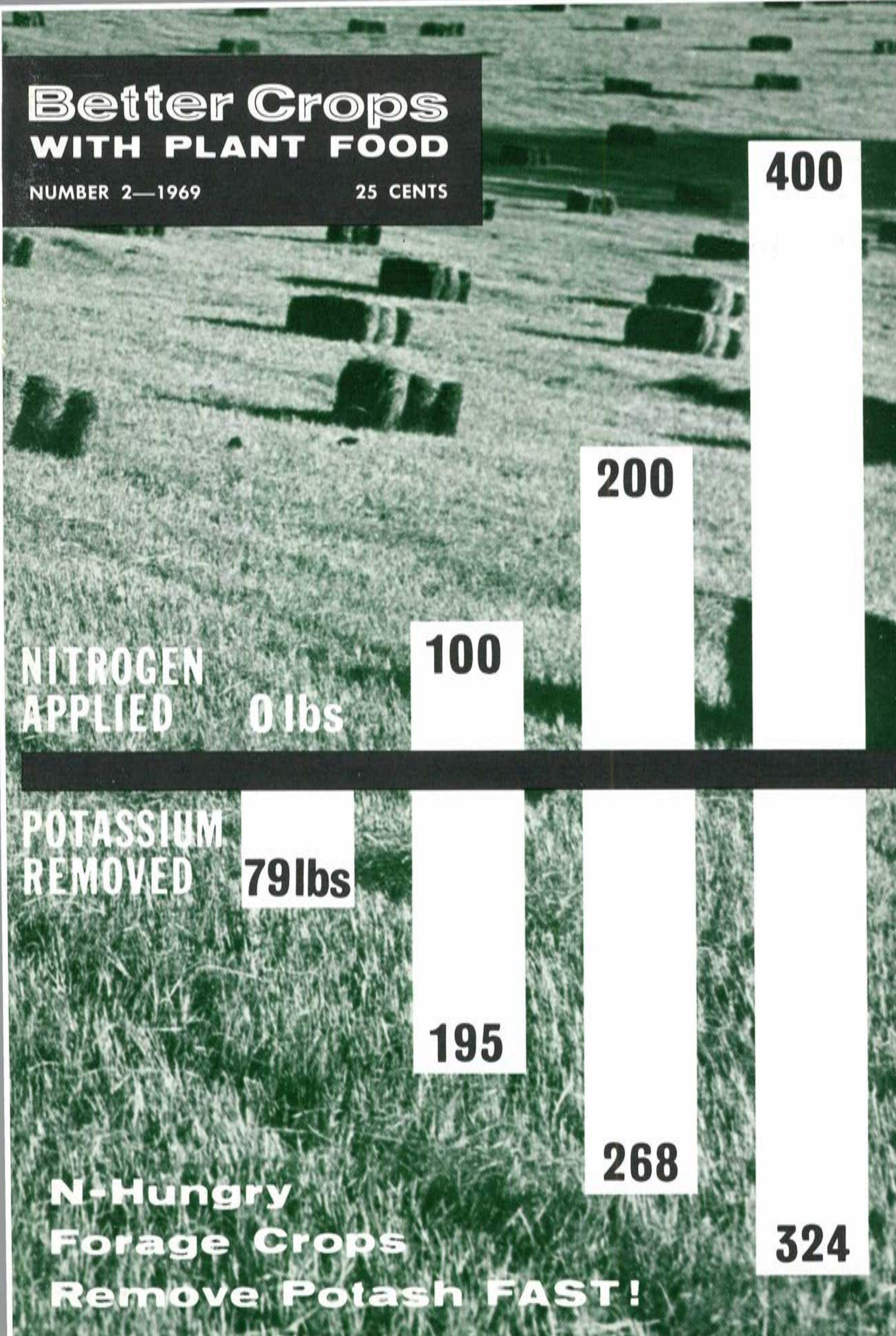
Better Crops WITH PLANT FOOD

NUMBER 2—1969 25 CENTS

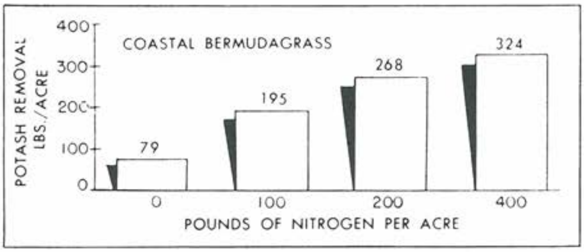


N-Hungry Forage Crops Remove Potash FAST!

Potassium MUSCLE Helps Get The Most From More Nitrogen

NITROGEN CAN SEND yields zooming. But in the process, the amount of K in a crop often declines even when soil K is medium to high and some K has been applied.

On the cover, tests showed the more nitrogen you apply the more potash Coastal Bermudagrass tended to remove as yields went up.



The 200-lb. nitrogen rate produced 6.3 tons per acre, which removed 268 lbs. of potash—or 43 lbs. K_2O for each ton of grass hay.

A 10-ton Coastal Bermudagrass crop removes a whopping 1,115 lbs. NPK—570 lbs. N, 145 lbs. P_2O_5, and 400 lbs. K_2O PER ACRE! The same amount of alfalfa (10 tons/A) removes even more—1,175 lbs. NPK—or 560 lbs. N, 115 lbs. P_2O_5, and 500 lbs. K_2O PER ACRE!

It really pays to give your crop ENOUGH potassium muscle to get the MOST from MORE nitrogen. Materials on pages 16-18 emphasize the importance of a fall forage program. **Are you ready?**

Better Crops WITH PLANT FOOD

The Whole Truth—Not Selected Truth

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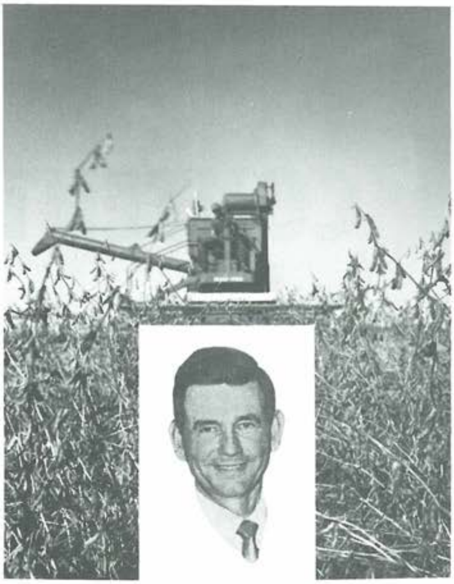


GEORGE KIMMONS, Ozark, Mo., champion, with 109.64 bu/a.

It happened . . . in the National Soybean Yield Contest . . . sponsored by Elanco Products Company and supported by the American Soybean Association. FOUR farmers broke the "mental jinx" that has enslaved soybean growers since soybean records began: the old "it-can't-be-done" attitude toward 100 bushels per acre.

The highest yield reached 9.6 bushels ABOVE 100 bushels. The contest prizes are valuable in this Elanco event—combine, tractors, planters—so the growers probably poured on fertilizers and chemicals beyond practical limits.

But . . . 548 bushels from 5 acres! Think of it! The 100-bushel winners were:

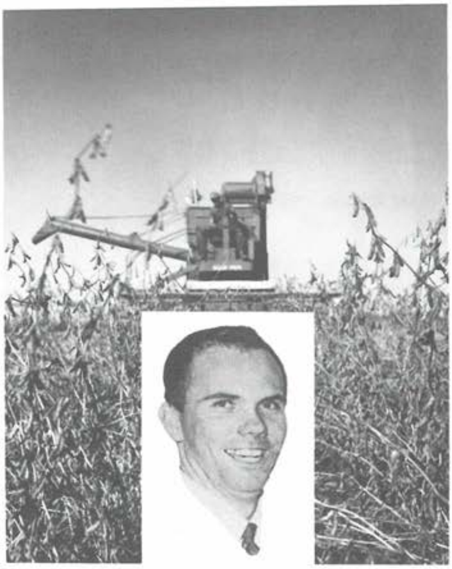
Over 100 bu. SOYBEANS Per Acre!

WOULD YOU BELIEVE 548 bushels of soybeans on 5 acres? In a day when the national average barely exceeds 24 bu. per acre?

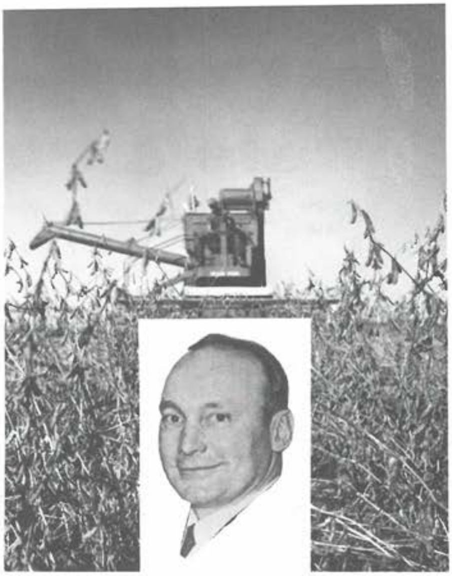
GERALD TARNOW, Rolling Prairie, Ind., with 103.84 bu/a.

George Kimmons, Ozark, Mo., champion, with 109.64 bu/a.

- Planted certified and germination-tested Clark 63 soybeans in 28-inch rows at a rate of 14 plants per linear foot of row on May 19.
- Broadcast-applied nitrogen at 135 lbs/a, phosphorous 105 lbs/a, and potash 165 lbs/a.
- Grew soybeans on the same field in 1967.
- Spring plowed and disked two times.
- Planted May 19 and rotary hoed twice. (Was regional winner last year).



MAX PEELER, Union, Nebr., with 100.55 bu/a.



HARRY E. PICK, Chenoa, Ill., with 100.74 bu/a.

HOW?

AS CONDENSED FROM THE SOYBEAN DIGEST

Gerald Tarnow, Rolling Prairie, Ind., regional champion with 103.84 bu/a.

- Planted certified Amsoy soybeans on May 14 in 30-inch rows at seven to eight plants per foot of row.
- Plowed down 1,000 lbs/a of 12-6-18 fertilizer, plus an additional 250 lbs/a of 8-25-3 at planting.
- Applied 3 gallons Na-Churs 2-20-18 as foliar sprays when the soybeans were 18 inches high and also 3 feet.
- Grew corn on the contest field in 1967.
- Cultivated once and hand-pulled some ragweed. (Was Indiana State Champion in 1966 and 1967).

