Better Crops
WITH PLANT FOOD

November-December, 1964

20 Cents

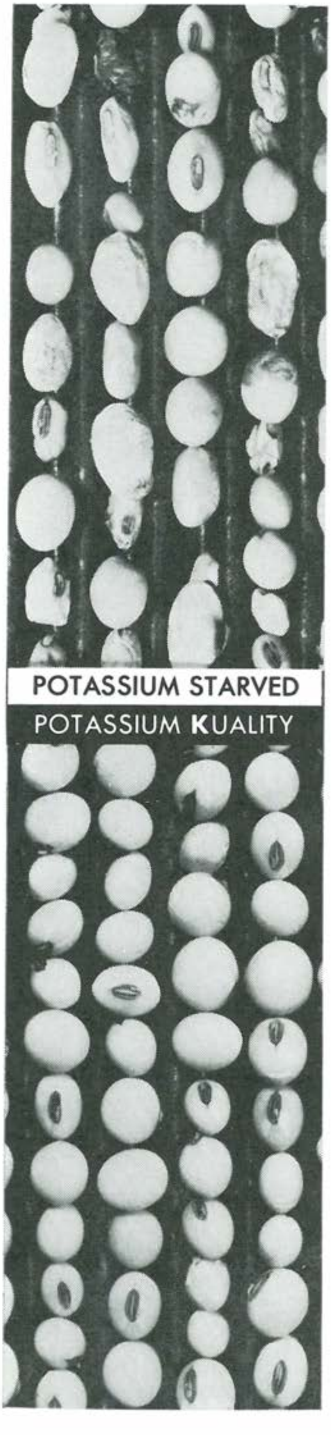
THE KEY...

ON THE COVER . . .

. . . the quality of your soybean crop begins with the quality of a single bean.

Through right management, this bean can be multiplied into thousands of quality soybeans per acre, into 50 bushels per acre averages by some growers.

The check list on the opposite page gives some steps to high quality yields.



. . . IS IN THE BEAN . . .

A CHECK (√) LIST FOR HIGHER SOYBEAN PROFITS

ARE YOU AMONG THE 90% WHO COULD PRODUCE 10 MORE BUSHELS PER ACRE WITH EASE BY FOLLOWING CERTAIN STEPS?

(√) FERTILITY, LIME ——————→ PICK UP **5-10** BUSHELS

Test the soil and apply lime if needed. Higher yielding fields are highly fertile. Keep them that way. Apply plenty of P and K to the crop before soybeans, because carryover fertility pays off on soybeans. Then maintain your fertility level by fertilizing the soybeans either broadcast or band placed 2" to the side and below the seed. You may need manganese. Check with your fertilizer dealer.

(√) SEED ——————→ PICK UP **5-10** BUSHELS

Use certified seed of adapted variety. Don't gamble with poor germination or the introduction of weeds. See your agricultural leader for best variety for your area and rotation each year.

(√) PLANT SPACING ——————→ PICK UP **4-6** BUSHELS

Narrow the rows in Northern States. Narrower rows, 20 to 30 inches, will increase yields. Equipment is available. Plant about 6 to 10 viable seed per foot of row depending on row width.

(√) LAND PREPARATION ——————→ PICK UP **4-6** BUSHELS

Use minimum tillage. Keep the soil loose between the rows so rain can penetrate.

(√) WEEDS ——————→ PICK UP **3-10** BUSHELS

Use a rotary hoe early. The "weed tax" takes its toll in many soybean fields. Win the battle the first four weeks after planting.

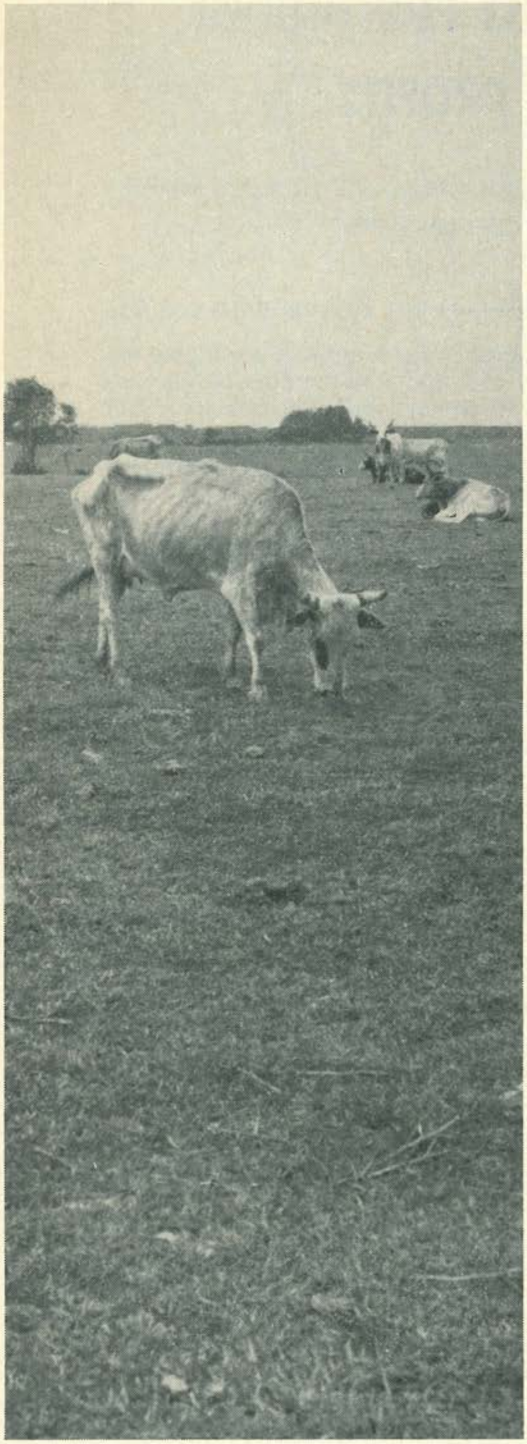
(√) INSECTS ——————→ PICK UP **2-4** BUSHELS

Check for root, stem, leaf and pod feeders. Consult your agricultural leader and your dealer on control.

(√) COMBINING ——————→ PICK UP **3-5** BUSHELS

Set the combine right. Don't leave 10 to 20% of your beans on the ground. Did you know 4 beans per square foot on the ground means a bushel per acre—lost! Set the combine by the manual—accurately.

FOUR GUIDES TO SOYBEAN PROFITS—**WALL CHART, FACT SHEET, NEWSLETTER, SLIDE SET**—SEE INSIDE BACK COVER.



IN
TEXAS!

NOT THIS . . .

J. R. CARROLL COUNTY AGENT

From only one cow *per 10 acres* to one brood cow and calf *per acre* —this is what Chambers County farmers can do to the carrying capacity of their unimproved pasturelands.

How?

By *right management*—proper fertilization and liming, the best adapted varieties, and efficient care and usage of the forage produced.

Today some farmers produce about 450 to 500 lbs. salable beef per acre. And the calf crop on their improved pastures runs over 90%, while unimproved pastures do well to run 60%.

Much progress can be traced to a decision our farmers made in 1961: that something had to be done to improve our agricultural income.

A basic problem—then and now—is low soil fertility.

