to substitute 5-10-30 for 0-10-30 if you believe a little nitrogen is helpful. If you use 5-20-10 in place of 6-24-12, increase the rate 20 percent.

FERTILIZER RECOMMENDATIONS ON ORGANIC SOILS

For Low Fertility Soil

Broccoli Cabbage and Cauliflower

Drill in four inches deep 600 to 800 pounds of 0-10-30 or 3-9-27 per acre for cabbage and 1,000 pounds per acre for cauliflower and broccoli. These crops need a sidedressing of 30 to 100 pounds of nitrogen fertilizer depending upon drainage and weather conditions. Cauliflower needs ½% boron and 0.04% molybdenum in the fertilizer if the soil pH is 5.8 or above. If below pH 5.8, use ¼% boron and 0.08% molybdenum.

Carrots and Parsnips

Plow down 3-9-27 or 5-10-30 containing ¼% boron and ½% copper at the rate of 800 pounds per acre.

If soils are extremely low in fertility, use combination fertilizer and seeder drill. Plow down 600 pounds of 5-10-30 containing ¼% boron and ½% copper. Use in band *one inch to the side* and *two inches below the seed*, 6-24-12 at the rate of 200 to 300 pounds per acre. Do not use large rates in band near seed as this can cause misshapen roots. Plow down placement is preferred especially for fresh market carrots.

Celery

For the early crop, broadcast or drill in 5-10-20 at the rate of 1,500 to 2,000 pounds per acre. Use 5-10-30 or 3-9-27 at similar rates for the late crop. Use ¼% boron in the fertilizer for rates of 1,000 to 2,000 pounds per acre. If less than 1,000 pounds, use ½% boron. Use 1% manganese in the fertilizer if the soil is above pH 6.5.

Sidedress one to three times during the growing season at the rate of 50 pounds of actual nitrogen per acre per application. The number of applications will depend upon the season, drainage and type of muck. Color of plant and plant tissue tests will help determine your nitrogen needs. Avoid excessive rates of ammonium nitrogen in the spring, especially if the land is fumigated. Under these conditions use only sodium nitrate and calcium nitrate. After June 15, ammonium nitrate is a good material. Ammonia type fertilizers can be used after July 1.

Certain celery varieties need magnesium applied as a spray. Use Epsom salts (magnesium sulfate) at the rate of ten pounds per acre per week. If this rate does not correct the magnesium yellowing, then step up rate to 20 pounds. Calcium is needed to prevent blackheart disorder and is applied as calcium chloride at the rate of five to ten pounds per acre weekly.

By R. E. Lucas
Extension Specialist in Soil Science
Michigan State University

Corn (Field or Sweet)

Plant population goals should be 18,000 to 20,000 plants per acre. Plow down 200 pounds per acre of 60% potash containing ½% boron. Use in bands two inches to the side and below the seed, 6-24-12 containing ½% copper and ½% zinc at rate of 200 to 250 pounds per acre. If the soil pH is above 6.5, use 2% manganese and 1% zinc in the row fertilizer. Sidedress with 50 to 80 pounds of actual nitrogen if plants are not dark green in color in late June.

Head Lettuce and Spinach

Disc in or plow down 200 pounds of potash per acre. The sulphate form has proved to be somewhat superior to the chloride (muriate) form on head lettuce trials. Use in bands two to three inches below the seed 400 pounds of 6-24-12 containing ¼% boron and ½% copper per acre. In addition, if the pH is 5.8 to 6.4 use 1% manganese in the row fertilizer. If the pH is above 6.4 then use 2% manganese. Molybdenum may be needed on acid mucks.

Onions

Plow down 300 pounds of 60% potash per acre. Apply in bands two to three inches below the seed 500 pounds of 6-24-12 containing ½% copper (2% copper for new land). Use 1% manganese in the band fertilizer if the pH is 5.8 to 6.4 and 2% manganese if the pH is above 6.4. These band rates are suggested for 18-inch row spacings. If rows are wider, reduce rates proportionally and increase broadcast application. Topdress onions in June with 200 pounds of pelleted ammonium nitrate or 150 pounds of urea per acre.