Max Peeler, Union, Nebr., regional champion with 100.55 bu/a.

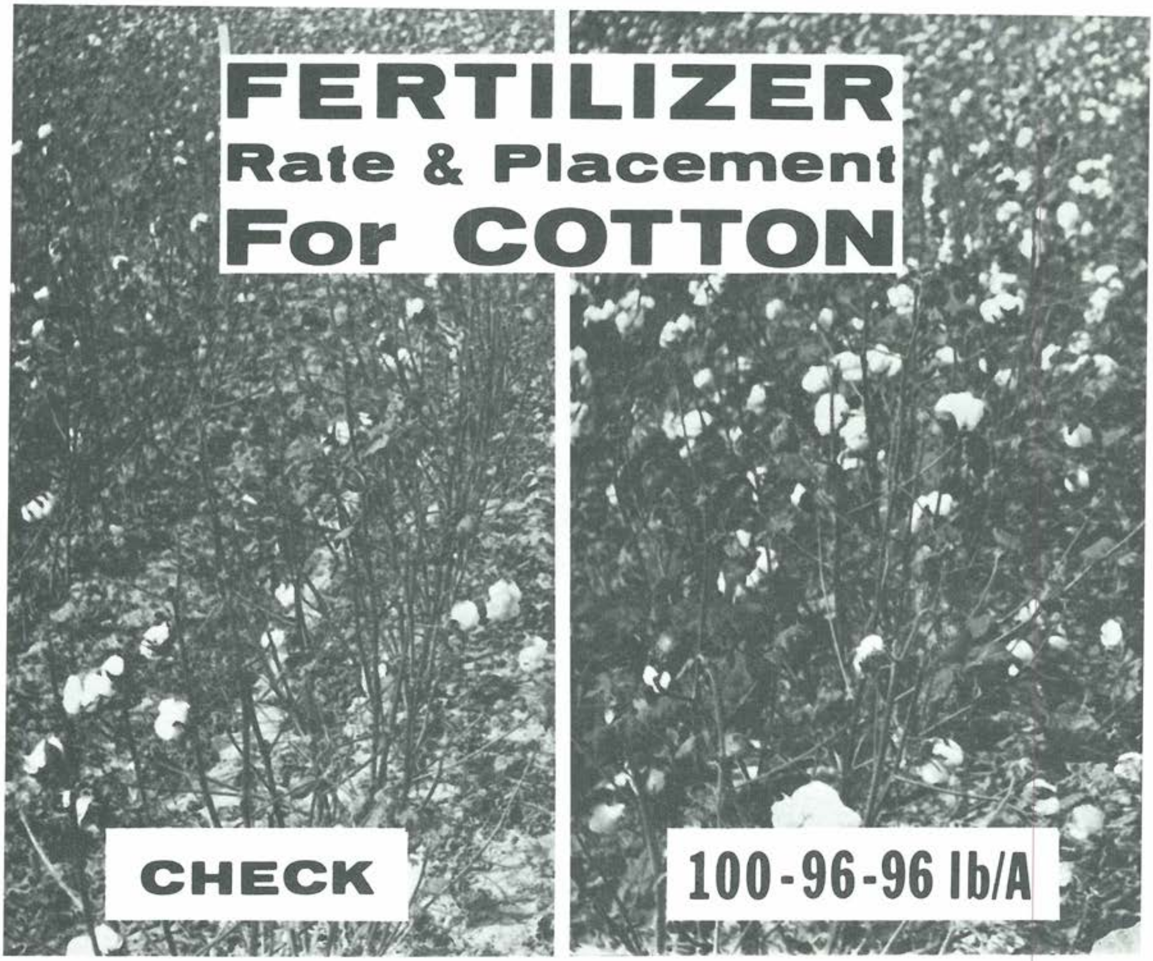
- Planted germination-tested Clark 63 seed May 15 in 40-inch rows arranged in a checkerboard pattern at 2 bu/a.
- Applied 100 lbs. anhydrous ammonia and 225 lbs. low analysis dry fertilizer.
- Rotary hoed twice. The field was in soybeans in 1967.

Harry E. Pick, Chenoa, Ill., central Illinois champion with 100.74 bu/a.

- On June 5 planted a commercial blend of germination-tested seed in 7-inch rows at 1.3 to 3 plants per foot of row.
- Used very high fertilizer rates—1,400 lbs. nitrogen, 1,320 lbs. phosphorus, and 1,600 lbs. potash, both liquid and dry.
- Also applied 2 gallons of 10-20-10 as a foliar spray when the beans were at 30% bloom. (Pick was national champion in 1967).

All four of the 100-bushel yield winners inoculated their seed. They also applied and incorporated Treflan on a broadcast basis. **THE END.**

FERTILIZER Rate & Placement For COTTON



J. R. OVERTON AND W. L. PARKS
UNIVERSITY OF TENNESSEE
IN TENNESSEE FARM AND HOME SCIENCE

HOW MUCH fertilizer to use and how to apply it are questions asked by every cotton producer.

Certainly proper rate and placement will not be the same for all soils or situations. Experiments to study rate and placement of fertilizer on cotton were conducted from 1961 to 1964 under several soil fertility conditions at the West Tennessee Experiment Station. (The relatively low yields reflect the poor land on which this work was done—Ed.)

A DIFFERENT LOCATION was used each year, and in some cases, soils were quite different. Seasons were also different from year to year.

In this work, 4-row plots about 30 feet long were used with 4 replications. The two center rows of each plot were picked by hand for yield determinations.

The first 3 years the experiments were on well-drained soils. In 1964, the experiment was on a somewhat poorly-drained Calloway soil with restricted drainage due to a slowly permeable layer at a depth of 18 to 20 inches.

IN TABLE 1, soil tests at each site were low for both phosphorus and potassium

MAJOR COTTON TRIALS SHOWED . . .

- **Highest yields were obtained with highest fertilizer rate—in this case, 100-96-96.**
- **Application rate was less important than the proper amount.**
- **Yield declined with nitrogen alone on soils testing low in phosphorus and potassium.**

except for the 1962 site—there the phosphorus test value was barely in the medium range. The soil pH was between 6.2 and 6.4 at all sites.

Dixie King cotton was planted on May 18 for the first 3 years and on May 20 in 1964.

IN TABLE 2, the rainfall data show:

- **1961 an average year with best rainfall distribution of the 4 years.**
- **1962 a dry year with over one-third of the total rainfall coming in September.**
- **1963 with fair moisture through July but August and September extremely dry.**
- **1964 a year of excess moisture in every month except May.**

Thus, rainfall and moisture conditions during the experiment covered the range from wet to dry.

IN TABLE 3, seed cotton yields were obtained at each site. A fertilizer response was obtained in each of the 4 years, but this was expected as low-testing soils were selected for the experiment.

FERTILIZER RATE: A significant difference among the three rates of complete fertilizer was observed for 3 of the 4 years and for the 4-year average. Figure 1 shows the sharp contrast. Highest yields

Table 1. Soils and soil test values for experimental sites

Year	Soil type	pH	Phosphate	Potassium
1961	Vicksburg Fine Sandy Loam	6.4	6 (Low)	45 (Low)
1962	Vicksburg Fine Sandy Loam	6.3	18 (Medium)	127 (Low)
1963	Vicksburg-Memphis Silt Loams	6.6	7 (Low)	70 (Low)
1964	Calloway Silt Loam	6.2	6 (Low)	85 (Low)

Table 2. Monthly rainfall and long term average for cotton growing season

Month	1961	1962	1963	1964	Long term average
May	4.67	2.33	4.78	3.14	3.97
June	4.75	2.49	2.64	5.31	4.08
July	3.80	2.16	3.56	5.43	4.46
August	3.66	1.19	1.17	5.22	3.28
September	1.20	5.41	0.99	4.85	3.39
TOTAL	18.08	13.58	13.14	23.95	19.18

Table 3. Results of rate and placement fertilizer experiments on cotton in West Tennessee, 1961 to 1964

Fertilizer treatment Pounds/acre			Method of placement	Planting condition	Pounds seed cotton per acre				
					1961	1962	1963	1964	Av.
N	P_2O_5	K_2O							
0	0	0	—	Flat	762	1082	1049	269	791
100	0	0	In row	Bed	526	733	753	323	584
100	24	24	Broadcast	Flat	626	1513	1392	545	1019
100	24	24	Broadcast	Bed	540	1089	1298	524	863
100	24	24	In row	Bed	821	1183	1358	800	1041
100	24	24	Band to one side	Flat	772	1432	1701	484	1097
100	48	48	Broadcast	Flat	839	1412	1640	659	1138
100	48	48	Broadcast	Bed	917	1331	1627	773	1162
100	48	48	In row	Bed	1198	1419	1681	908	1302
100	48	48	Band to one side	Flat	1134	1479	1788	625	1257
100	96	96	Broadcast	Flat	1262	1526	1963	1103	1464
100	96	96	Broadcast	Bed	1552	1412	1950	1237	1538
100	96	96	In row	Bed	1384	1405	1936	1318	1511
100	96	96	Band to one side	Flat	1543	1560	2057	793	1488
				RATES					
100	24	24			690	1304	1437	588	1005
100	48	48			1022	1410	1684	741	1214
100	96	96			1435	1476	1977	1113	1500
L.S.D. (5%)					137	N.S.	146	141	87
				METHODS					
Broadcast, Flat					909	1483	1665	769	1207
Broadcast, Bed					1003	1277	1625	845	1188
In row, Bed					1134	1336	1658	1008	1284
Band to one side, Flat					1150	1490	1849	634	1281
L.S.D. (5%)					158	N.S.	N.S.	163	N.S.

were obtained with the highest rate of fertilization (100-96-96 per acre) in 3 of the 4 years.

In 1962, there was no big difference among the three rates of complete fertilizer used, but a significant response to the lowest rate was obtained over no fertilizer and nitrogen alone.

It was at the 1962 site that the soil test values were highest for any of the sites tested and where rainfall was lowest during most of the growing season.

Applying nitrogen only to cotton on the low-testing soils resulted in a yield decrease in 3 of the 4 years and for the 4-year average. Results similar to this are often observed under conditions of nutrient imbalance.