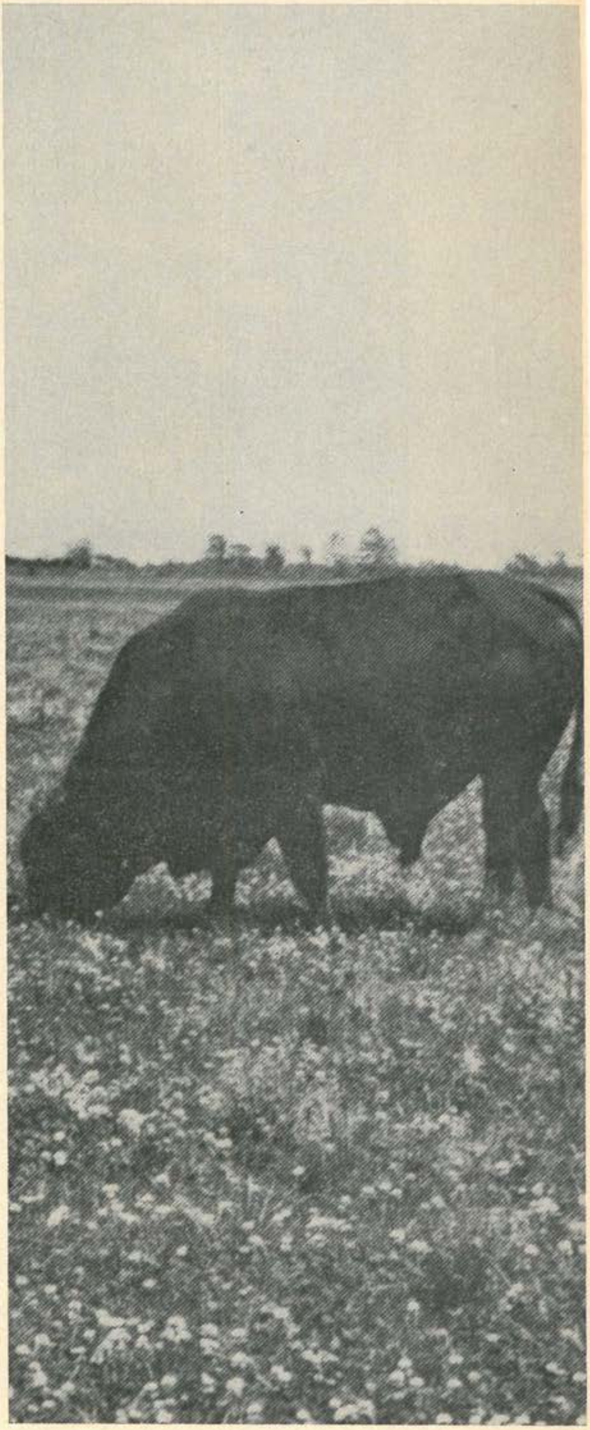
Loin disease, often found in cattle grazing unfertilized pastures, is nothing but phosphorus deficiency in the diet. Where fertilizer is adequately added, this problem disappears.

In fact, Chambers County soils and most Texas Gulf Coast soils are very

MAKE PASTURES PAY PROFITS!

. . . BUT THIS

IS THE GOAL OF OUR CHAMBERS COUNTY SOIL FERTILITY PROGRAM



low in phosphorus and many are low in potash. Many soils also need lime.

To tackle this problem, our farm leaders organized the Chambers County Intensified Soil Fertility Committee as part of an over-all agricultural program to build the county:

- W. M. Edmonds, rice farmer and rancher, as chairman of the agricultural division.
- B. M. Jenkins, rice farmer, rancher, and largest La. S1 white clover seed producer in the U. S., as chairman of the Intensified Soil Fertility Committee.
- W. S. Edwards, rancher, as vice-chairman of the Committee.
- Sherwood Blair, farmer and Chambers County tax assessor-collector, as secretary-treasurer.

Keeping clover in our pastures is a big goal of our program. After all, our county is the S1 White Clover capital of the world, growing about 50,000 acres of this highly nutritious legume that lives through the summer and fall

TO MAINTAIN STRONG WHITE CLOVER-GRASS PASTURES, both test demonstrations and farmer experience indicate a fertilizer treatment of 0-100-100 per acre each year. Grasses, spurred on by the large quantity of clover-produced nitrogen, can out compete clover for medium to low levels of phosphorus and potash. If farmers fertilize fully for the clovers and manage them right, the grasses will take care of themselves.

and reviews its growth from stolens in the fall.

We harvest from 100 to 200 lbs. clean seed per acre from about 6,000 acres each year.

Clovers demand much phosphorus and potash—especially potash—but are poor feeders. The grasses, with tremendous root systems, are greedy feeders. Many farmers lose the clover in their pastures by fertilizing for the grass but not the clover—that is, they do not provide enough phosphorus and potash for the clover to get its needed share in the face of the highly competitive grass.

Of course, it takes more than fertilizer to maintain a good stand of clover in a pasture. A key management step is removal of excess forage in the fall. Most successful farmers do this to allow sunlight to hit the soil and give small germinating clover plants a better start.

The excess forage is far more profitable as hay than as dry grass interfering with fall growth of clovers.

Our committee now maintains 59 pasture fertilizer test plots over the county, keeping careful records on forage, protein, beef, and seed production—and costs.

WHERE THE PROOF IS IN THE PRACTICE

When fertilized with 192 lbs. of phosphorus and 120 lbs. of potash per acre Louisiana S1 White Clover had 26.6% protein content on the Jenkins Farms nea Hankamer. The high quality forage yield of 72,000 lbs. green weight supporte one brood cow and calf per acre. Salable beef (calf) ran between 450-500 lbs per acre.

About 30% of our pasture and rangeland can now be called improved. That leaves over 100,000 acres of open rangeland waiting to be treated so it can carry one cow and calf per acre instead of one cow per 10 acres!

CLOVER IS GOLD when fertilized and managed right. We estimate that Louisiana S1 White Clover produces over 200 lbs. nitrogen per acre for a clover-grass pasture. You can figure your own cost—$20 to $25 per acre—if you bought it as fertilizer nitrogen.

NOT THIS . . . BUT THIS
comes from scientific tests

Like the rice plants above, the Chambers County Soil Fertility Program is based on scientific farming:

1 Field Tours—showing firsthand what proper fertilization can do to forage and rice yields.

2 Tissue Test Clinics—revealing facts about plant nutrition needs not clear to the naked eye. Five tissue testing kits are now used throughout the county.

3 Short Courses—keeping farmers up to date on latest fertilizer practices and beef cattle findings.

4 Forage Testing Service—urging farmers to use this new Texas A & M service, to become aware of high *quality* hay through proper fertilization, curing, and handling.

Two 1974 Projections:

Establish 79,956 acres of adapted grasses and legumes in crop rotation and improved pastures in the next 10 years.
Increase percent calf crop to at least 85% average by 1974.

The Jenkins Brothers cut 36,000 bales of Coastal hay from 70 acres in 1964—with no irrigation. They used 2,300 lbs. of 16-6-12 fertilizer and 500 lbs. ammonia sulphate per acre. Their bales averaged over 50 lbs. per bale, their yields 12.5+ tons per acre.

THE END

IN WESTERN OREGON

ALFALFA NEEDS POTASH

ALFALFA is usually the highest yielding forage crop in the Pacific Northwest when grown on suitable soils. . . . and the right management practices can mean plenty of high quality feed.

The route to a successful alfalfa program includes these steps:

LIME—to correct acid soils that have come from heavy rainfall (more than 40″ annually) west of the Cascades.

PHOSPHORUS—to help establish alfalfa on many soils and boost subsequent yield production.

POTASSIUM—to insure good yields, longevity of stand, and winterhardiness.

BORON and SULFUR—to overcome the deficiency of these elements in most western Oregon soils.

INOCULATION: *Good* inoculation is *essential*. Apply 2 to 5 times recommended amount of fresh inoculum and *don't let* the inoculated seed *dry excessively* during planting.

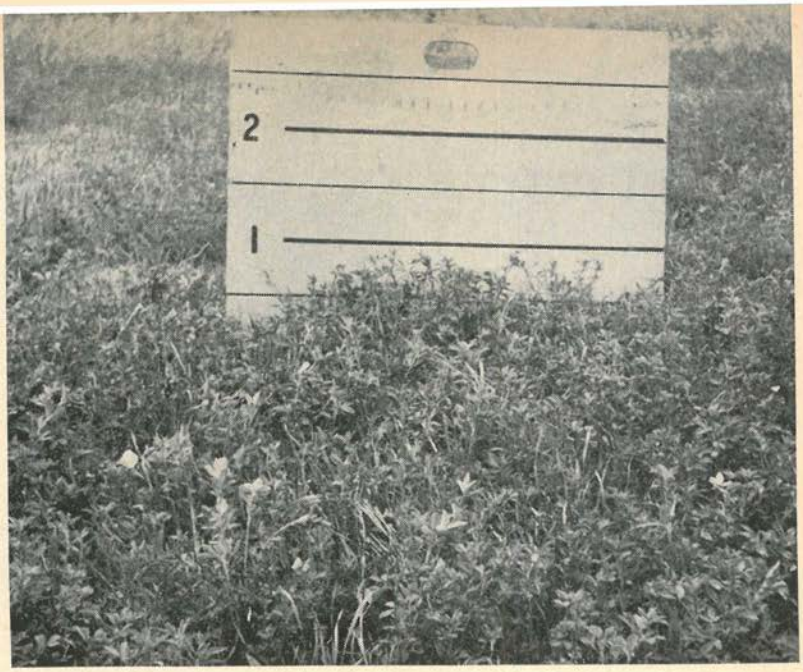
AND REMEMBER: Your alfalfa crop removes large amounts of potassium—considerably more potassium than phosphorus with each crop. A potash bearing fertilizer should be used annually when your K soil level is not high.