If all the fertilizer is applied broadcast, then disc in 1,200 pounds of a 5-20-20 fertilizer containing the needed minor elements.

Peppermint and Spearmint

In the spring, apply broadcast or drill in 400 to 500 pounds per acre of a 5-20-20 fertilizer. Topdress in June with 60 pounds of actual nitrogen per acre when the foliage is dry. Use only pelleted materials. Immediately follow the nitrogen application with a drag or finger tooth harrow so as to knock off any nitrogen pellets adhering to plants. Spearmint needs 2% manganese in the fertilizer if pH is above 6.5.

An alternate program so as to get winter hardy roots is to topdress mint stubble after harvesting with 200 pounds of 0-10-30 fertilizer per acre. In the following spring broadcast 200 pounds of 6-24-12 fertilizer.

Potatoes

Plow down either 500 pounds of 50% potassium sulfate or 400 pounds of 60% potassium chloride. (The sulfate form will give tubers a higher specific gravity test. Chippers, however, report that color is better using the chloride form.) In addition, use in bands near the seed piece, 400 pounds of 6-24-12 or 500 pounds of 5-20-5 per acre. Two percent manganese is needed in the row fertilizer if the soil pH is above 6.0. Manganese can also be applied on the foliage at the rate of 5 pounds of manganese sulfate per acre per spray, applied about four times during the growing season.

If no fertilizer is used in row, then broadcast and disc in or plow down 1,000 pounds of 0-10-30 or 3-9-27.

Avoid excess nitrogen fertilizer so as to help prevent excess tops and mature crop in fall. Extra nitrogen, however, may be needed if soil is extremely acid, season is cool and wet or field is poorly drained. Nitrogen levels can be checked using a tissue test on base of leaf petiole. Chemicals used for the test can be purchased from your county agricultural agent.

SOIL TEST STANDARDS FOR ORGANIC SOILS

Soil Acidity

Below pH 4.0—extremely acid........Need 10 tons limestone per acre
pH 4.0–4.5—very acid...............Need 5 to 8 tons limestone per acre
pH 4.6–5.1—acid...................Need 1 to 4 tons limestone per acre
pH 5.2–6.3—okay for most crops......May need manganese in fertilizer if pH is above 5.9
pH 6.4–6.9—nearly neutral...........Need manganese in the fertilizer
pH 7.0—neutral.....................Need manganese in the fertilizer
pH 7.1 or above—alkaline............Need manganese in the fertilizer

If available calcium exceeds 5,000 pounds per acre there is doubtful response to liming regardless of pH or percent base saturation.

	Phosphorus Soil Test—Lbs. per acre		
Fertility Level	Pastures, Hay, Barley, Oats, Rye, Soybeans	Corn, Wheat, Field Beans, Alfalfa, Mint	Sugar Beets, Potatoes, Most Vegetables
Very low	0–10	0–15	0–20
Low	11–20	16–30	21–40
Medium	21–35	31–50	41–70
High	36–70	51–100	71–140
Very high	71+	101+	141+

	Potassium Soil Test—Lbs. per acre	
Fertility Level	Pastures, Mint, Field Crops	Sugar Beets, Potatoes, Vegetable Crops
Very low	0–50	0–100
Low	51–125	101–250
Medium	126–200	251–400
High	201–400	401–800
Very high	401+	801+

Magnesium Test	
	Percent Saturation
Very low	0–2.0
Low	2.1–5.0
Medium	5.1–8.0
High	8.1–15.0
Very high	15.1+

The percent magnesium saturation should exceed the percent potassium saturation to prevent magnesium deficiency in crops. Dolomitic limestone is recommended if the magnesium saturation falls below 5 percent.

	Ideal Percent Cation Saturation of a Fertile Organic Soil (Tentative)	
	Pastures, Mint, Field Crops	Sugar Beets, Potatoes, Vegetable Crops
	Percent	Percent
Calcium	40 –75	40 –75
Magnesium	7 –12	7 –12
Potassium	0.5– 1.0	1.0– 2.0

Nitrogen Fertilizers—Organic soils contain considerable total nitrogen. To be used by plants, the organic matter must be decomposed. Excess acidity, poor drainage, heavy rainfall or low soil temperatures retard decomposition by soil microorganisms or leach out available nitrate nitrogen. Crops growing on shallow organic deposits or on old weathered fields often require additional nitrogen. A plant well supplied with nitrogen is dark green in color and has a limber, succulent growth.