The cotton yields obtained in these tests are low as expected from soils testing low. Other factors conducive to low production such as poor structure, slow aeration, slow infiltration, and inactive microbiological population are often associated with low-testing soils.

Results from other experiments indicate it takes about 3 to 4 years of good fertility management to bring yields on such soils to their productive potentials.

FERTILIZATION METHOD. The average cotton yield over the 4 years showed

Table 4. Soil test values resulting from four fertilizer treatments broadcast, disked in, and planted flat, Jackson, Tennessee, 1961, 1962, and 1963

Fertilizer rate, pounds per acre			Soil test results[1]					
			1961		1962		1963	
N	P_2O_5	K_2O	P	K	P	K	P	K
			Pounds per acre					
0	0	0	18	100	17	66	14	104
100	24	24	19	82	16	78	15	108
100	48	48	26	110	35	87	22	107
100	96	96	31	124	44	109	39	124

[1]Soil samples were taken at the end of the season, 0 to 6 inches depth, from the row area.

no significant difference among the four methods of applying the fertilizer.

In 1961, the two methods that concentrated the fertilizer near the row were significantly better than the other two methods.

In 1964, the two methods involving bedding were significantly better than the other two methods.

This difference was probably due to the fact that bedding reduced the unfavorable effects on cotton of excess moisture on the poorly-drained Calloway soil.

These results indicate method of applying fertilizer to cotton is not as important as getting the proper amount of fertilizer applied. Any of the four application methods appeared to be equally effective when averaged over the 4-year period. But the 1964 data along with other information (Tennessee Farm and Home Science 54, June 1965) indicate that under some circumstances, bedding cotton may be better than planting flat.

The advantages in bedding come from improving soil moisture and soil temperature conditions in the seedbed. This contributes to better stands and helps the plants to withstand periods of excessive moisture during the growing season.

SOIL TEST VALUES. After the growing seasons of 1961, 1962, and 1963 when the cotton was on the well-drained soils, 0-6 inch soil samples were obtained from the row of each plot that received 800 pounds of 6-12-12 broadcast fertilization and was planted flat.

TABLE 4 SUMMARIZES soil test results from these samples.

These results show the fertilizers caused a significant increase in phosphorus soil test values but only a slight increase in potassium soil test values.

The phosphorus soil test values for the 96-pound per acre rate would be classed as high, while those for the 48-pound per acre rate would be classed medium to high.

All potassium soil test values would still be classed as low except the 124-pound per acre test values in 1961 and 1963, and these are barely in the medium test range.

THE END

PAGES 16-20!

Answer 'Em with FACTS

"EVERYTHING'S SKY HIGH at the supermarket. Boy, the farmers must be getting rich! They oughta . . . with the tax money they get NOT to grow crops."

EVER HEARD THAT before? Many a white-necked Rotarian . . . suburban-secure Kiwanian . . . Babbitt-bouncing Optimist has muttered it as he turned his steaks on the patio grill. Many a housewife has sighed it as she lugged in the last bag of groceries.

None of them knew the facts. A recent New Holland brochure tells the facts, based on USDA and U.S. Congressional Committee on Agriculture reports. **Better Crops Magazine** has edited them into the following capsules.

Let your urban friends know . . .

THAT food costs rose less than most consumer items between 1947-49 and 1966—only 35% compared to 85% for medicare, 52% for rent.

THAT an HOUR OF WORK in a factory bought more food in recent years than it did 20 or 30 years ago:

	1935	1945	1966
Round steak	1.5 lbs.	2.5 lbs.	2.4 lbs.
Bacon	1.3 lbs.	2.5 lbs.	2.8 lbs.
Milk	4.6 qts.	6.5 qts.	9.7 qts.
Oranges	1.7 doz.	2.1 doz.	3.4 doz.
Bread	6.6 lvs.	11.5 lvs.	12.2 lvs.

THAT three factors affect our food budget: (1) Processing costs—such as canned, frozen, concentrated, dehydrated, ready-mixed, ready-to-serve foods; (2) Transportation and packaging costs; (3) *Non*-food items on your check-out tape casually charged to food budget.

THAT the cost of marketing food soared more than 130% in less than 20 years—from $22.6 billion in 1947 to $52.1 billion in 1966.

THAT farmers have not been getting the benefit of higher food prices, as average wholesale farm prices decline before over-supplied wholesale markets.

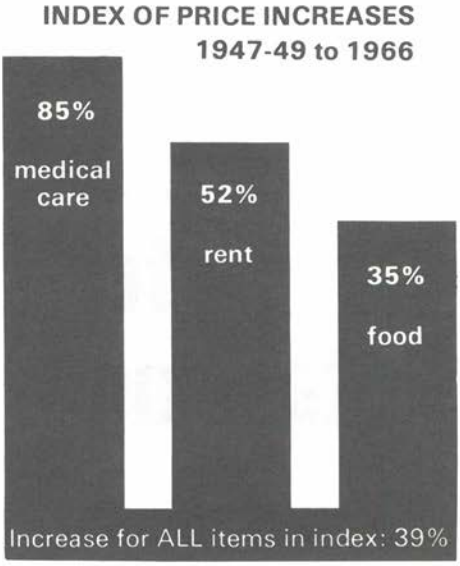
THAT the farmer's share has recently been 2.8¢ from a 30¢ box of cornflakes . . . 59¢ from $1 worth of choice beef . . . 3¢ to 4¢ from a 22¢ loaf of white bread . . . 23¢ from a man's $4 cotton shirt . . . 25¢ from $1 worth of pine in his woods.

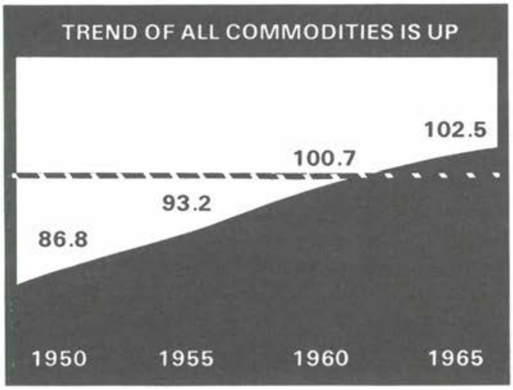
THAT the farmer has the following income to live on (using 1966 average figures): About $5,024 per farm net out of about $13,100 gross . . . about $1,730 per farm person in disposable personal income . . . about $1.60 per hour for farm work compared to $2.71 per hour for factory worker, $2.39 for food market employee!

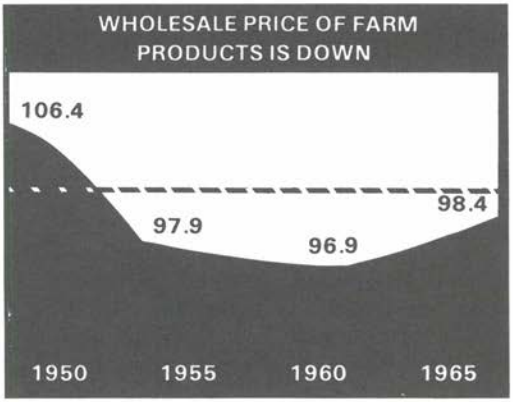
THAT the world's most efficient food producer (the American farmer) is squeezed between rising operating costs and declining wholesale farm produce prices—from an index of 106.4 in 1950 to 98.4 15 years later.

THAT agriculture is the nation's biggest industry, with better than *$273 billion* assets . . . nearly ⅔ the value of all current U.S. corporate assets.

THAT farming involves 5.2 million workers—more than the combined work force in transportation, public utilities, steel, and automobile industries.







THAT 30% of private enterprise (3 out of every 10 jobs) is *related* to agriculture. For example, 8 million people store, process, and merchandise agricultural products, while 6 million provide the supplies farmers use.

THAT farmers pump $45 billion a year into our economy—$33 billion for goods and services just to produce their crops and livestock, $12 billion for food, clothes, medicines, furniture, appliances, etc.

THAT farmers use about ⅓ the steel the auto industry does—some 5 million tons yearly in machinery, trucks, cars, fencing, building, etc.

THAT farmers use 28 to 30 billion kilowatt-hours of electricity a year—more than Baltimore, Chicago, Boston, Detroit, Houston, and Washington, D. C. combined.

THAT farmers pay their share of public programs—$1.7 BILLION in farm real estate taxes . . . $300 million in personal property taxes . . .$318 million in gasoline taxes . . . $180 million in motor vehicle license fees . . .$350 million in sales taxes . . . $1.5 BILLION in federal and state income taxes . . . all in one year, 1966.

THAT American agriculture exports more farm products than any other country—$6.9 billion worth from 78 of our 300 million harvested acres in one year.

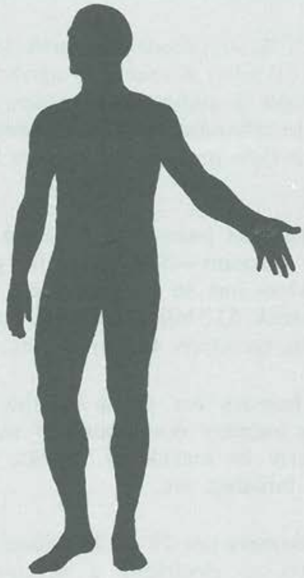
THAT one hour of farm labor now produces over 6 times the food and crops it did in 1919-21.

THAT one farm worker can now produce enough food, fiber, and other farm commodities to supply himself and 38 other people.

THAT farmers get barely a quarter of USDA appropriations—about 27% in 1966—as the balance goes to programs serving everything from defense areas to food distribution and natural resource improvements.

Human NEED for Potassium

Edited by BETTER CROPS From POTASH REVIEW



RESEARCH SCIENTISTS of the University of Minnesota Health Sciences Center report that an invariably fatal kidney birth defect may be caused by a shortage of potassium when the kidneys are developing, in St. Paul **Pioneer Press.**

The researchers are Dr. Roger Herdman, associate professor of pediatrics, Dr. Daniel Perey, medical fellow in the department of pediatrics, and Dr. Robert Good, professor of pediatrics and microbiology.

Dr. Good, a world authority on immunology, said that the research team's discovery "points out potential hazards of diuretic drugs (drugs which remove excess water from the body, thereby reducing bloating) and other potassium-depleting agents if they are given to pregnant women or to very young and premature infants."

Dr. Perey and Dr. Herdman found that after they injected newborn rabbits with steroid hormone, the animal's potassium levels dropped and they developed an ailment which resembles the fatal human condition known as polycystic disease of the kidney.