BY T. L. JACKSON
OREGON STATE UNIVERSITY

K

TREATED

PLOT



POTASSIUM PUTS VIGOR IN ALFALFA STAND—plays a big role in maintaining the stand. This Columbia County experiment contrasts a K treated plot with a no K treated plot.

The K-treated plots averaged 8 healthy alfalfa plants per sq. ft. at the end of 3 years—the no-K plots only 1.5 plants per sq. ft., with marked reduction in the vigor of surviving plants.

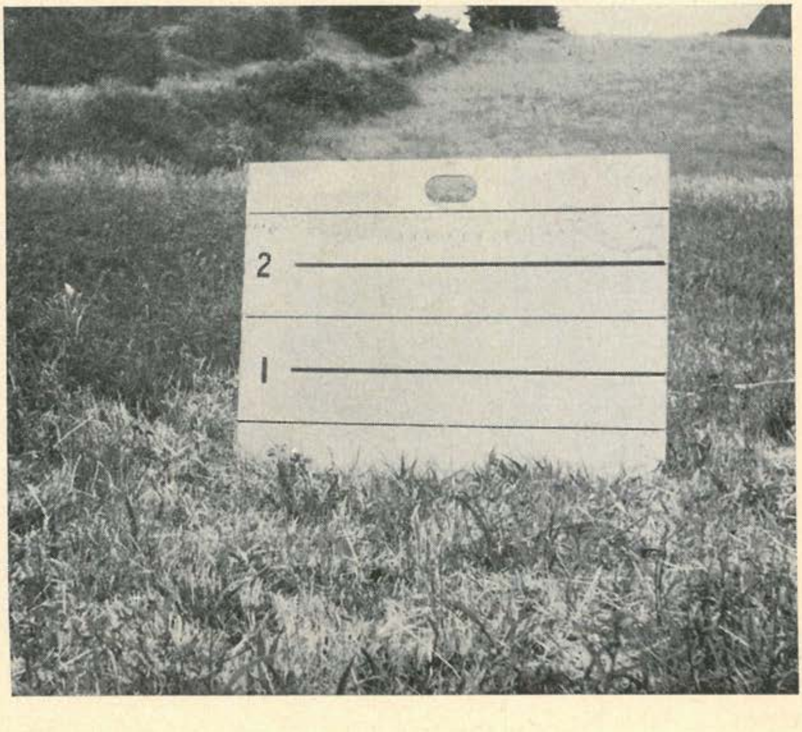
The experiment began with a potassium soil test value of 200 lbs. K per acre.

These experiments turned up some soils with adequate potassium and no expected response from K fertilization.

NO

K

PLOT



LIME

ON THE ACID SOILS of Western Oregon, lime is important for alfalfa production—as shown by this contrast on some hill soils. The first step to a successful alfalfa crop is a soil test and proper liming. Remember: liming generally reduces the amount of potassium plants take up, since the calcium in the lime competes with potassium in nutrient uptake.

PHOSPHORUS

BAND APPLICATION of phosphorus is very important in establishing alfalfa on acid soil and low-P soil. This contrast between broadcasting and banding phosphorus 1″ below the seed at planting occurred at Red Soils Experiment Station near Oregon City. After stands become established, phosphorus should be broadcast annually in the fall or early spring when needed for production. Remember: plant roots really go after nutrients from moist surface soils in early spring and under summer irrigation.

BAND BROADCAST

and **POTASH** ➚

FIELD EXPERIMENTS, like the one above, have shown alfalfa's need for potash fertilization on many soils throughout Western Oregon.

These experiments have developed a basis for predicting soil test values where alfalfa will respond to potassium fertilization.

Measuring potassium removal from the soil through changes in soil test values has been a major part of these alfalfa experiments. Potassium soil test values are generally measured by extracting the soil with one normal ammonium acetate or sodium acetate.

Soil test values of 350 lbs. K per acre have been high enough for sustained production of high yielding alfalfa on the well drained valley floor soils. Alfalfa roots go to a depth of 6-8 feet on most of these soils, while the subsoil is often well supplied with potassium and has a pH approaching neutral.

On the foothills surrounding the Williamette Valley, about 2,000,000 acres of unimproved pastures offer great forage potential.

Non-irrigated alfalfa will yield 3.5-4.5 tons per acre on most of these soils when properly limed and fertilized—*removing 120-180 lbs. of potash per acre each year.*

Irrigated alfalfa will yield 6-7 tons per acre on these hill soils (the same on deep, well drained valley floor soils *without* irrigation)—*removing 200-280 lbs. of potash per acre.*

HOW K FERTILIZATION AFFECTED ALFALFA YIELDS AND POTASSIUM SOIL TEST VALUES—3 YEARS PRODUCTION.

Potassium treatments each year	Location #1			Location #2		
	1st Yr Yield Lb/A	2nd Yr Yield Lb/A	3rd Yr Yield Lb/A	1st Yr Yield Lb/A	2nd Yr Yield Lb/A	3rd Yr Yield Lb/A
No Potassium	8320	4590	1000	9110	9600	8570
75 lbs. K_2O/A	8430	6160	6860	8860	9430	9950
150 lbs. K_2O/A	9080	6510	6980	9230	10150	9880
	Potassium soil test values—Pounds K/A					
	Lb/A	Lb/A	Lb/A	Lb/A	Lb/A	Lb/A
Check	400	340	130	370	350	330

All plots received optimum application of lime applied before planting (Optimum lime treatments on hill soils have pH above 6.0 and are about 60% or more base saturated.), 90 pounds of phosphate (P_2O_5)/A each year, 40 pounds of sulfur/A each year, and 2 pounds of boron/A each year.

K ON YIELDS AND VALUES

High K removal (by high yields) reduces potassium soil test values markedly on soils of inadequate reserve potassium supplying power.

In this table (above), locations 1 and 2 showed fairly comparable K soil test values when the experiments started, but location 2 had a better reserve supply of K.

Both locations declined in soil test values during the 3 years—location 1 more than 2. First year both responded about the same from potassium fertilization, but location 1 showed much greater response the second and third years.

Some experiments with higher K soil test values and greater reserve supply of soil K showed neither this drop in K soil test values nor a response from K fertilization during the 3 years.

SOIL TEST—DON'T GUESS

The best rule is this: soil test for potassium every fall when heavy K-using alfalfa is grown on fields where soil test values are approaching levels at which K response might be expected.

Potassium rates vary with expected yield and soil test value. County agents and state universities have this advice throughout the Pacific Northwest.