Spring planted crops on most adequately drained soils require 25 to 50 pounds of nitrogen per acre. On soils that need additional nitrogen, the amounts may range up to 150 pounds. Avoid excess nitrogen on potatoes, carrots, table beets, sugar beets, and small grains.

FERTILIZER RECOMMENDATIONS FOR ORGANIC SOILS BASED UPON SOIL TEST BY THE BRAY P1 METHOD FOR PHOSPHORUS AND EXCHANGEABLE 1 N AMMONIUM ACETATE METHOD FOR POTASSIUM.

Available soil phosphorus Pounds per acre of "P"				Pounds P_2O_5 per acre recommended
			15	200
		10	30	160
		20	40	130
	10	40	60	100
5	20	60	80	75
15	40	80	110	50
30	60	100+	140+	30
50+	75+	—	—	20
blueberries buckwheat clover grass oats rye soybeans pasture	alfalfa asparagus barley beans corn mint peas radishes sudan grass sweet corn turnips wheat	cabbage carrots cucumbers endive lettuce parsnips potatoes pumpkins spinach sugar beets table beets	broccoli cauliflower celery onions tomatoes	

Available soil potassium Pounds of "K" per acre					Pounds K_2O per acre recommended
				100	600
				200	500
			100	300	400
		100	200	400	300
		150	250	450	250
	75	200	300	500	200
	125	250	350	560	160
50	200	300	400	620	130
100	250	350	450	700	100
150	280	380	480	750	80
200	310	410	510	800	60
250	350	450	550	825	40
275	375	475	575	850	20
300	400	500	600	900	0
barley blueberries grass oats rye pasture wheat	beans clover corn mint peas soybeans sudan grass sweet corn turnips	alfalfa asparagus cabbage carrots cucumbers lettuce parsnips radishes spinach	broccoli cauliflower onions potatoes sugar beets table beets tomatoes	celery	

Table (red) Beets, Swiss Chard	Disc in or plow down 800 pounds of a 3-9-27 fertilizer containing ½% boron and ½% copper. Use 1% manganese if soil pH is 5.8 to 6.4 and 2% manganese if pH is above 6.4. Plowing down 500 pounds of table salt is helpful if soils are low in potassium.
Turnips, Rutabagas, Radishes, Cucumbers	Drill in or disc in 500 pounds of 3-9-27 or 5-10-30 per acre. Use ¼% boron in fertilizer for radishes and ½% boron for turnips and rutabagas. If soil pH is above 6.0, use 2% manganese in the fertilizer for all crops.
Beans, Soybeans	Disc in or plow down 300 to 400 pounds of a 0-10-30 fertilizer. If pH is above 6.0 plow down 150-200 pounds of 60% potash and band place near seed 150-200 pounds of 20% superphosphate containing 5% manganese per acre. Additional manganese may be needed for soybeans and can be applied as a spray on affected plants with 6 pounds of manganese sulfate in 15 gallons or more of water per acre.
Sugar Beets	Plow down 400 pounds of 60% potash per acre. Use in bands three inches below the seed or one inch to the side and two inches below the seed 300 pounds of a 6-24-12 containing ½% boron and ½% copper. Use 1% manganese in the fertilizer if the pH is 5.8 to 6.4 and 2% if the pH is above 6.4.

THE END

FIRST WORLD SOIL MAP

TARGET DATE: 1968

THE first soil map of the world will be prepared by the Food and Agriculture Organization (FAO) and the United Nations Educational Scientific and Cultural Organization.

The group, led by Dr. V. Kovda of UNESCO, was composed of nine leading soil scientists from the eight continental regions of the world, and representatives of FAO, UNESCO, and the International Society of Soil Science.

Overall correlation work is being undertaken by Dr. R. Dual, Project soil correlator at FAO headquarters.