Both men said that they could not say, at this stage, whether their work will also apply to human beings.

LIVING MATTER consists of 28 elements, 13 of them being non-metals, and 15 metals. Among the latter, potassium (its chemical symbol, K, stands for Kalium, which is derived from the Arabic word kali) has an important physiological part to play in the human organism.

Knowledge of its metabolism has expanded greatly in recent years, so that one can now obtain a general view of the biochemical character of this element and the human need for it.

A healthy adult weighing 154 pounds has a potassium capital of about 9 ounces. Most of it is in the muscles.

Potassium is indispensable in forming and growing cells. Without it, organic nutrients (proteins, carbohydrates, and lipids) cannot be assimilated. It is necessary equally for the working of the heart, brain, glands, nerves and muscles.

Man obtains potassium as a component of his ordinary foods. A normal diet provides enough to balance the daily losses. A lack of potassium causes serious disturbances in the human body, whether the shortage comes from dietary origin,

Showing Up In Many Ways

From Original By
Mme. Dr. M. A. Pointeau-Pouliquen

disease attack, or some forms of medication.

Potassium excess also causes trouble, but is a rarer condition, connected with a malfunction of the system that regulates the potassium balance of the organism.

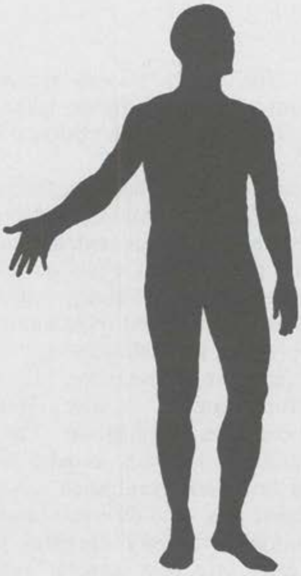
THE HUMAN BODY, like that of other living organisms, is made up of millions of cells, the microscopic units of life.

A cell is surrounded by a membrane and is filled with a fluid called the intracellular fluid. The human body contains about thirty litres of this intracellular fluid, holding in all 3250 mEq of potassium (1 mEq = 1 milliequivalent, 39 mg).

Around the cells, which are thus bathed in it, is a nourishing liquid, the interstitial fluid. This, and the blood plasma, are the extracellular fluids: 15 litres in all, containing 70 mEq of potassium.

By far the greater part of the potassium in the body is thus to be found inside the cells.

The extracellular fluids are a means of transport, a carrier of potassium to the



WHEN AN OREGON State University coed was found dead in her bed after losing 40 lbs. through a diet-pill program, a Portland physician checked into the pills and found three interesting things:

1—Amphetamines and digitalis to reduce appetite.
2—Thyroid hormone to speed up body metabolism.
3—A diuretic and laxative to increase excretion.

The doctor concluded:

1—The amphetamines "reduced consumption of food containing potassium."
2—The diuretic and laxative caused "further potassium loss from body tissues."
3—Such potassium loss made the heart more sensitive to another component of the pills—digitalis. The result could be fatal disturbance to the heartbeat.

In previous issues, BETTER CROPS magazine has featured items on the importance of potassium in building strong muscle tissues, including the heart.

The following article, from the POTASH REVIEW out of Berne, Switzerland takes another look at the important role of potassium in the human body.

organs. The blood plasma receives the potassium supplied by foods, taken up by the small intestine in the course of digestion.

It passes on the potassium, through the intermediation of the interstitial fluids, to the cells which are thus replenished to the liver, and to the bones where potassium is placed in reserve. Finally, the blood plasma transports 'used' potassium to the kidneys, where it is eliminated.

An excess of potassium, of dietary origin for example, is also eliminated, since there is an 'equilibrium'. The potassium stock of the body is adjusted to a constant level, however much is supplied.

To keep this equilibrium requires the intervention of a very complex system, which calls into play several endocrine glands (adrenal cortex, pancreas, hypophysis), and the nerve centres also.

When this very sensitive mechanism is deranged, as may happen in the course of various diseases, the intake and elimination of potassium get out of balance. The biochemical consequence may be either an excess or a deficiency of the element.

Within the cell, potassium is in equilibrium with other substances: sodium, hydrogen ions, calcium, and magnesium. A disturbance in the metabolism of any of these can interfere with the others, and shift the ionic balance inside the cell.

How, in medical practice, can suspected anomalies of the potassium equilibrium be confirmed? There are two relatively simple means of putting it to the proof. These are:

(1) 'Kaliaemia'; estimation of potassium in the blood. The normal level is 3.9 to 5.1 mEq/litre in the healthy subject.

(2) The electrocardiogram. When the potassium equilibrium is disturbed, there are always changes in the electrical potentials recorded for heart, brain, or muscle.

In practice the electrocardiogram, that is to say the record of the electrical potentials developed by the heart muscle, is the simplest and best known method of verifying alterations in body potassium.

POTASSIUM CONTENT

(in mg per 100 g)

FRUIT			
apricot, fresh	440	grapefruit	190
apricot, dried	1700	peach, fresh	160
pineapple, fresh	210	peach, dried	1100
pineapple, juice	140	pear	130
cherry	260	apple	120
fig, fresh	190	grape, fresh	254
fig, dried	780	grape, juice	120
orange	170	tomato	270
VEGETABLES			
globe artichoke	430	kidney bean	300
beetroot	350	dried beans	1200
carrot	311	potato	420
cabbage	300	lettuce	140
spinach	490	mushroom	520
MEAT AND POULTRY			
beef	340	ham	350
veal	380	duck	385
rabbit	390	turkey	370
mutton	300	chicken	370
pork	305		
FISH			
haddock	315	oyster	200
pike	350	salmon	315
herring	300	trout	330
CEREALS			
oats (rolled)	340		
wheat (germ)	780		
MILK AND CHEESES			
cows' milk	143	Camembert	90
Roquefort	100	Gruyere	110
MISC.			
chocolate	440	beer	50
egg	100	wine	100

INSUFFICIENT POTASSIUM: Systematic surveys of the blood potassium levels of apparently normal individuals have shown that a degree of insufficiency is not uncommon.

Signs of potassium insufficiency are:

- Neuromuscular troubles ranging from fatigue or muscular weakness to paralysis, according to the extent of the deficiency. The paralysis may affect the muscles of the trunk and limbs, the respiratory muscles, and the smooth muscles of the digestive organs. In the last case there may be a stoppage of the alimentary canal through paralysis of the intestine.

- Heart troubles. The heart is relaxed and dilated. The electrocardiogram is abnormal, and heart failure is a possibility.
- Nervous troubles, ranging from an indifference to the surroundings to a state approaching coma. These are signs of impaired brain function.
- The skin is dry, dehydrated.

These signs are not always noticeable and easily recognized, especially when they affect a child or even a young baby.

Causes of potassium insufficiency:

1—K insufficiency often results from medication or surgical treatment.

- The taking of preparations containing sodium, such as certain 'nerve medicines' which are often used to an inadvisable extent today.
- 'Slimming cures' badly conducted, often undertaken without any medical supervision (abuse of laxatives and purgatives to the point of chronic diarrhea; abuse of drugs that increase urinary elimination), and often coupled with an unbalanced dietary regime that cannot make good the losses of minerals.
- K insufficiency may set in a day or so after surgical treatment, and it is important to watch the blood mineral concentrations after major operations.
- The employment of the artificial kidney, in serious renal diseases, can also lead to such an imbalance, as can continuous digestive aspiration, sometimes used in acute intestinal stoppage or other disorders of the digestive system.

2—K insufficiency most commonly results from an organic illness: digestive, renal, nervous, or endocrine.

All digestive illnesses involving loss of liquids can be the cause of potassium depletion—such as diarrhea, especially the dangerous form of it associated with toxicosis in unweaned infants . . . and vomiting, from any cause, if profuse and repeated.

- Endocrine diseases. The cortex of the adrenal glands plays an important part in potassium regulation. Malfunction of these glands (originating in a tumor, for example, which brings about an excessive hormone secretion), finds expression, among other signs, in a fall in potassium.
- Kidney diseases. Forms of chronic nephritis with renal insufficiency as a long-term result, are responsible for disturbances of body potassium. Either an insufficiency or an excess may be manifested. In either case, it is a serious complication.
- Nervous diseases, whether congenital or infectious (meninigitis, poliomyelitis, encephalitis).

Finally, any factor causing severe shock to the organism (intense cold, surgical operation, hemorrhage, serious illness, or even strong emotion) can cause K insufficiency.

In addition to treating the root cause, K insufficiency must be relieved by increased potassium intake through a potassium-rich diet, sometimes through potassium salts as an oral medicine when possible or by the intravenous route—but always under a doctor's care.

POTASSIUM EXCESS: This is a rarer condition. A healthy subject is perfectly tolerant of an excessive potassium intake—the regulatory mechanism comes into action to eliminate the surplus. No trouble arises unless this mechanism gets out of order.

Such a derangement may arise through **dysfunction of the adrenal cortex . . . diabetic coma . . . renal inadequacy . . . severe state of shock (after wounding or crushing injuries).**

Along with the treatment to deal with these causes, a diet low in potassium should be given for the time being—only under a doctor's care.

POTASSIUM IN THE DIET: Food and drink are the only sources of potassium for a human being in normal circumstances, and the diet must of course provide an amount at least equal to the daily need—that is 2.7 to 4.3 g of potassium—to keep the balance.

It is found that an excess of potassium in the food intake does no harm at all to a normal individual. On the other hand, man is sensitive to a shortage of potassium in his food, and K insufficiency is relatively common. It follows that a potassium-rich diet is all to the good.

The growing child has higher requirement than the adult, for forming new cells.

If man is to obtain the proper amount of potassium in his diet, it follows that the foodstuffs of which it is made up—fruits, vegetables, meats and so on—shall also be adequately rich in potassium.

This will be the case when food crops and fodder crops are provided with potassium in the form of fertilizers. These replace the organic manures (of which supplies are now inadequate) to the immense need of mankind.

Finally, one may note that every plant, every animal also has its regulatory mechanism and retains only the necessary amount of potassium. It must appear that use of potassium fertilizers is an excellent means of making sure the continually increasing human race gets its indispensable potassium. **THE END**

Coffee Big "K EATER"

COFFEE IS ONE of the tropical crops that need a high level of soil fertility. It absorbs soil nutrients fast and has a high demand for them.