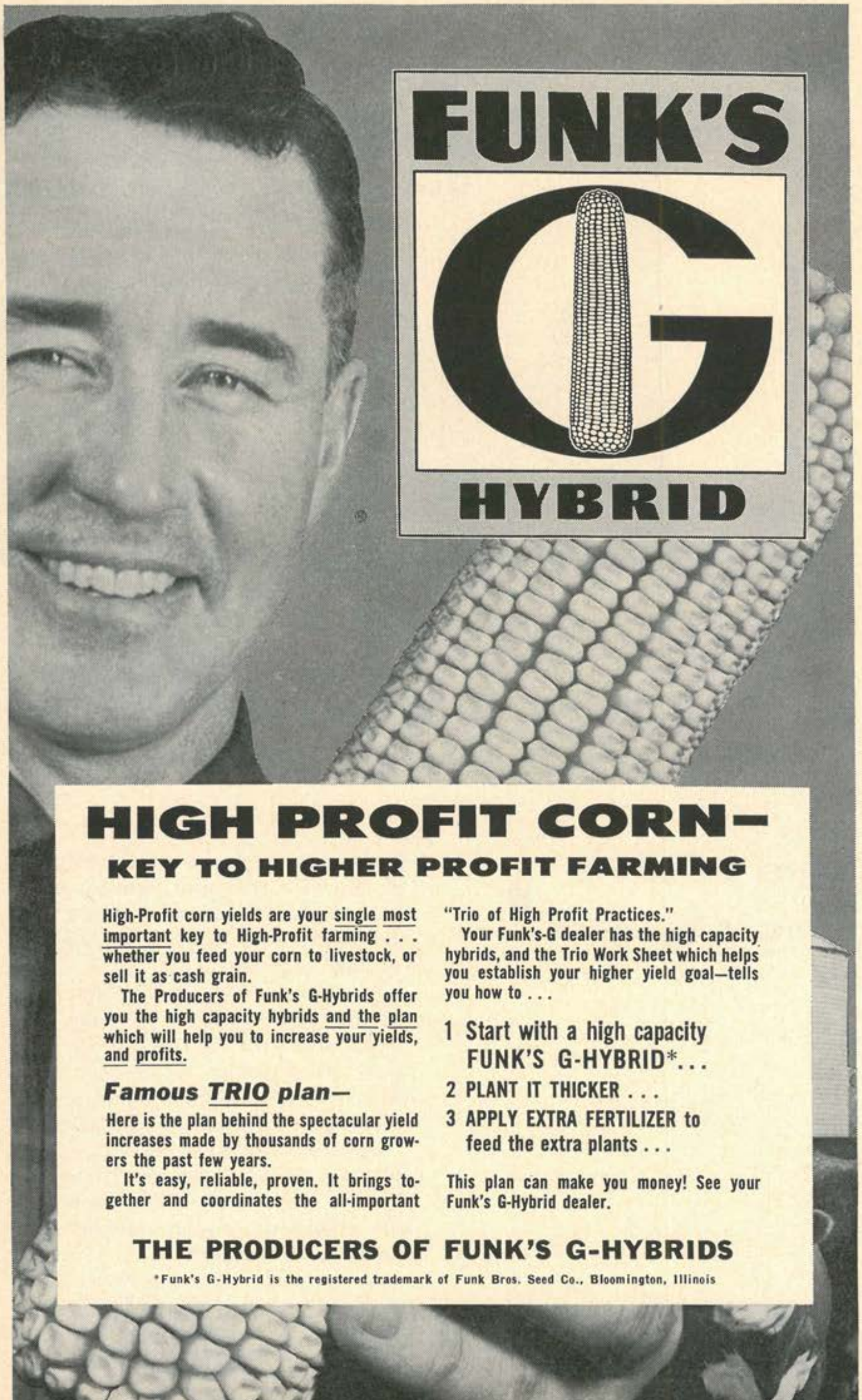
WATCH BORON & SULFUR NEEDS

When growing alfalfa in Western Oregon, apply 2 lbs. of boron and 30-40 lbs. of sulfur per acre for maintenance.

A boron soil test will tell you when boron left from previous applications is enough for the alfalfa crop.

Boron is very critical without irrigation because the surface soil dries out and reduces availability of boron.

THE END


FUNK'S
G
HYBRID
HIGH PROFIT CORN—
KEY TO HIGHER PROFIT FARMING
High-Profit corn yields are your single most important key to High-Profit farming . . . whether you feed your corn to livestock, or sell it as cash grain.
The Producers of Funk's G-Hybrids offer you the high capacity hybrids and the plan which will help you to increase your yields, and profits.
Famous TRIO plan—
Here is the plan behind the spectacular yield increases made by thousands of corn growers the past few years.
It's easy, reliable, proven. It brings together and coordinates the all-important "Trio of High Profit Practices."
Your Funk's-G dealer has the high capacity hybrids, and the Trio Work Sheet which helps you establish your higher yield goal—tells you how to . . .
1 Start with a high capacity FUNK'S G-HYBRID*. . .
2 PLANT IT THICKER . . .
3 APPLY EXTRA FERTILIZER to feed the extra plants . . .
This plan can make you money! See your Funk's G-Hybrid dealer.
THE PRODUCERS OF FUNK'S G-HYBRIDS
*Funk's G-Hybrid is the registered trademark of Funk Bros. Seed Co., Bloomington, Illinois

BY

NATHAN PECK

CORNELL University

SNAP BEANS

One a Failure One a Success

Snap bean growers are learning the need for adequate fertilizer potassium on low-K soil to balance high phosphorus rates applied for vigorous seedling growth.

A good example is the New York grower who applied nitrogen and phosphorus (without potassium) in a band at planting to several large fields of snap beans—fields several miles apart on different soil types.

On one large field, his crop was a complete failure—not worth harvesting. The leaves were yellowish brown, with scorched, ragged margins. Obvious potash hunger!

On another field, his crop produced excellent yields of pods, from vigorous plants of healthy green leaves.

Why the difference? What happened?

WHY?

SNAP BACK with POTASH

1 The grower tested the soils for P and K needs on *most*—but *not all*—of his fields. The field that failed did not have a soil test. Later tests showed soil P and K both low. The fertilizer phosphorus met the P need. *BUT* without fertilizer potassium on the low-K soil, the high phosphorus rate seemed to induce potassium hunger—and with it yields not worth harvesting!

2 The field with excellent yield was soil tested. It had adequate soil K—but a need for N and P which the grower met with adequate fertilizer.

RECOVERY FROM POTASSIUM HUNGER in one month—July 24 to August 25—is the amazing story of another snap bean field.

When only fertilizer N and P were banded at planting to this field of low available soil P and K, severe potash hunger showed up at early blossom stage—about a month after planting.

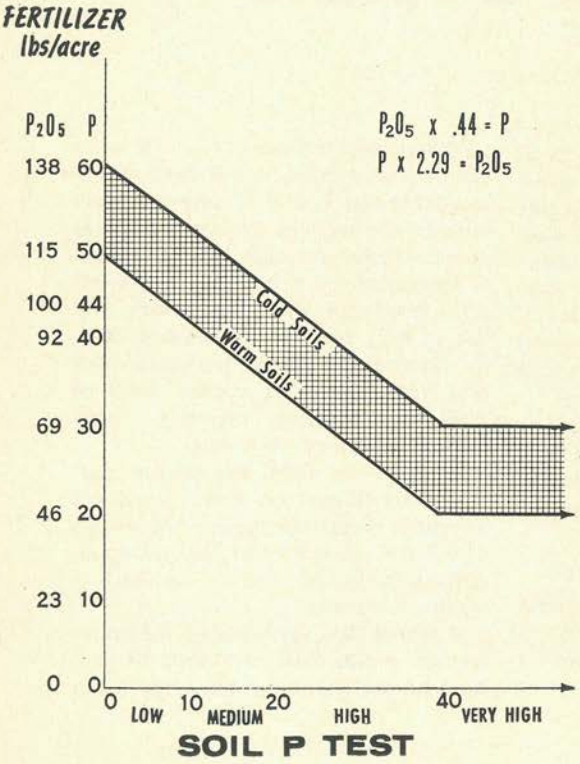
To correct this K hunger, the grower topdressed the whole area with 100 lbs. of KC1 per acre at blossom time. By harvest, the plants had recovered and he harvested a normal yield of pods—an amazing recovery, especially in relatively dry soil.

In this same field, the grower permitted us to put on some potassium sidedress trials, using spray treatments of 5 lbs. K per acre and banded applications (both dry and in solution) of 50 lbs. K per acre.

A month later (by harvest), the band-treated plants had recovered to produce normal yield, but the spray treat-

A CROP LIKE THIS *costs* the grower. Improper soil fertility—in this case inadequate potassium—plays a big role in limiting yields. No fertilizer K sidedressed

ments had not recovered from K hunger. The banded K treatments in solution of 300 gallons water per acre caused better recovery than the banded dry treatments in this dry season.



HOW MUCH FERTILIZER P?