The first step will be the preparation of regional maps bearing an integrated legend. The first draft of a series of continental maps will be available for the next Congress of the International Society of Soil Science in 1964.

The second phase will be the preparation of a second draft of the soil map in 1966, with a view to publication in 1968.

International Fertilizer Correspondent

Says Fielding Reed in ASA's *Crops & Soils*

FORAGES

FACING POTENT FUTURE

FORAGE production has always played an essential role in American Agriculture. Today and tomorrow it will assume even greater importance. If our great livestock industry is to flourish and prosper, feed and forage must keep pace with the times.

The USDA envisions a net *decrease* of 51 million acres in cropland by 1980, but a net *increase* of 19 million acres in forages, pastures and range. This will mean a total of 652 million acres in grasslands. The problems of efficient production, utilization, and management of this vast acreage will require an all-out effort on the part of our scientists and farmers.

If we are really fair in our calculations, we find that even our better farmers get entirely too little net return from livestock enterprises that utilize pastures and forage crops. An accurate computation of net return should evaluate the land at what it would bring on today's market. This should include all costs incurred in maintenance, marketing, losses and taxes. If this is done, our figures will show how difficult it is to net much in livestock farming, and the necessity of a good forage production program.

This simply means that the need for well organized, coordinated research for better forage crops is tremendous. To cite a few examples:

► We have far too little research that includes all phases of production. A team approach is needed that coordinates the efforts of the soil and plant scientist, the animal scientist, the engineer, and the economist. Farmers have yet to refuse to adopt practices they are sure will make them money. They have difficulty converting lush pastures, or the recommendations leading thereto, into dollars and cents in the pocket. Every recommended practice should be carefully evaluated to determine its contribution to a bigger net profit.

► We must do much more work on

"utilization." Every farmer asks how he can stretch his forage and pasture products throughout the year to better advantage. His pastures are undergrazed part of the year and overgrazed during the rest.

► "Management" is just as important. Let's give the man who is willing to do a first class job of management a *prescription* for making money. It doesn't have to be "fool proof." If research points out what can be done using the *best* management practice, then the farmer who wants to try it can take advantage of it.

► A great deal of research on forage "quality" is needed. Just yields, or even beef gains, or short-time milk production, isn't enough. We've got to learn what truly constitutes "quality" forage. We have not completely agreed on answers to such questions as "Are legumes desirable and practical in a pasture? What does it take to keep the right balance between legumes and grasses? What about the dollars and cents values?"

All of this boils down to the hard fact that tomorrow's livestock producer must find a way to get more productive forage into his operation. New findings that are with us today make this more attractive than ever before. Forage farming of 10 years ago will not do the job. It must be a modern version.

This means that farmers must use the newest, most productive, disease- and insect-resistant legume or grass varieties available. It means fertilizing at recommended rates with the right kind of fertilizer. It means proper crop and animal management—grazing at the right time, harvesting at the right growth stage, and efficient handling and storing of hay or silage.

All these practices must be combined into a balanced system to avoid any one factor limiting the responses that the farmer can get from other improved practices.

FOR LIFETIME CAREER?

WHY CHOOSE AGRONOMY?

RESEARCH AND EDUCATION, EXPERIMENT STATIONS, COLLEGES OF AGRICULTURE, USDA

University of Illinois
Agronomy News

DO you want to farm some of the finest soil in the world?

Would you like to probe the inner secrets of plant growth?

Or would you prefer the challenge of a more applied problem, such as helping farmers decide which is the best cropping system and whether to use anhydrous ammonia or ammonium nitrate?

Does a career in technical service relating to sales of fertilizers and weed killers appeal to you?

Would you like to explore ways to conserve moisture and eliminate drouth in the corn belt?

These and many other opportunities await those who prepare for careers in agronomy.

Agronomists work with soils and crops. Nearly all life depends ultimately on soils. It is the agronomists' responsibility to learn to understand soils . . . to classify them . . . to fertilize, lime, and till them for maximum profit . . . to develop better crops

ARE NEW APPROACHES NEEDED . . .