No definite recommendation for the kind and amount of fertilizer to apply can be made. Fertilizer needs of coffee depend on some factors like variety, soil, climate, cost and availability of fertilizers and method of plantation maintenance.

However, you can always depend on soil analysis to tell you what nutrients your soil lacks. In addition, observation of your plants can show you what they sorely need. You can make a trial application on a few coffee trees.

Usually, we determine the success of fertilization by the yield or return over the cost of fertilization. But specialists warn this is not enough indication because a big harvest may be obtained this year at the expense of the future crop.

Rainfall and growth habit of plants are important to consider when fertilizing coffee. Fertilizer may only be wasted when applied at the wrong time. Also, increased growth of the plant rather than more fruit may result if fertilization is ill-timed.

HERE ARE SOME general facts about coffee fertilization that may help in determining the time, kind, and amount of fertilizer to apply:

1—Potash is needed at all times by the coffee plant. It is the main mineral constituent of coffee. Best time to apply potash is before the rains come.

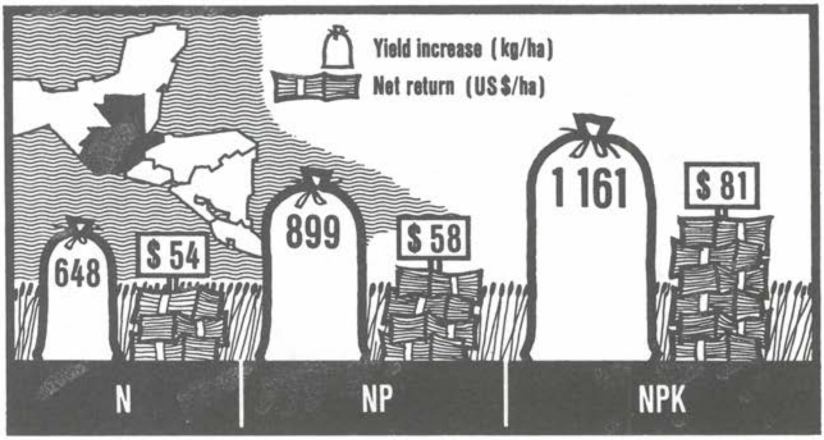
2—Nitrogen is also needed at all times. Nitrogenous fertilizer is usually topdressed in split applications near the end of the rainy season.

3—Phosphorus is needed most by coffee at the start of the fruiting season. Best time to apply is at about the flowering stage.

4—A normal crop of coffee "eats away" from the soil about 100 kg. nitrogen, 20 kg. phosphoric acid and 110 kg. potash to a hectare.

ARYA SWAPATRA

FAO: Fertilizer use on wheat in Guatemala profitable



GUATEMALA HAS to import considerable quantities of wheat. Yet there are unutilized potentials to increase the country's domestic wheat production.

Fertilizer demonstrations carried out in the West Plateau under the FAO Fertilizer Program in 1965/66 showed high responses to the application of N, P and K. Nitrogen alone increased average yields by 60%. With complete fertilizer treatments, including phosphorus and potassium, yields were more than doubled.

The response to 50 kg/ha K_2O, applied in addition to 100 kg/ha each of N and P_2O_5, was 262 kg/ha of wheat. The EXTRA net income due to potash application totaled $23/ha! POTASH REVIEW

HEAVY CROPPING EATS UP POTASSIUM

HEAVY CROPPING is depleting the potassium supply of irrigated farms in central Washington, according to a Washington State University study, led by scientists D. W. James, W. H. Weaver, and R. L. Reeder.

Potash hunger is showing up frequently in some potato fields . . . where tests show limited K supply and potash fertilizers are not used.

It has also shown up in two or three major grape vineyards of the Yakima Valley.

Until recently, little or no need for potassium fertilizer has shown up on Central Washington's irrigated farms.

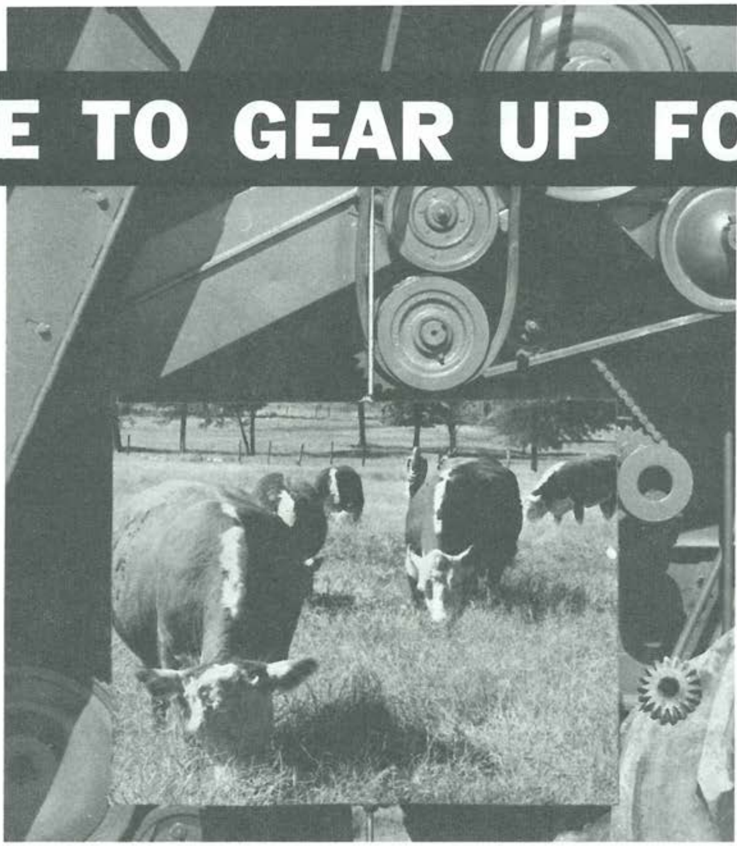
Recent research shows heavy potash users—Sudangrass, wheat, sugar beets, dry beans, field corn, potatoes, alfalfa—removing between 200 and 400 lbs. potassium PER ACRE. Potash fertilizer BOOSTED bean, Sudangrass, and field corn yields in soils testing below 200 K, potato yields in soils testing below 400 K.

THE TRIALS WERE conducted on outdoor fields, while most investigations on soil K potential are conducted in the greenhouse and laboratory.

Results from the test plots on Shano

TO INSIDE BACK COVER

TIME TO GEAR UP FOR A



Time To Let Growers Know:

MANY OF THEM SPEND 7 to 8 times more to buy feed than they invest in fertilizer to grow **feed** on the same acres they now farm. On most farms, 75 to 80% of the nutrients needed by dairy cattle can come from forage crops, even more for beef cattle and sheep, USDA says.

FOR EVERY DOLLAR a grower spends to produce grain he can get the same amount of feed nutrients from hay or silage (including corn silage) for 65 to 75¢ under many conditions. And from pasture forage it may cost him only 35¢ of that grain dollar.

SEVERAL STATES HAVE started forage testing services to check quality . . . to help growers reduce costs . . . to guide them in feeding most efficient ration. It pays to check with local agricultural advisors on where to get hay or silage tested for feeding value.

IT TAKES JUST as much money and labor to plow, plant, spray, and fence for low yields as for high yields—and just as much land. A little more investment in right fertilization might carry the grower from break-even yields to $50 or more clear profit from EACH acre.

FERTILIZED PASTURES pay off, as this Texas grower found in a Pilot Pasture Program:

	1965	1966	1967
ACRES	30	46	46
COWS	20	31	35
RETURN per acre	$31.87	$34.65	$49.83
RETURN per cow	$47.82	$51.43	$63.06

FALL FORAGE PROGRAM

WALL CHARTS

To Display Hunger Signs & Plant Food Removal Trends

PLACE MATS

To Pep Up Dinner Meetings With Top-Yield Techniques

NEWSLETTERS & FOLDERS

To Reach Extra Thousands Through Fast Mail Programs

SLIDE SETS

To Put Living Color & Interest In Your Future Talks

ORDER ON NEXT PAGE

10-TON COASTAL BERMUDAGRASS removes a whopping 1,115 lbs. NPK—570 lbs. N, 145 lbs. P_2O_5, and 400 lbs. K_2O PER ACRE! The same amount of alfalfa (10 tons/A) removes even more—1,175 lbs. NPK—or 560 lbs. N, 115 lbs. P_2O_5, and 500 lbs. K_2O PER ACRE!

10 TON/A ALFALFA gives the *energy* (TDN) found in 315 bu. of corn or 10.5 tons of corn silage . . . and the *protein* found in 715 bu. of corn or 150 bu. of soybeans. Even 5 ton/A alfalfa adds up to a lot of corn and soybeans.

IN MANY CASES, properly fertilized forage might produce 500 to 1,000 lbs. of beef per acre per year and milk production from 100,000 to 400,000 lbs. on a 100-acre operation. When $1,500 worth of fertilizer may add nearly $18,000 worth of milk, it's time to remind growers of the values in forage farming.

USE LEGUMES when possible. Researchers say legumes stimulate the cow's hormone system. Legume-grass pastures have produced more gain or milk per head, often per acre—plus higher weaning percent, slightly heavier calves. Clover-grass pastures have produced beef about 40% *more economically* than all-grass pastures.

RIGHT RATIO RATES the careful attention of every forage producer who fertilizes his crop—especially when the right fertilizer ratio can mean $1,200 MORE return from each 50 acres of alfalfa.