PHOSPHORUS POINTERS

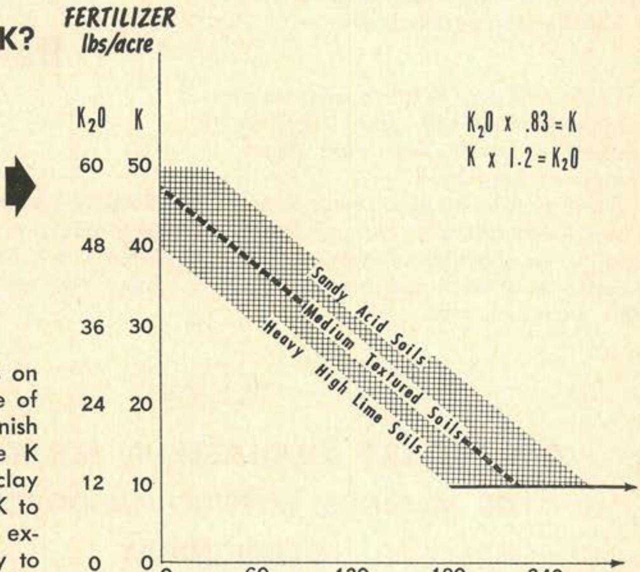
P promotes rapid seedling growth and high yields of uniform sized pods for one-pick harvest—important with mechanical picker that removes all the pods at one picking. Most effective placement is a band 2″ to side and 2″ below seed at planting. Further away may delay early response of seedlings—closer may injure germinating seeds.

A CROP LIKE THIS *pays* the grower. Proper soil fertility—in this case adequate potassium—plays a big role in producing top yields.

50 lbs. fertilizer K per acre sidedressed at early blossom stage.

AMAZING RECOVERY . . . IN CENTRAL NEW YORK

HOW MUCH FERTILIZER K?



POTASSIUM POINTERS

K need for snap beans depends on (1) amount of K in solution at time of soil test, (2) ability of soil to replenish K in solution from less available K forms in the soil, especially in the clay fraction. When banding fertilizer K to supplement available soil K, avoid excessive rates to prevent salt injury to seedlings. High rates of soluble N plus K must be kept away from the seeds.

RESPONSE TO FERTILIZER P AND K AT DIFFERENT LEVELS OF AVAILABLE SOIL P & K

No. of Locations	Available Soil P	Available Soil K	Yield change compared to no fertilizer P or K: Fertilizer P without K (Lbs. pods/A)	Fertilizer P plus 33 lbs. K/A (Lbs. pods/A)	Fertilizer P plus 66 lbs. K/A (Lbs. pods/A)
4	Low	Low	−530	+1280	+1340
4	Low	Med	+1290	+380	+230
9	Med-High	Med-High	+530	−30	−10

The modern grower cannot afford to guess, cannot gamble on crop failure—even in a couple of fields.

Soil tests will help him know the nutrient supplying power of his soil. Will help him choose the right amounts of fertilizer P and K.

Without soil tests, we recommend about 40-45 lbs. of P per acre (90-120 lbs. P_2O_5) and 30-40 lbs. of K per acre (35-50 lbs. K_2O) in a band at planting to insure adequate P and K.

We suggest 40 lbs. nitrogen per acre in a band will usually meet snap bean needs. Apply no more than 40-50 lbs. K per acre *in a band*. When more K is needed, broadcast and work into the soil before planting, to keep it well away from the seeds.

Fertilizer P and K are a bargain in modern farming costs. They have increased relatively less than labor, equipment, and seed.

So, it pays to apply as much P and K as will economically return profits, so long as you maintain proper nutrient balance and don't injure your crop from excessive rates.

Soil Test!

Don't Guess With Your Snap Beans

REMEMBER: Fertilizer P (without adequate fertilizer K) on a soil low in available K will induce or accentuate K hunger and reduce yields.

THE END

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RSONAL LETTER TO 4-H AND FFA YOUTHS OF AMERICA

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Poe was a gentleman,
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long list of awards
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mes as Taft of Ohio, Rockefeller of New York, Wallace of Iowa, Lowell of Harvard, Knapp of Agricultural Extension, etc.

About his many crusades to sell "two-arm farming" (crops and livestock) to his native South . . . to improve marketing programs and create credit systems that would not break your parents' back . . . to build better schools, with good roads to them and to the market places beyond . . . to bring the best health facilities to rural life . . . to encourage more homes with beauty and more churches with as much concern for today's injustices as for tomorrow's rewards . . . to sell the need for world peace if mankind is to survive . . . and to urge higher cultural values if we are to enjoy that survival fully.

But I'm sure he would say, "Don't waste your space on those things—just tell them I spent my last day as optimistic about *their* future as I felt for my own future the first morning I swept out the little *Progressive Farmer* print shop in Raleigh in 1897."

And with that statement he would give you the key to all his work over all these decades—optimism!

Clarence Poe was an incurable optimist whose tremendous scope of self-study and travel and professional contacts made him a wise optimist.

He was one of the most broadly read and educated men the South has ever produced, who wrote and spoke to his farm audiences in the same language he used before university faculties or U. S. Congressional committees.

He got that way by working at it every day of his life. And he practiced what he preached by farming many years during his editing career.

He knew alfalfa, cotton, tobacco . . . but he knew far, far more. He knew political science, history, economics . . . but far more. He knew the Bible and Liberty Hyde Bailey's Principles of Agriculture, and he read everything Thomas Jefferson wrote—and he could quote Shakespeare more fluently than most school teachers.

But with all his knowledge, he maintained his plowboy's instinct toward the underdog. From 1897 to 1964, his writings were forever sprinkled with concern for the destiny of the average man.

He told me one time that he realized the world must be lead by uncommon people.

But he insisted that average folks grow into uncommon leaders through the development of their character, their hearts, and their minds.

"And in that order, don't forget, in that order!" he insisted.

If Hollywood ever did the story of Clarence Poe's life, I'm sure they could not resist their usual temptation of having the young "southern" man walking out of the big white house on the hill, surrounded by magnolias, bidding farewell to gentry parents as he left to acquire "culture" at the state university.

Clarence Poe reached the end of his life in a home on a hill—with a culture far broader than most institutions can give a man, as much at home with Holsteins as with Hawthorne.

He acquired it without the advantages we take for granted today—but with a tool as old as man: the sweat of the brow. One thing made him remarkable—that he could reach his last day as warmly concerned for uplifting *every man* as he was the first day his pen wrote of youthful hopes.

He succeeded. And he believed you can succeed, too, so long as you work to develop your everyday abilities into uncommon leadership.

Santford Martin, Editor

PEOPLE MAKE FORAGE PAY . . .

IN KENTUCKY

BY WARREN C. THOMPSON
EXTENSION FORAGE SPECIALIST
UNIVERSITY OF KENTUCKY

WHERE we devote more than 60% of our cropland to pasture and hay production . . . accounting for nearly $220 million income from meat and milk sales off of these 8.5 million acres.

WHERE new, improved practices have proved this income represents only 20 to 25% of our people's agricultural potential.

Many farmers are making forage production pay off, growing their pasture and hay crops with the same care they manage other crops.

This trend is not a coincidence. It is due to the educational efforts of agricultural workers all over Kentucky. County agents have emphasized four basic steps to success:

1. PASTURE RENOVATION—putting legumes back in old grassy pasture fields.

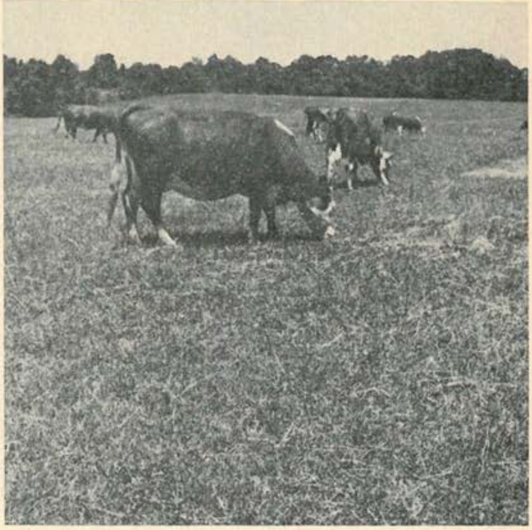
2. FERTILIZATION—to maintain high quality and yield of production and longevity of stand.

3. FORAGE MANAGEMENT—to reduce waste of herbage and to control weeds.

4. SPECIES CHANGES—to increase carrying capacity and reduce weather hazard effects.

"How can you expect to get big return from pastures unless you take care of them? On our farm, pastures get as much attention as corn, tobacco, wheat, or any other crop."