By W. G. Duncan

TO farmers throughout the ages soil, water, plant diseases, and destructive insects have been the great problems and challenges. Crops on fertile soils grew and yielded well if it rained and disease and insects did not take too heavy a toll—otherwise the farmer and sometimes those he fed suffered.

The scientific study of agriculture started with the farmer's point of view, since such problems as fertility, moisture, disease, insects, etc. were everyday realities to him.

Fertilizers were developed to make poor soils fertile. Crop varieties were selected or bred to be more resistant to drouth and disease. The insect problem was turned over to the entomologists. All of this has helped develop agricultural stability and increasing yields.

But in spite of these many achievements, I would like to propose that these earthy beginnings have led agronomists to a distorted view of the *whole* problem, a view that may se-

and to grow them in better ways.

Agronomists have the major responsibility for applying the principles of many basic sciences to the practical problems of plant growth and soil management. Some agronomists are trained as pure chemists . . . others have strong training in physics and mathematics . . . some are plant physiologists, geneticists, or microbiologists. An agronomist played a major role in the development of streptomycin.

PRIVATE ENTERPRISE, AGRICULTURAL INDUSTRY AND BUSINESS

In addition to the common farm tools used in field experiments, the tools of the trade of agronomists are many and varied. Agronomists use radioactive tracers to study plant nutrition and the movement of weed-killing chemicals within plants. They use X-rays to study the crystal structure of clays. Agronomists peer through microscopes aimed at the inside of plant cells, searching for the secrets of plant inheritance and

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riously retard further progress.

Agronomists seem confused, but well aware something is wrong with their approaches to agricultural problems. They recognize the need for a better understanding of the facts they collect. They see many present experiments as tired repetitions of older

. . . IN AGRONOMIC SCIENCE?

University of Kentucky

work with newer tools.

Although they know of unsolved problems and relationships, they hesitate to set up experiments that will add to the already vast stores of unused and undigested data. Many agronomists feel they are losing prestige among scientists in other disciplines. Dissatisfied with the relatively slow progress being made, they know that the best graduate students are not choosing the agricultural sciences.

Does part of our difficulty come from a warped approach to our problems? By studying agricultural problems from the farmer's point of view, has our attention been diverted to effects rather than causes? Are we

WHY CHOOSE AGRONOMY?

for the way in which certain chemicals kill plants.

Trained agronomists may thus choose their life work from many different fields that relate to soils and crops. But there is still further choice of opportunities in agronomy. The work they choose may range from the highly applied (farming) to the highly abstract (basic research).

Between these extremes are the college and high school teaching, the extension service, and soil conservation work.

Fertilizer companies and manufacturers of weed chemicals conduct research, sales, and technical services that employ agronomists.

Large seed companies are looking for plant breeders and other men trained in agronomy to direct their production programs.

Agronomists hold many important administrative positions. Some of them are deans and directors of research and extension in land-grant colleges.

Some are doing technical work with the Ford and Rockefeller Foundations in Asia, South and Latin America.

ARE NEW APPROACHES NEEDED?

treating the symptoms rather than looking at the *diseases*? Is more thought being given to finding out what to do than to understanding important principles?

How would some hypothetical scientist look at agronomic problems if he had no preconceived ideas on the subject?

The Nature of Our Problem

A normal beginning might be to define the nature of agricultural production as related to the energy transformations involved. This definition might show how the basic process of all agriculture is the capture of radiant energy (in the form of light) to power the chemical synthesis of carbon dioxide and water to make useful products. *All agronomic research, therefore, must be related in some way to this basic process.*

This process might be divided into two phases: *the synthetic phase* and *the utilization phase*.

The synthetic phase would have to do with energy relations, chemical reactions, substrates, and with the physical arrangement of the photosynthetic surfaces with regard to the energy sources. The utilization phase would be concerned with the division of the synthetic products between useful and non-useful plant parts, the quality of the economic products, and similar considerations.

The Synthetic Phase

The synthetic phase might be subdivided into biochemical and biophysical problems and into the problems concerned with the spatial arrangements of the photosynthetic surfaces.