FOR FORAGE PROFITS

	Free Sample	Cost Each In Quantity
NEWSLETTERS		
Grow Two EXTRA Tons of Alfalfa—You Can Do It! (For Midwest, M-134)	______	______ 3¢
What Is Forage QUALITY—She Can Tell You (For South, S-152)	______	______ 3¢
Is Your TURF Behind The 8-Ball (For Midwest ____ M-141; East ____ E-128)	______	______ 3¢
You Can WINTERIZE Your Forage Crops This Year (For Midwest M-128)	______	______ 3¢
PLACE MATS		
You Can Grow 10-Ton Alfalfa	______	______ 2¢
Is Your Turf Behind The 8-Ball	______	______ 2¢
WALL CHARTS		
Know Potash-Starved Legumes When You See Them		______ 10¢
Plant Food Utilization—Nutrients Used Up By 20 Major Crops		______ 10¢
FOLDERS		
How Proper Fertility PAYS On Grasses and Legumes, B-60	______	______ 3¢
Coastal Bermudagrass—Your TRIPLE-THREAT Grass, D-65	______	______ 3¢
Potassium Helps Bluegrass Face HOT Summer, C-3-64	______	______ 3¢
Potash Can Toughen Your Turf, T-Su-65	______	______ 3¢
Put KUALITY In Your Lawn Turf, A-1-66	______	______ 3¢
Ten Tons Alfalfa NOW, A-Su-66	______	______ 3¢
Are You Geared For 10 Tons Forage? B-2-67	______	______ 3¢
Potassium Builds Alfalfa Quality, D-1-68	______	______ 2¢
Potassium Builds Quality in QUALITY GRASSES, G-1-68	______	______ 2¢
SLIDE SETS & SCRIPT	***10-Day Loan***	***For Purchase***
Build Quality Lawns For Beauty, 41 slides	Date ______	______ $8.00
Alfalfa For Top Profits, 40 slides	Date ______	______ $5.85
Coastal Bermudagrass, 49 slides	Date ______	______ $7.20
Fertilize Forages For Profit, 43 slides	Date ______	______ $6.30

Total Payment Enclosed $ ______

Name ______ Address ______

City ______ State ______ Zip Code ______

Organization ______

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

GEAR UP FOR FALL-WINTER

Let Growers Know . . .

THAT plowdown fertilizer often gives better yields than disked nutrients—sometimes 10 MORE bushels per acre corn.

It puts time to best use, with fertilizer spreaders and plows following right behind soybean and corn combines. It puts the plant food deep to give crops extra feeding and a cushion between rains next summer. Iowa research found both plowdown phosphorus and potassium boosted corn yields 8 bushels PER ACRE over the disked-in method.

THAT fall-winter fertility makes the grower more flexible and the industry more service-sure.

For the grower it speeds planting . . . reduces spring work load, soil compaction, costly delays . . . beats late spring drouth in the South, gets on full feed fertilizer.

For the industry it increases plant volume . . . improves customer service and equipment use . . . spreads work load . . . reduces storage needs and demurrage.

FOR EASY MAIL OUTS

FOR DINNER MEETINGS

AIDS ON NEXT PAGE

FOR COLORFUL TALKS

FOR PUBLIC DISPLAY

FALL-WINTER ACTION MAKERS

	Free Sample	Cost Each In Quantity
NEWSLETTERS		
Add Extra Days To Spring With Fall-Winter Fertility (For North M-150____; South S-155____)	____	____ 3¢
Year-Round Fertility Starts NOW (For Midwest, M-146)	____	____ 3¢
FOLDERS		
Beat the Weather—Fertilize This Fall (For Midwest, I-7-65)	____	____ 3¢
Let's Face Fall-Winter Facts (For Midwest, C-Su-66)	____	____ 3¢
PLACE MATS **(For Dinner Meetings)**		
Year-Round Fertilization Starts Today	____	____ 2¢
Grow 10-TON Alfalfa	____	____ 2¢
Keep Your Turf From Getting Behind The 8-Ball	____	____ 2¢
Aim for 80+ Bushels Of Soybeans	____	____ 2¢
You Can Grow 200 Bushels Of Corn	____	____ 2¢
WALL CHARTS		
Fall-Winter Fertilization Pays		____ 10¢
Soybeans Get Hungry, TOO!		____ 10¢
KITS OF ADVERTISING MATERIALS		
Order Catalog of Promotion Pictures & Newspaper Ad Mats	____	
Kit of Easy-To-Adapt Facts For Radio-Newspaper Advertising	____	____ 15¢
COLOR POSTCARDS		
Plan For "FULL-FEED CROPS" To Prevent HIDDEN Hunger	____	____ 2¢
Year-Round Fertilization Tips To Top-Profit Yields	____	____ 2¢

SLIDE SET & SCRIPT

Facts FAVOR Fall-Winter Fertility:

For South 10-day Loan____; Purchase____ $6.25

For North 10-day Loan____; Purchase____ $6.25

Total Payment: $____

Name____ Address____

City____ State____ Zip Code____

Organization____

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

A Few Whinnies

A baseball game being played in Old Man Jones' pasture broke up in the seventh inning in an uproar when Joe Spivis slid into what he thought was third base.

"Papa, I have to bring to the class tomorrow a simple explanation of 'inflation' and also of the Einstein theory of relativity. I wish you would help me."

"All right, son. Suppose we begin with Einstein's theory. That's the easiest."

A teacher was attempting to explain to the class the difference between abstract and concrete, and was doing her best to make the explanation very simple and clear. "Now," she said, "concrete is something that you can see and abstract is something that you cannot see."

A little boy looked quite enlightened, so the teacher ventured to test her explanation. "George," she said, "give me the explanation of something concrete."

"My pants," was George's reply.

"Correct," said the teacher. "Now give me an example of something abstract."

"Yours," gleefully answered George.

A prominent bishop sat in a box in the opera house awaiting the curtain and watching the fair ladies in low cut evening gowns being ushered to their seats. After looking around the house with opera glasses, one of the ladies in the party said:

"Honestly, bishop, did you ever see anything like it in your life?"

"Never," gravely replied the bishop, "never, since I was weaned."

Some of our older readers give fervent thanks that they lived in the days when you could kiss a girl and taste nothing but girl.

A young couple had just returned from their honeymoon. One of the bride's friends immediately called on her, and by way of making conversation asked:

"And how did John register at the first hotel you stopped at?"

"Oh, just fine," replied the bride happily.

A school boy writing a composition on Queen Elizabeth said: "Elizabeth was a queen and a virgin. As a queen she was a great success."

A fat lady stepped on the scales, not knowing they were out of order, and put in a penny. The scales went up to 57 pounds and stopped. A newsboy standing by noticed the situation. "My Gawd!" he cried. "She's hollow!"

A young school teacher entered the bus and sat down. She looked at the gentleman across from her and smiled very sweetly. He looked puzzled. Realizing that she didn't know him, she stammered:

"Oh, sir, please forgive me. I thought at first you were the father of one of my children."

At the next corner she left the bus.

DEALER

MARION E. KROETZ AND WALTER H. SCHMIDT
AREA EXTENSION AGENTS, AGRONOMY

OHIO STATE UNIVERSITY
DEFIANCE AND FREMONT, OHIO

LIME AND FERTILIZER dealers contact large numbers of farmers.

Some of these farmers maintain close contact with Extension personnel. Others do not. In all cases, these farmers want information that can best be supplied through Extension directly or indirectly. So, we asked both ourselves and industry: "How can Extension help dealers, working directly with farmers, get the agronomic information they need?"

Our **partial answer** to this question was a school for lime and fertilizer dealers and a demonstration report meeting conducted by and for dealers.

DEALER SCHOOL. The idea for a dealer school came from an industry request saying, "Our dealers need help in basic agronomic training." From this spark a school outline was created and sent to all dealers for their comments. They showed much interest and many suggested subjects the school might teach.

The program consisted of a 30-hour school conducted during one week. The school started on Monday morning, running from 9:00 to 4:30 each day through Thursday, and was completed by 3:00 p.m. Friday.

This allowed participants to spend full

Various methods of teaching were used. Illustrated lectures introduced specific subject matter area.

All lectures were open to questions by the dealer-students.

TRAINING

"an extension responsibility"

time in school, rather than trying to add an educational schedule to an 8-hour work day. This helped tremendously in conducting the school.

TABLE 1 gives the courses. Much emphasis was given to soils in the geographical area, their properties, and how these properties affect fertility and crop management.

TABLE 1.

SUBJECT MATTER FOR DEALER SCHOOL

Soils	9 hours
Lime	3 hours
N-P-K	7 hours
Micronutrients	2 hours
Diagnostic Techniques	2 hours
Crop Production Practices	7 hours
TOTAL	30 HOURS

The sessions on crop nutrients emphasized crop requirement, ways of supplying the requirement, and problems involved with each nutrient.

The diagnostic approach emphasized the value of looking at ALL factors when planning crop production programs and the need for problem-solving missions.

The crop production course discussed fertilization of each individual crop along with related management practices.

General discussions were held throughout each day to tie together subject matter and expand on ways to apply it.

A 400-acre class farm served eight work-sessions that helped dealers apply the information being discussed in the school.

The basic reference for this school was the Ohio Agronomy Guide developed by the State Extension Agronomy Staff at Ohio State Universty. In addition, a kit of reference material was prepared for each student, with the American Potash Institute providing some of the material for this notebook.

Since the school was held for dealers from northwest Ohio, much of the information applied directly to this area of the state, sometimes was not applicable statewide. For example, preventing manganese deficiency, growing bird-resistant grain sorghum where blackbirds prevent growing corn, and controlling wind erosion of sand could be discussed much easier in a regional than in a statewide school.

Teachers included the two area agronomists, research and state extension staff, and an industry agronomist. The area agronomists participated full time in the school, teaching specific subjects while maintaining continuity between subject matter areas.

SCHOOL RESULTS. Four 1-week schools have been held to date, with 139 dealers completing the 5-day course. Group size ranged from 20 to 63.

The smaller groups are much easier on the instructors and probably give the participant more opportunity to take part. But the large school group did not show any serious problems. A group of about 30 seems ideal for this type of school.

A pre-and-post-test was given. These tests included 25 subject matter questions and were identical except for color of paper. TABLE 2 shows the average pre-test score was 56% correct and average post-test score was 78%.

TABLE 2

PRE-AND-POST-TEST RESULTS

PERCENT CORRECT

Date	Pre-Test	Post-Test	Enrolled
Dec. 1966	53	76	27
Feb. 1967	58	82	63
Jan. 1968	62	70	20
Jan. 1969	51	79	29
Weighted Ave.	56	78	
TOTAL			139

Simply taking the test the second time did not account for this improvement, it seems, because 13 participants at one school missed the first hour due to bad roads and did not see the pre-test. Their average score on the post-test was 80%, while the total group had 82% on the post-test.

What did dealers like best about the school? They emphasized strongly these major items:

1—A better understanding of the Ohio Agronomy Guide.
2—Information on soils. This was a new area of study for many.
3—Understanding of soil test response curves for various crops and their use in making fertilizer recommendations.
4—Freedom of discussion and informality during school.

It should also be emphasized that Extension gains much from this type of contact with dealers—many good ideas on programs and needs of people.