Howard Ham, Logan County



Good management produces quality animals and pastures like these—part of the Ham operation. Regrowth on this pasture is about two weeks old.

1—FEEDER CATTLE PROGRAM WORKS

Giving his pastures as much attention as his rotational cash crops pays Howard Ham of Logan County.

He operates 657 acres—150 in woods, 310 in cash crops, and 197 of the roughest land in pastures.

His pasture operation grossed him a little over $65 per acre last year—with an acre fertilizer from cost running between $7 and $12, his mowing bill about $3 per acre.

Ham raises cattle for sale to "finish-feeders." His herd consists of 100-108 beef cows, varying by the year. The 197 acres of pastureland provides grazing for the herd.

When drought emergency hits, he has some rotational land (normally used as hay) for grazing. His annual goal is to average 500 lbs. of feeder calf from each cow. He made it with a little to spare in 1963.

"To get good gains, you've got to keep a good supply of legumes in your grass stand," he contends. "Cattle just seem to do better, especially from mid-June to late August, when legumes stay in the grass."

The Ham program boils down to these four steps:

1 Topdress fertilization every year, based on soil tests and advice from County Agent Aubrey Warren.

"I never buy a pound of fertilizer or lime without a soil test."

2 Move livestock from field to field . . . to keep pastures in shape.

"I like to turn onto a field when the grass and legumes are about 4-6 inches tall and vigorous. When they start eating the forage close, I move them to a new field."

3 After grazing, mow close.

"By close mowing, I get the weeds and over-mature plants the animals have turned down due to poor quality, etc."

4 See the cattle about every day.

"This keeps me up to date on the changes they are making, problems coming, etc. This helps us save well over 97% of our annual calf crop."

". . . but the biggest single contribution has been home-grown feed of high quality and plenty of it for year-round use."
Maurice Furlong

Once he gets a field of grass established, Furlong renovates to introduce legumes—using only lime, phosphate, and potash to avoid over-stimulating grass. He re-renovates each field every two to three years to keep the legume balance.

2—A FARM WITH A FUTURE

From 13 cows producing 6,900 lbs. of milk each to 35 cows producing 15,026 lbs. each . . . that is the story of Maurice and Hilda Furlong who own one of the most efficient dairy farms in Kentucky.

It is not a large farm—only 139 acres in Barren County—but it is a successful farm because the Furlongs have used new ideas to get the most out of their land and animals.

Furlong has gradually improved the quality of his cows—true. But the biggest key to his success has been high quality feed grown at home.

FOR GOOD PASTURES:

1 He uses Ky. 31 tall fescue for climatic and soil erosion reasons.

Year	No. Cows	Pounds of Milk Per Cow	Butterfat Per Cow	Feed Cost Per 100# Milk
1954	13	6,900	290	1.71
1955	13	7,100	290	1.45
1956	23	7,550	328	1.49
1957	21	7,530	344	1.79
1958	20	9,350	388	1.44
1959	24	10,000	399	1.40
1960	21	10,456	409	1.56
1961	25	10,222	397	1.76
1962	26	11,000	454	1.72
1963	33	14,169	545	1.73
1964	33	15,026	581	1.97

2 When the field of grass gets established, he "renovates" to introduce Kenland red clover and ladino.

3 He prefers mid-winter disking (Nov. through Jan.) on the contour to reduce erosion.

4 Fall and winter soil tests are taken ahead of disking and the fields treated early for "easy coverage."

5 He uses only lime, phosphate, and potash in renovation—to prevent over stimulation of grass that might crowd new legume seedlings.

6 He makes seedings by mid-February, taking a chance on winterkill because he has had weed troubles with late seedings in late March and early April. Has yet to lose early seeding.

7 When grass covers the soil again, he starts grazing. And when seed heads start emerging, he mows *close*. Then as re-growth starts, he uses temporary fences to keep field small enough for graze off in a week or less.

8 He topdresses yearly—from 60 to 90 lbs. of P_2O_5 and K_2O per acre for the past 3 years.

9 He re-renovates each field every 2 to 3 years to keep legume balance—between 25-50% legumes in the mixture.

FOR GOOD HAY:

1 More than 90% of his hay crop is alfalfa and alfalfa-grass mixtures.

2 He usually makes four cuttings a year on established (1 year old or older) stands—starting with the bud to bloom stage on the 1st cut and "cutting by the calendar" each 5 to 6 weeks, depending on weather. The last cut comes by mid-September.

3 He fertilizes each winter or early spring according to soil test recommendations by County Agent F. R. Atherton—from 60 to 100 lbs. P_2O_5 and 90 to 200 lbs. K_2O per acre plus boron.

FOR GOOD CORN SILAGE:

1 He shoots for 15,000 stalks per acre, planted by early May (or even mid to late-April when possible) and fertilized to produce 100 to 125 bushels of corn grain per acre.

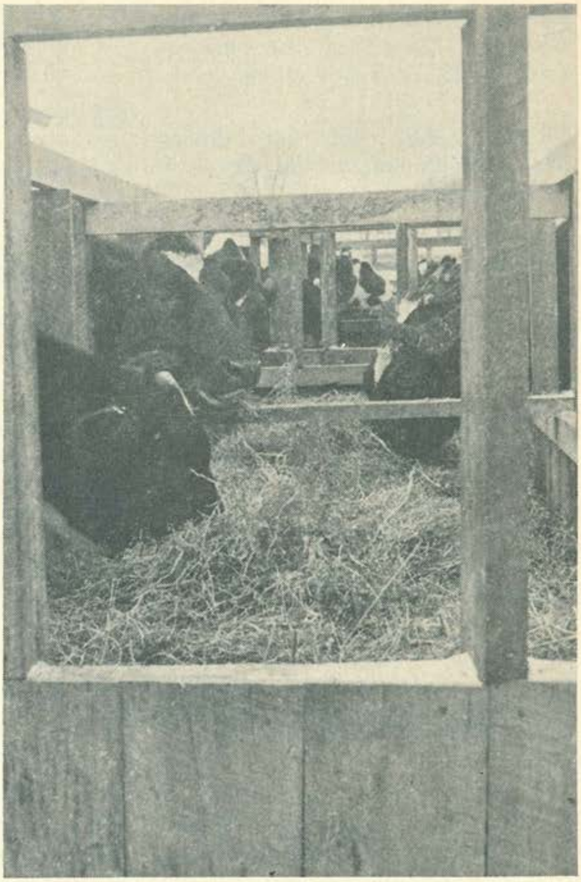
2 He will usually apply around 1,000 lbs. of 10-10-10 equivalent plus 30-50 additional lbs. of nitrogen and all the barn manure he can spare.

3 He averaged about 19 tons per acre cut in dent stage in 1963.

. . . ON HOME-GROWN FEED

These DIHA records tell the Furlong story. By 1962 their willingness to try new ideas—high level fertilization of all crops, pasture renovation, new feed and animal handling facilities—began to pay off.

"An acre of good alfalfa for each milking cow helps make dairying pay—especially when you get 5 or more tons of quality feed from about the whole acreage each year."
George Depp



3—MAKE DAIRYING EASIER WITH TOP QUALITY FORAGE

"Farmers like George Depp sell recommended practices by *results* they get from using the practices," Lincoln County Agent, Russell Cornelius, contends. As a fluid milk producer, operating a 211 acre-50 cow dairy herd, George Depp gets both high milk production per cow and high total milk production from the herd.

Last year he exceeded 12,000 lbs. per head. Basic steps were these:

1 Top quality and high yields of forage feed for year-round use.

2 Close culling in herd for easy milking, animal handling, and high production potential.

3 Feeding by production and animal size.

4 Housing and feeding facilities engineered for convenience and animal health when confined.

FOR GOOD HAY:

1 He follows soil tests in fertilizing his alfalfa.

2 He makes 4 harvests on established stands (1 year or older)—cutting first at bud-to-bloom stage, then at 5-6 week intervals until harvest 4 not later than mid-September.

3 When drought cuts grazing, he often grazes by rotation. He sets stocking rate (based on temporary field size) high enough to finish grazing in 7 days or less—usually 8-10 cows per acre on the 1st and 2nd growths, 3-4 cows on the 3rd and 4th growths for a week.