The general objective of research into the biochemical and biophysical aspects of agricultural production would be to improve the efficiency of light utilization—that is, secure a maximum amount of primary synthetic product from a given amount of light energy.

Involved would be the selection of varieties with high-energy-conversion capabilities, the study of substrates and catalysts, and the study of optimum physical conditions for the synthesis. The unit of measurement and the basis

A three-year Survey of the occupations of agronomy graduates of agricultural colleges in the United States from 1957 to 1959 showed them engaged in the following occupations:

Occupation	Percent
1. Agricultural business	19
2. Work toward advanced degrees	19
3. Agricultural conservation	15
4. Military service	13
5. Farming	12
6. Agricultural education	5
7. Research	4
8. Miscellaneous	13

THE END

for study and comparison would most likely be the plant leaf or individual cell.

It should be noted here that this first part of the synthetic phase includes much of the study of fertilizers, soil fertility, soil moisture, climatology, and plant breeding. A significant difference is that such work is done with *cells* and *leaves* as the primary points of interest.

The second division is related to the physical positioning of the leaf surface for optimum reaction rates and times of exposure. In plant terms, this would have to do with the rate and pattern of planting, the positioning and area of leaves on the plants, and the length of the productive season. Here the principles of optics should prove most useful.

The Utilization Phase

The problems of utilization of photosynthetic products seem largely a matter for geneticists and plant breeders to work with. If the area of interest were broadened to include utilization of the plant or its parts, most of agricultural science would be included.

Lack of Information

Anyone interested in looking at agronomic problems from such a radical point of view would be shocked at the *lack of information* available for his use. For example:

1 He would be amazed to find that although solar energy is the source of all agricultural production, no one had ever measured sunlight in a way that could be directly related to plant growth or leaf function.

2 He would find that only a few men had made studies of leaf function in relation to light intensity and most such studies related to non-agricultural plants. (And none of these studies is directly concerned with the effect of fertility of soil or with moisture availability.)

3 He would find no work relating single leaf function to whole plant growth and very little relating leaf angle or area to plant yield.

4 He would find very little about the leaf area index of crop plants or the factors affecting it—in fact very little to indicate that agronomists generally were even aware of a relationship between leaf area, light conditions, and yield. (One unfamiliar with the background might even conclude from a casual reading of the literature that agronomists thought plants were wholly nourished through their roots by underground "plant foods.")

Considering agronomy from this available information, our unprejudiced scientist might either set out to secure the basic information he needed to start work or wash his hands of the problem and look for another field.

It is extremely doubtful that he would linger to appreciate the approaches used by agronomists in working at their problems. This takes a farm background—in a day when farm "backgrounds" grow rarer by the year. **THE END**

"DOWN" CORN CAN BE PREVENTED . . .

THE PAST year you may have had severe lodging or stalk break of corn. Thousands of farmers suffered severe losses from "down" corn. Can it be prevented? If so, what is the remedy?

It can be prevented, but you must start now, and I propose to give you the remedy.

For some 70 years, I have been acquainted with the growing of corn. Of all common farm crops, my father always grew much more corn than the average farmer.

In the spring of 1881, he moved on to the farm where I grew up and which I still own. That same year, or possibly a year later, with the help of my older brothers and a neighbor's boy, he planted a 20-acre field of corn with hand hoes.

A few years later, my father bought a horse-drawn, two-row, check-drop corn planter. That was the first machine of its kind in the neighborhood. I was born in 1884 and remember well its early use.

This brief history will, I trust, indicate to you that I am not a novice to corn growing.

During recent years, there has been little or no lodging or stalk break of corn on my farm. In 1961 there was none at all. The farm is located in Trempealeau County, Wisconsin.

Annually, over some 100 acres of corn are grown. To prevent lodging and stalk break of corn, my studies and observations tell me that you should give attention to the following.

Balanced Soil Fertility

There is an old adage which says: A high level of available soil nitrogen tends to produce excessive growth of tender, succulent leaves in plants which are often subject to disease and infestation by insects. A high level of available soil phosphorus tends to produce early maturity of high-quality grain or seed. And, a high level of available potassium tends to produce strong straw of the small grains and stalks of corn.