DEMONSTRATION REPORT MEETING. Another type of dealer training was initiated in December of 1968 in northwest Ohio—a meeting where dealers reported demonstration results or field trials they conducted. The meeting attracted 107 dealers to hear 14 reports on demonstration results.

Twelve of these 15-minute reports were given by people working in the lime and fertilizer industry, two by Area Extension Agronomists. Extension distributed author summaries of these reports to people attending the meeting.

Reports were given on N-P-K rates, row spacing, use of Regim-8 (TIBA) on soybeans, manganese on alfalfa, tillage for corn, plant analysis summary, manganese and zinc chelates for corn-soybeans-alfalfa, and drill vs. broadcast fertilizer for wheat. Some dealers reported up to 3-years data.

DEALER CONTACTS. Dealer School evaluations show the average dealer has some influence on 150 farmers. This means the 139 participants in our dealer schools have some influence on 20,850 farmers.

Any way you look at it, even granting some duplications, this approach reaches a lot of farmers. This fact, along with helping dealers have a more successful operation, justifies Extension's effort to give lime and fertilizer dealers facts that will help them in their day-to-day job.

THE END

ARE ALL THE GROWERS IN YOUR AREA FORTUNATE ENOUGH TO GET YOUR EXPERT ADVICE?

PAGES 16-20!

AUSTRALIA, with a mere 12,000,000 people spread over its 3,000,000 square miles, is surpassed only by the United States and the Soviet Union in the extent of its aerial farming.

By far the greatest proportion of this activity in Australia is seeding and fertilizer spreading to improve pastures on sheep and cattle properties.

In 1951, a handful of agricultural aircraft operators spread less than 1000 tons of fertilizer for pasture improvement. Now the total area treated from the air in one year has reached 17,000,000 acres —nearly 80 per cent of it pasture improvement work.

The principal reason for this rapid growth was the establishment by the major fertilizer manufacturers of a Group Plan for contract spreading and bulk handling of fertilizers.

The airplane had already demonstrated that it was the most efficient means of spreading the fertilizers, mainly because of the terrain involved in pasture improvement. So, to relieve the property owner of all problems associated with carrying out a fertilizing program, the companies introduced the Group Plan. **This involves the integration of bulk loading, rail transport, distribution, and the air spreading operations into a complete co-ordinated contract service.**

SPECIAL ENGINEERED loaders confine the aircraft at the fertilizer dump only seconds. Skilled pilot and efficient loader-driver mean an average of 10 tons an hour. In favorable conditions, 15 tons an hour can be spread by the one aircraft.

It is conservatively estimated that more than 80 percent of all land in good rainfall areas of the Australian continent, which is about the same area as the United States less Alaska, is suitable for more intensive grassland techniques. This means much more work to be done by the agricultural pilots.

Fertilizer company forecasts predict that the 50,000,000 acres now under pasture improvement will rise to 130,000,000 acres in the next 20 years. It is estimated that 300 million dollars a year will be spent on pasture improvement over the 20-year period of the forecasts.

With a corresponding and proportionate increase in cotton, tobacco, and other crops which can be treated from the air, the volume of this work will also continue to increase sharply.

The potential for aerial agriculture in Australia is enormous. A flying training school has been set up at Bankstown airport to teach the techniques of aerial agriculture and assure the future supply of suitable pilots. **POTASH REVIEW**

IN CORN YIELDS . . .

Were YOU Disappointed?

B. O. BLAIR
PURDUE UNIVERSITY

MANY FARMERS in the central Corn Belt were disappointed in their 1968 corn yields.

It seemed we had almost an ideal summer and certainly an optimum fall for maturity. Then, why the light chaffy ears, low test weights, and poor ear tip fill?

Let us review the 1968 growing season for corn in Indiana:

Many farmers planted in late April and early May, though the soils were below 50°F. They hoped a warming period was on the way and they would be ahead of the game.

In most years this would be a good bet, because early planting is a recommended practice. The situation looked very good in central Indiana at the time, with excellent weather covering the last week in April and the first 10 days of May.

But then came 26 days of rain at least once every day, with the sun seldom seen. This reduced stands already planted, gave cool season grasses a wonderful opportunity to start, and kept the emerged corn seedlings dwarfed and short of nitrogen in the cold soil.

When the rainy period finally ended, much of the remaining corn acreage was planted in early June and, for the most part, the first two weeks were not the most ideal for germination and vegetative growth of a warm season crop.

Late in June the heat came on and by July 4 many fields began to show a potential for good yields. But the early plantings were dwarfed. And the late plantings, although healthy, had lost 4-5 weeks of valuable growing time and heat units needed for plant growth and leaf development.

Weather records of 1920-1966 show that our best corn yields in Tippecanoe County (such as the 105-bushel county average in 1965)—occur with a warm May and June followed by a cool July and August. The latter usually comes from adequate rainfall or cool cloudy weather, as in 1967 when temperatures ran 6°F below normal followed by a very dry fall up to October 10.

Lacking this growing start in 1968, the maximum leaf surface in many instances was not reached before July 25. **By this time root growth had practically ceased. This left the corn plant with shallow root systems and a photosynthesis surface ready for maximum effort, but too late for luxury uptake, particularly of K+.**

LUXURY K UPTAKE is important? Why should K uptake come early? It can most likely come early when leaf surfaces are produced early and while root systems are still actively growing.

In 1965, Indiana averaged 94 bu/A. Much of the corn had reached maximum leaf surface by July 10-14, allowing some two weeks for active photosynthesis while soil temperatures continued to rise and root systems were still active.

This gave an opportunity for K+ uptake and for K to be moved into the sink areas (leaves) about the ear. It's very important to FILL the sink with K+ before silking to insure ENOUGH K when the big need comes.

In 1968, climatic conditions were such that uptake occurred, but late, and limitations did exist in these beautiful tall plants with ears as much as 72″ from the soil surface.

POTASSIUM IS IMPORTANT, serving as the catalyst for conversion of sugar to starch and starch to sugar. Thus, on a good day much sugar is converted to starch in the leaf, making use of K+.

These large starch grains translocate with great difficulty, if at all. Thus K+ is needed again during dark periods to transform them into smaller movable sugars that can be translocated to sites of need (sinks).

The developing kernels act as sinks for the sugars, amino acids, and other materials. K is then called on again to transform the sugars and amino acids back into the structural and storage carbohydrates and proteins that make up the kernel.

EARLY SEASON IS IMPORTANT. If early growth has not occurred, if leaf and root development has not synchronized, and if K uptake has not progressed beyond current needs for later use, then the transformations just described may not function at maximum.

The result may be light chaffy ears, low test weights, and poor ear fill. In 1968, K was not in the plant **WHEN NEEDED** in spite of high soil tests for K.

In my opinion, this is why farmers of central Indiana and perhaps elsewhere experienced lower yields than the season should have appeared to provide. We had ample heat units for a good yield, but they came too late to assist with timely growth and luxury uptake especially of K+.

A warm May and early June coupled with the remainder of the 1968 season could have put Indiana's state average corn yield well over the 100-bushel average.

In total, getting top corn yields requires more than cultural practices, fertility, and the best hybrids. Mother Nature must still cooperate with us, especially in the early spring, for the "yield machinery" to function in high gear.

Schaal, L. A. and B. O. Blair. The Temperature Factor in Corn Production in Tippecanoe County, Indiana. Proceedings of the Indiana Academy of Sc. Vol. 77, 1968. Newman, J. E., B. O. Blair, R. F. Dale, L. H. Smith, W. L. Stirm and L. A. Schaal. Growing Degree Days—A new system of rating crop maturity could help you predict harvest dates more accurately. Crops & Soils 21 (3) 9-12, 1968.

THE END

MR. EXPERT . . .

Why Aren't YOU Farming?

ONCE UPON A time, like right now, there was a farmer who owned so many labor saving devices and received so much advice he only had to work 16 hours a day. The remaining time he spent reading about how to be more efficient.

On his way to the field to plow one typical morning, the farmer was met by a steady stream of helpful advisers.

"You should have plowed last fall," said the county agent.

"Plant single cross corn," advised a seed corn salesman.

"Tile the field first or you might as well save your breath," warned the SCS technician.

"Soybeans are your best bet, and I have just the variety. . ."

"A good place for conservation reserve"—State Wildlife officer.

"Why don't you try a new cash crop, like vegetables?"—Produce manager at local supermarket.

"Your best bet is to turn it into a golf course."—Close friend and sportsman.

"What about a subdivision?"—Brother-in-law in real estate.

"Just sell it and let me spend the money."—His wife.

WHILE THE YOUNG farmer was trying to get some plowing done, he switched on the tractor radio and the Voice of Agriculture at the University lectured him about putting enough lime down and what to do about his manganese deficiency. He switched stations to get the market report and found that he should have sold his hogs yesterday, the fathead, and if he didn't buy this new kind of rat poison, his farm was doomed.

By choretime, most of the advisers went home because their work day was over. The milk inspector had left a note saying the milkers needed new inflations and that there were three microscopic particles of dirt in the pipeline. A report from DHIA pointed out it was costing him 87¢ a day to keep lovable old Crumpled Horn in the milking line.

AFTER EATING supper (8:30 p.m.) he turned on the TV and heard the Secretary of Agriculture telling him to gear up to feed the whole blooming world—even though he wasn't getting paid enough for feeding 37 other Americans yet.

The young farmer was not ungrateful for all the help he was getting, mind you. He realized that it was all given in a spirit of help and generosity.

But he began to wonder if all the people busying themselves with helping him were unconsciously treating him like a digit on the computer, or a machine to be greased, cranked up and kept going like a windup toy.

The young farmer whipped out a sheet of paper (it was long past midnight) and began to figure how much time it would take him if he really did everything right: Clean air filters every 12 working hours; keep air pressure correct in all the tires (232 of them); make sure the pulsator was in perfect timing every milking; check every quarter of every cow with the strip cup every milking; cut every needle tooth from every pig; give every calf a scours pill every time it needed one; feed precisely the right amount of grain, hay and silage; kill every yield-cutting weed, nematode, weevil, and wireworm; pick up every nail and piece of wire that might penetrate tire or cow stomach; grease every bearing; replace every worn-out belt and spark plug before it caused trouble; keep the walls painted and the faucet dripless in the hired man's house, not to mention his own; support four farm organizations and 22 community projects; attend meetings of the school board, the zoning board and the JCs so farming interests would be properly represented.