4 He topdresses annually, applying higher potash levels in recent years—400-600 lbs. of 0-10-20B or 0-10-30B per acre—since soil tests show him "losing ground" on potash.

5 He usually seeds a perennial grass with alfalfa to cut crabgrass competition and erosion—depending on higher potash rates to reduce greedy grass-take-over.

Many alfalfa fields produce well as 6 to 10-year plantings today—in contrast to past stands that seldom ran past 4 years with good yields.

FOR GOOD PASTURES:

1 He has turned toward renovating well established grass sods—heavy disking in early spring, fertilizing and liming by soils tests, and seeding (by or before mid-March) to adapted legumes.

2 One renovated field produced 190 cow-days per acre of grazing before October freeze-down. (Normal untreated "native pasture" produces an average of 40 cow days a year.) He says, "Our first renovation seeding to alfalfa ('64) was the best spring-alfalfa seeding we ever made."

3 He opens small areas to reduce pick grazing by the animals, mows frequently (after each graze-off), and holds high fertility level.

4 He grows his nitrogen with legumes, adding phosphate and potash according to soil tests—400 lbs. of 0-20-20 per acre last year.

5 His mixture is primarily orchard grass and ladino, with perhaps 20% Kentucky bluegrass and alfalfa.

FOR GOOD CORN SILAGE:

1 He fertilizes and manures his best level soil and plants adapted varieties early at 14,000 to 16,000 plants per acre.

2 He considers less than 20 tons per acre cut in dent stage a near catastrophe—and has averaged well over 100 bu. corn grain per acre since 1946.

THE END

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COUPON ON BACK COVER

SOME ABC'S (PRINCIPLES) OF NITROGEN FERTILIZATION IN NORTH CAROLINA WHERE . . .

FORAGE FACTS POINT TO ▶ MORE ◀ NITROGEN NEED

BY W. W. WOODHOUSE N. C. STATE, RALEIGH

Usage of N on forages in North Carolina in the past has been quite low—about 1/33rd of that recommended, the 1960 census revealed.

We feel we have enough good experimental data now to provide a sound basis for a greatly expanded use of N on these crops. We also feel this expansion must be sound if it is to last.

The following material pulls together results typical of the more important phases of nitrogen fertilization on these plants in North Carolina. The purpose is to illustrate principles, not to define practices. Practices, to be sound, must be based on principles. Practices will change with time. Principles, if we understand them correctly, do not.

A. LEGUME-GRASS MIXTURES

1 FIXATION

Recent work using N^{15} as a tracer has confirmed that applied nitrogen can enter a legume and substitute for nitrogen that would otherwise be fixed from the atmosphere. In such cases, nitrogen fixation can be sharply reduced, as shown in the following table. This would largely account for the poor returns

TABLE 1—EFFECT OF APPLIED N ON PER CENT OF N FIXED FROM THE ATMOSPHERE IN ESTABLISHED LADINO CLOVER—CECIL CLAY LOAM, RALEIGH, N. C., 1956

N applied lbs./A	Per cent N fixed, by cuttings		
FEB. 24	MARCH 17	APRIL 21	MAY 16
25	65	91	92
50	42	87	87
100	25	75	83
200	10	43	75

often obtained from applying nitrogen to legumes and legume-grass mixtures.

2 ESTABLISHMENT

Light applications of nitrogen are usually recommended for establishing mixtures of this type. Nitrogen applied at seeding is primarily an insurance measure in case inoculation of the clover is slower than normal. Such applications may be instrumental in saving the stand where inoculation fails, provided early steps are taken to reinoculate. Total forage yields may be increased in early spring by applying nitrogen at seeding, but the effect of nitrogen soon disappears, as Tables 2 and 3 show.

TABLE 2—EFFECT OF NITROGEN APPLICATION ON ESTABLISHMENT OF LADINO CLOVER-ORCHARD GRASS AND LADINO CLOVER-TALL FESCUE. SEEDED OCTOBER 10, 1951, (WASHINGTON COUNTY, BLADEN SILT LOAM).

Lbs. N applied			Lbs. acre of dry forage 1952						
At Planting	Nov. 15	Feb. 15	Apr. 17	May 19	June 18	July 17	Aug. 19	Sept. 18	Total
0	0	0	623	1125	1329	663	1253	1038	6030
20	0	0	866	1328	1394	658	1144	956	6346
80	0	0	980	1301	1153	589	1280	1021	6324
20	40	0	923	1305	1211	671	1220	1030	6360
20	0	40	1376	1241	1183	615	1190	992	6597
20	20	20	1126	1267	1221	679	1248	1037	6578
LSD (05)			130	126	137	N.S.	N.S.	N.S.	N.S.

All nitrogen treatments were effective in changing the yield of clover and grass in the first cutting (Table 3). The 20-pound application, made at planting, appeared to benefit the establishment of both. It increased the growth of both clover and grass at this cutting and had no appreciable effect on the proportion of one to the other. Heavier rates increased the growth of grass, but tended to reduce the growth of clover. By June 18, the stimulating effect of these treatments on the grass had greatly diminished, but the effect of increased competition on the clover was more evident than in the early spring.

TABLE 3—THE EFFECT OF NITROGEN APPLICATIONS AT SEEDING ON YIELD AND PERCENTAGE OF CLOVER AND GRASS OBTAINED TO FOLLOWING SPRING. (WASHINGTON COUNTY, BLADEN SILT LOAM).

Lbs. N applied			Yield and percentage composition of clover and grass*							
			April 17				June 18			
At Planting	Nov. 15	Feb. 15	Yield		Per Cent		Yield		Per Cent	
			Clover	Grass	Clover	Grass	Clover	Grass	Clover	Grass
0	0	0	290	333	38	43	802	496	61	38
20	0	0	376	490	36	47	892	502	64	36
80	0	0	240	740	20	59	612	541	52	46
20	40	0	239	684	20	58	632	580	52	47
20	0	40	286	1090	18	68	610	572	51	48
20	20	20	250	876	18	64	665	555	54	45
LSD (05)			65	95			126	N.S.		

*Percentage not indicated was weeds.

3 MAINTENANCE

(a) Productive Soil

Once legume-grass mixtures are well established, relatively high production can be obtained provided they are properly fertilized and managed. Since observations have indicated that nitrogen application to a legume-grass sod will temporarily increase grass growth in the mixture, many attempts have been made to increase yields by supplementing the nitrogen supply with nitrogen from commercial sources. Usually, however, the increase in yield is not enough to justify the cost of the nitrogen applied.

In the experiment of Table 4, nitrogen produced some appreciable yield changes. Time and rate of application, plus their effects on the grass-clover balance, seemed to affect the final result. For example, the 50-lb. rate had little effect on either yield or clover content. A total of 100 lbs. increased yields when applied half in August and half in October, while 100 lbs. applied October 1 in one application had no effect on total yield.

The 200 and 400 lb. rates are the only ones that had a major effect on yields. The response to these rates was more nearly that to be expected from a pure grass sod. This is not surprising since these rates were high enough to result in a drastic reduction in clover in the first spring and almost complete elimination by August of the second season.

The applied nitrogen seems, in part, to have replaced rather than supplemented the nitrogen made available by the legume. Consequently, the response from applied nitrogen and N recovery on the grass-legume mixture appears quite low when compared with those on pure grass. The 201 lbs. of N in the forage on the no-nitrogen treatment doubtlessly came largely from the legume.

TABLE 4—EFFECT OF NITROGEN APPLICATIONS ON THE YIELD, BOTANICAL COMPOSITION, AND NITROGEN CONTENT OF AN ESTABLISHED SOD OF LADINO CLOVER-TALL FESCUE. (HAYWOOD COUNTY) FIRST TREATMENT APPLIED AUGUST 1950.