Thus, to lessen the tendency of cornstalks to lodge or break, you should make certain that your supply of nitrogen, phosphorus, and potassium is well balanced, and especially that the supply of the potassium is adequate.

By:

1 Supplying enough available potassium.

2 Using plant resistant, early maturing hybrids.

3 Killing root worms with insecticide.

4 Planting two kernels together.

There is a good reason why a high level of available potassium is all-important. The structural material of the cornstalk, exterior wall and interior pith, consists largely of a carbohydrate called cellulose. The starting process in the manufacture of cellulose by a plant is the manufacture of starch. It is well known that a satisfactory rate of starch manufacture by a plant depends on a good supply of potassium in the plant. Thus, it is evident why a high level of available soil potassium is needed to produce cellulose, the structural material needed for strong cornstalks that resist lodging and stalk break of corn. If your soil does not have a good supply of available potassium, you should fertilize with this element.

A high level of available potassium will also stimulate the growth of brace roots which consist largely of cellulose and arise from the lower nodes of the stalk. One should realize that not always will a high level of available potassium of itself solve the problem. You must give other factors consideration.

Some Hybrids Resistant

It is well known that some hybrids of corn are more subject to lodging and stalk break than others. There are several reasons for this.

Some hybrids have stronger stalks, better rooting, and are less subject to stalk-weakening disease than others. Also, obviously the taller the corn and the higher the ear set, the greater the leverage of the wind and the greater the tendency to lodge.

Advises World Soils Authority, *Emil Truog* In Hoard's Dairyman Magazine

Selection of an earlier-maturing hybrid generally means a shorter stalk. Also, severe lodging often occurs during prolonged fall rains when the soil becomes soft and provides weak anchorage for the corn roots.

A hybird of earlier maturity will not be so green and heavy during this time and, therefore, is more apt to pass safely through this critical period. In a desire to get the highest possible yield by growing a late-maturing hybrid, you may suffer a loss because of lodging and late harvesting of immature corn.

On my farm located about 40 miles north of La Crosse, Wis., a 95-day hybrid is grown. In early July of 1961, this corn had tasseled, and by the forepart of September, the ears were hard and ready to harvest. Of course, to get this early maturity and be assured of more dry corn in the crib, you must plant early on well-drained soil that is properly supplied with all of the needed elements in readily available form.

Control Rootworm

In recent years, some lodging of corn has been caused by an insect called the corn root-worm. This is not generally a problem in Wisconsin, unless corn is grown on the same ground three or more years in succession. Rotation provides automatic control.

The adult stage of the worm is a beetle which lays its eggs on the young corn roots. The worms on hatching immediately feed on the roots, and if the infestation is severe, may cause the young corn plants to lean over. If the infestation is less severe, lodging may not occur until later.

Fortunately, we have two effective insecticides to combat this insect. They are aldrin and heptachlor. If experience tells you that your corn soil is infested with rootworms, you should, by all means, use one of these insecticides. They may be applied in several ways—by plane or ground machine.

At one pound actual chemical per acre, these materials may be applied between December 1 and March 15. Use a 10 per cent granular formulation or include the insecticide in broadcast fertilizer. Such treatment should be applied to level, fall-plowed fields. Disking need not be done until corn planting time.

They may be applied in several different ways. A common method is to broadcast before planting 1½ pounds per acre of either material and disk it under within the same day. Also, application may be made at a 1-pound rate by mixing the insecticide with the starter fertilizer and dropping no deeper than the seed corn along the row with a split boot distributor.

The modern fertilizer distributor, which places the fertilizer at one side and deeper than the seed, is good placement for the fertilizer but does not get the insecticide mixed sufficiently with the soil near and around the seed.

The insecticide may be applied with a special planter-mounted sprayer or granule applicator. Seed treatment at the rate of 1 ounce of insecticide per bushel of seed is effective against light infestation of the rootworm.

Plant Two Kernels Together

If you have been drilling your corn in rows about 40 inches apart and dropping 1 kernel every 7 or 8 inches apart so as to get a stand of about 20,000 plants per acre, you may lessen the tendency to lodge by dropping 2 kernels every 14 or 16 inches apart.