JUST TO LIST all the marks of an efficient farmer took the rest of the night, and the sun was rising when he finally arrived at the number of hours it would take to do a job that all the advisers would be, if not pleased, at least soothed. He'd have to work 32 hours every day.

Next morning, he hung a sign on the milk house door: "Office Hours 7:00 to 9:00 p.m. by appointment," and went fishing.

To be quite frank, the farmer barely broke even that year, which worried the banker, the PCA man, the equipment dealers, the government and a great many other people whose livelihood depended on his success. But to all their frowns, the young farmer had an answer: "If you're so smart, why aren't you farming?" There was a new bounce in his step, the work all got done in fairly tolerable fashion, and his son knew what it was like to hook a 2-lb. bass.

THE YEARS ROLLED by and the farmer's new vigor, acquired from being a little less efficient and a little more relaxed, gave him five years of active farming he would not otherwise have had.

And whenever anyone asked to see his best cow, he'd show them Crumpled Horn. She didn't give much milk, but she was the only cow he knew that ever learned how to shake hands with her left front foot.

GENE LOGSDON

FEED COASTAL BERMUDAGRASS FOR . . .

The LONG Pull

(10 . . . 15 . . . ? . . . YEARS)

W. W. WOODHOUSE, JR., N. C. STATE UNIVERSITY
IN CROPS & SOILS MAGAZINE

FOR MANY of the sandy, very drouthy soils of the Southeast, Coastal bermudagrass may be the only paying crop available. Thus, once established, it would be nice if it could be left there indefinitely.

Can stands of Coastal be kept productive on submarginal soils for long periods of time—15 years, 30 years, indefinitely? We think so.

We have just completed the fourteenth year of a field trial with this crop, growing on a deep sand in the Sandhill Region of North Carolina. Since, with the better treatments the last 5 years have been the best, we think we are learning how to hold this level of production right on into the future.

Proper fertilizer and lime use is a must. Practices that appeared to be getting you by in good shape the first few years, don't hold up over the long pull. For example, the lowest rate of potassium we tested, 40 lbs. per acre annually (48 lbs. potash), was adequate the first 5 years but failed to produce full yields in eight out of the next nine years.

Similarly, almost no lime response occurred until the fifth year, but then production on the unlimed soil started dropping, falling to one-third of normal by the eighth year. Sulfur response began to show up in the fourth year and became more marked as time went on.

APPETITE FOR POTASSIUM. This shouldn't be too surprising. Take, for example, fields fertilized with 200 lbs. of nitrogen per acre annually. Over a period of 14 years, **more than a ton of potassium an acre has been removed in the hay harvested from them. And remember that sandy soil is very low in potassium to start with and it has little ability to hold nutrients of any kind.**

Coastal's deep and extensive root system enables it to do well with adequate fertilization on these poor drouthy soils. We found roots below 8 feet and they were quite plentiful at 7 feet.

This cuts way down on leaching loss of nutrients such as nitrogen and potassium at least during the growing season. It also means that Coastal can "mine" the soil nutrient supply to considerable depths and it helps explain the lack of early response to some nutrients that may become really critical later on.

THE RIGHT RATE. The amount of nitrogen applied on a crop of this sort largely controls production level, provided the supply of other nutrients is kept in balance. Consequently, it makes sense to tie phosphorus and potassium fertilization to the rate of nitrogen.

Our data indicate that the rule of thumb of applying fertilizer in a 9-1-4 ratio (4-1-2 oxide form) is not too far off the mark.

Lime becomes important for maintaining Coastal bermudagrass sooner or later, although it may not seem so for a while. On sandy soils the fairly high nitrogen rates required by this plant can acidify the soil to great depths if you don't have an adequate liming program.

In our experiment with infrequent liming and high nitrogen, we developed a strongly acid profile down to a depth of 8 feet. We are trying to correct this by frequent topdressing of lime, but we are not yet sure it can be done. In the meantime, we are suggesting that growers apply lime fairly often to keep this condition from developing.

Secondary nutrients such as sulfur and magnesium are likely to become limiting sooner or later unless provisions are made for them.

Micronutrients do not seem to have been a problem on Coastal so far, either in our trials or elsewhere. However, it would not be surprising to see one or more of these become limiting in time on very sandy soils.

There is not much zinc, calcium, or boron in a ton of Coastal hay, but removing 100 tons or more of hay could begin to put a strain on the soil supply.

WHOLE Package Gets Top YIELDS

LOOKING FOR TOP YIELDS? Indiana corn contest winners looked to **the whole package of practices** to get winning yields:

Fall plowing . . . soil testing . . . early planting (before May 10) . . . closer rows (less 34″ rows) . . . insecticides and herbicides . . . plenty of fertilizer . . . high plant population.

Yield contests are on the climb, according to Purdue Extension Agronomist, Ben Southard, reporting in **Crops and Soils Notes.**

They make good "talking matter" from late November until planting next year. Neighboring farmers can use them to keep up friendly competition. Industry salesmen can use them to sell products. And Extension specialists can use them as a good teaching tool.

Indiana has sponsored its corn yield contest 54 years, Southard reports. Originally a 5-acre hand harvest contest, it was changed in 1966 to a 10-acre picker-sheller contest with **a strong state recheck and verification program.**

"This new contest clearly demonstrates what Indiana farmers can produce on large acreage with modern harvest equipment," Southard explains, "and incorporates a measure of efficiency as well as production."

HE CITES THREE WAYS such contests benefit farmers: (1) They increase incentives to produce more by adopting new practices. (2) They produce results that can be used as an effective educational tool. (3) They provide an excellent opportunity to learn the yield potential of soils, as record-keeping contestants determine what yield level is the most profitable.

Indiana's 1968 10-Acre Corn Contest—sponsored by the Indiana Crop Improvement Association with the Cooperative Extension Service—showed how top corn producers use the latest agronomic practices to lead the way.

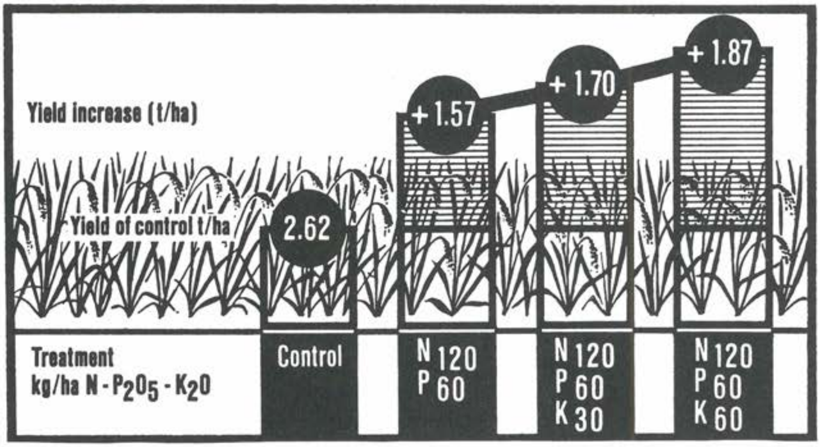
THE TABLE summarizes practices from field record sheets, based on 100 random samples in each group.

THE END

TOP YIELD GROWERS USE PACKAGE OF PRACTICES TO LEAD WAY

Practice	Above 150 bu.			80-120 bu.		
Fall plowed		25%			7%	
Soil tested		52%			23%	
Planted before May 10		86%			55%	
Planted less 34" rows		49%			15%	
Use soil insecticides		67%			44%	
Use herbicides		76%			59%	
Average lb. fertilizer	N	P_2O_5	K_2O	N	P_2O_5	K_2O
	163	128	166	113	106	115
Planted above 22,000		84%			40%	
Av. plants per acre		25,000			22,800	

Increasing yields of paddy by NPK in India



RESULTS OF 449 fertilizer experiments conducted on cultivators' fields in 9 districts of India during the "kharif" season 1967/68 on high-yielding varieties of paddy showed significant responses to large fertilizer applications.

The heavier NPK treatment (120 kg/ha N, 60 kg/ha P_2O_5 and 60 kg/ha K_2O) recorded the highest order of response, i.e. an increase in yield of 1.87 t/ha (total 4.49 t/ha) as compared with the untreated control (yield = 2.62 t/ha).

Potash at the rate of 60 kg/ha K_2O, given in addition to N and P, raised yields by nearly 300 kg/ha whereas the lower dose of 30 kg/ha produced a yield increase of only 132 kg/ha. **These findings indicate that K_2O rates exceeding 60 kg/ha would possibly result in a still higher yield increase. POTASH REVIEW**

FROM PAGE 15

silt loam (in the Columbia Basin) showed that central Washington soils do not have an unlimited capacity to provide adequate readily available K under certain systems of cropping. This conclusion is in contrast with that of other researchers who tested K potentials of similar soils in the greenhouse.

At the same time, the results of this investigation, indicating that K soil test index can be used to predict the relative K potential, agree with results of earlier workers.

The changes in the K soil test index in the Shano silt loams were observed from 1961-1967. The investigators also made some observations of Selah loam in the Kittitas Valley which had been under cultivation since 1932, and compared the cultivated soil with nearby rangeland soil.

The cultivated land has been irrigated and used for forage and row crop production, with very limited use of K fertilizers. K soil test index values were generally below 300, to as low as 60.

Samples of Selah loam from the rangeland averaged 628 and 513 K soil test index. The investigators state that other factors may have contributed to the differences between the cropped and uncropped areas, but removal of K in irrigated crops undoubtedly has had a predominant influence. **THE END**

"ENORMOUS RESPONSE"

MICHIGAN STATE UNIVERSITY has informed the American Potash Institute that it has received "enormous response" to an article recently published in the Institute's BETTER CROPS magazine.

The article, **"Soil Science Teaching Comes Alive,"** appeared in Number 4, 1968 BETTER CROPS issue. It features a new approach for teaching introductory soil science—a 5-credit course with only two lectures, but an unscheduled multi-media study lab with special demonstration tables and study stalls for tape recorded lessons illustrated by colored slides, all guided by a special workbook.

To answer the interest generated by the BETTER CROPS article, Michigan State is offering the course's materials for purchase: tapes, tape scripts, colored slides, and workbook. Send all inquiries to Dr. Henry Foth, Department of Soil Science, Michigan State University, East Lansing, Michigan 48823.

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