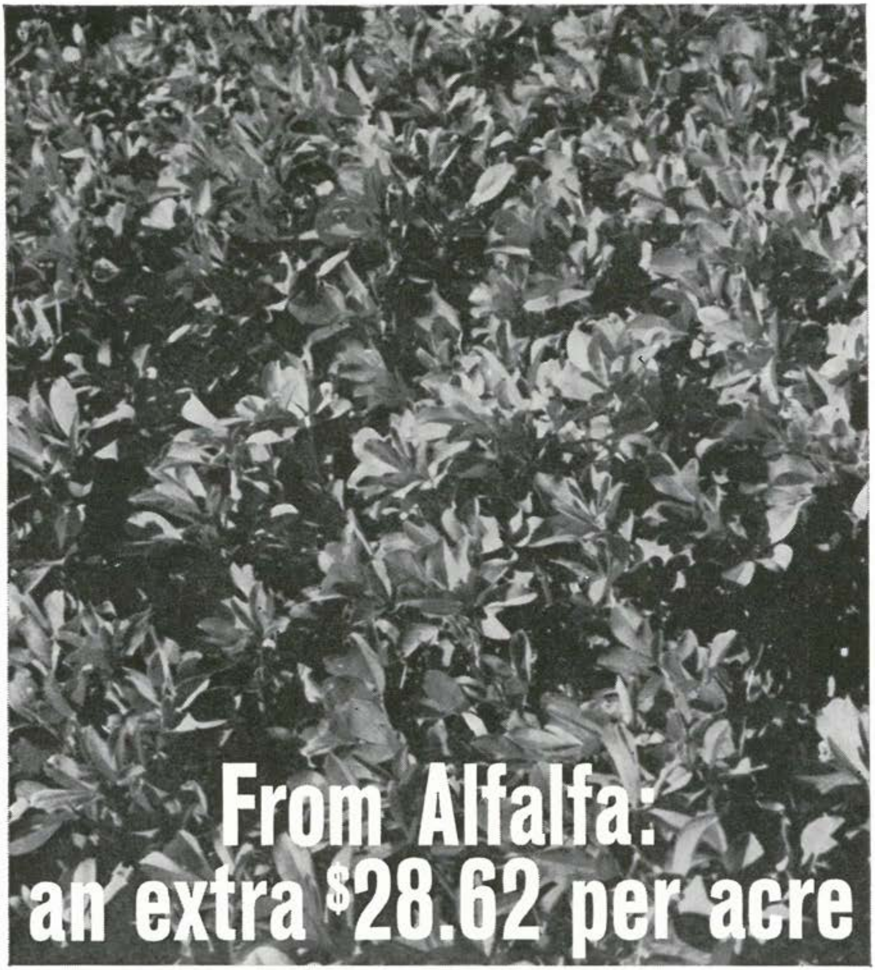
This will not change your corn population but by having two plants close together, each will help to brace the other against wind pressure.

A second advantage is that when the kernels germinate, the two sprouts being together will help each other in breaking through a hard, crusty soil, giving you a more uniform stand.

You can lessen and prevent lodging and stalk break of corn by attention to the following:

1. Make certain your soil has an adequate supply of available potassium. This element is needed in building the structural material of cornstalks.
2. Select a hybrid that is known to be resistant to lodging and has a maturity date adapted to your locality. Late maturities are more subject to lodging.
3. Guard against root damage caused by the corn rootworm by using an insecticide on infested soils.
4. When planting, drill 2 kernels of corn together every 14 to 16 inches apart rather than 1 kernel every 7 to 8 inches apart. Two stalks side by side will brace each other against wind.

THE END



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Treatment	Fertilizer Acre Rate	Acre Yield Dry Matter	Increase Per Acre	Increased Value	Fertilizer Cost Per Acre	Net Profit Per Acre
Top-dressed with 0-10-30B	480 lbs.	8368 lbs.	2970 lbs.	$37.12	$8.50	$28.62
Not top-dressed		5398 lbs.				
Source: Mimeo report, C.J. Chapman, Soils Dept., University of Wisconsin						

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