Lbs. of N Per acre annually				Yield 1951–52 2 yr. ave.	% clover		1951 % N	Lbs. N in forage 1951	Apparent recovery %
Feb	May	Aug	Oct		June	Aug.			
0	0	0	0	5836	39	49	2.96	201	
—	—	—	50	6055	34	36	3.18	228	+54
—	50	—	—	6313	30	27	2.77	194	−12
—	—	50	50	6547	22	21	3.10	241	+40
—	—	—	100	5832	18	12	3.28	231	+30
25	25	25	25	6642	18	20	2.86	223	+22
50	50	50	50	8111	8	1	2.86	259	+29
100	100	100	100	9550	2	trace	3.30	355	+39
LSD		(05)		144				0.15	

(b) Quality—(protein)

Ladino clover is usually considerably higher in nitrogen than the tall fescue, regardless of treatment. For this reason the average nitrogen content (protein content) of the grass-legume mixture is greatly influenced by the clover content of the mixture. So, it is necessary to resort to rather high rates and frequent applications in order to appreciably increase the nitrogen content of such a grass-legume mixture with nitrogen fertilizers. The clovers are also much higher in calcium content than the grasses, and a shift toward more grass lowers the total calcium in the mixture (Table 6).

TABLE 5—THE EFFECT OF APPLIED NITROGEN ON YIELD, NITROGEN CONTENT AND BOTANICAL COMPOSITION IN A LADINO CLOVER-TALL FESCUE SOD (WAKE COUNTY)

Lbs. N applied per acre annually		Av. yield 1949–51 lbs. per acre	% N in forage Av. 1949–51	% clover April 24, 1951	% recovery 1949–51
Feb.	Sept.				
0	0	3396	2.84	52	—
25	25	3921	2.65	29	16
50	50	4483	2.68	22	20
100	100	5246	2.75	5	22

(c) Competition For Nutrients

Table 6 shows some of the complications that may arise through the use of N on mixtures. Note particularly the K_2O content of the grasses compared with the level of this element in the associated legume. Ladino in this case is running around 2.5% while the grasses are at 4%.

The 2.5% K_2O in clover shown here is close to the critical level for this plant. The grasses on the other hand can thrive at around 3% or less. As potassium supply becomes short, the clover will drop below the critical level, to 2% or less, while the grass will hold at 3.5 to 4% until the clover disappears from the sod, many trials show. Thus, clover is readily "crowded out" of the mixture by low potash.

Stimulation of the grass by the addition of N to the mixture increases the drain on K supply and thus aggravates this situation. This is probably the mechanism whereby clover is most often "damaged" by nitrogen application, rather than competition for moisture, light, and space.

TABLE 6—CHEMICAL COMPOSITION OF INDIVIDUAL SPECIES OF LADINO-GRASS MIXTURES. CECIL CLAY LOAM, RALEIGH, NORTH CAROLINA*

	Average analyses of April 11, July 4, Sept. 26, 1949 harvests							
	Legume (%)				Grass (%)			
Mixture	N	CaO	P_2O_5	K_2O	N	CaO	P_2O_5	K_2O
Tall fescue + Ladino	4.3	2.3	1.0	2.6	3.3	.8	1.4	3.8
Orchard + Ladino	4.3	2.4	1.1	2.6	3.7	.9	1.4	4.3

*Plots harvested every 2 weeks April 11–November 21 500 lbs. per acre of 0–9–27 applied annually.

B. PERENNIAL GRASSES ALONE

These plants in our climate and on our soils depend almost totally on applied nitrogen. Without it, yields will range from 1½ tons downward to as low as ½ ton.

1 COASTAL BERMUDA

(a) Rate

Coastal Bermuda is our most responsive grass. Table 7 shows a good season on sandhill sand with all known deficiencies corrected. Yield response is very sharp, up to 200 lbs. of N, with some response up to 600 lbs. Recovery of applied N is exceptionally high, except at the very low and very high rates.

Increase for the second 100 lbs. of N is almost equal that from the first 100 lbs. Rates up to around 300 lbs. of N on this plant are practical for hay. Present indications are that for grazing only, rates should be lowered somewhat.

TABLE 7—F 11—1962, 8TH HARVEST YEAR, COASTAL BERMUDA—LEE COUNTY

Nitrogen applied lbs/A			Total Yield		Apparent Recovery of N	
April	After 1st Cut	After 2nd Cut	lbs/A	Crude % Prot.	lbs.	%
	None		1,404	9.3	...	..
17	17	17	2,948	9.2	22	44
33	33	33	6,746	10.4	92	92
67	67	67	10,503	12.3	184	92
50	May, July, Aug.		11,572	11.8	198	99
133	133	133	11,588	16.6	287	72
200	200	200	13,824	18.1	372	62

TABLE 8—EFFICIENCY OF N RATES ON COASTAL

	From 100 lbs. N on		
	2 acres	1 acre	½ acre
Yield of hay	5896	6746	5251
Yield crude protein	542	702	646

(b) Time

Time of N application on grasses is critical. Table 9 illustrates the principles operating, whether the plant be Coastal, fescue, or bluegrass.

(1) Nitrogen applied too far ahead of active growth is ineffective (see Table 9).

(2) Response to any one top-dressing is usually limited to about six to no more than eight weeks. Note that April 1, May 1, and July 1 all produced the same total yield. The time at which it grew was quite different (a severe dry

TABLE 9—TIME OF APPLICATION OF N ON COASTAL—WILLARD—1957

	Hay yield lbs./acre			
N Applied	May 29	July 15	Sept. 5	Total
200 lbs. Feb. 15	1581	1943	1678	5202
200 lbs. April 1	3452	2954	1958	8364
200 lbs. May 1	3293	3142	1829	8264
200 lbs. July 1	700	2127	5261	8088

spell in any one period would have reduced the efficiency of that particular N application).

2 TALL FESCUE

Tall fescue is also quite responsive to nitrogen. In practice, tall fescue cannot use as much applied N as Coastal. Table 10 shows the potential *where* good stands are maintained. Applications as high as 400 lbs. per year will usually result in stand losses. Also, while May or June applications increase growth, they will sooner or later cause stand losses. These are due, apparently, to over-stimulation of those plants at a time when they would normally be somewhat dormant. The direct cause of death is usually pathogenic. Consequently, 200 to 300 lbs. of N, split between late winter, early spring, and early fall seems to be the practical limit on this plant.

TABLE 10—TALL FESCUE, WAKE COUNTY, 1951

Lbs. N				Yield
Feb.	May	Aug.	Oct.	Dry Forage
0	0	0	0	1,612
25	25	25	25	4,162
50	50	50	50	7,314
100	100	100	100	11,060

C. ANNUAL GRASSES

1 MILLET

These plants are quick growing and must have N readily available. Table 11 is a good example of the type of response on a soil that had a fair supply of N in the beginning.

(a) Nitrogen must be applied *as needed*. As with the perennials, most of any given application is harvested in the next cut.

(b) Nitrogen should be adjusted according to the appearance of the plant and the *need for forage*.

TABLE 11—GAHAI MILLET, CLAYTON, 1956—F376

Nitrogen Application—Lbs./A.			Total Yield
At Planting	6 in. High	After 1st. Cut	Lbs./A.
15	0	0	3424
15	50	0	5113
15	50	50	6973
15	100	100	8469

PKL according to soil tests.

2 WINTER ANNUALS

Barley is given as an example of this group of grasses (Table 12). Again this is on a soil that was fairly fertile to begin with.

(a) N was needed both fall and spring.

(b) Limitations of the growing season caused less total nitrogen to be used than on millet (Table 11).

(c) Quality was doubtlessly increased by N.

TABLE 12—NITROGEN ON BARLEY—WAKE COUNTY—CECIL Cl L.—1944-45

N			
At Plant	November 1	February 15	Yield
16	0	0	3451
16	0	25	3983
16	25	25	4492
16		50	4186
16	50	50	4871
16	0	100	4604

PKL according to soil tests.

Clipped to simulate grazing—yield for silage would probably have been higher if lodging didn't show up.

D. MIXTURES OF ANNUAL GRASS AND LEGUMES

In most cases, nitrogen fixation by annual legumes is slow enough to make the addition of nitrogen to such mixtures necessary for full yields.

(a) Winter annuals, in particular, need N application scaled down only 20 to 30 per cent compared with what would be required on the grass alone.

(b) Annual lespedeza is an exception. It fixes a considerable amount of N under favorable conditions and is likely to be crowded out where much N is applied.

INFLUENCE OF NITROGEN ON LADINO-GRASS (HUMID AREA)

	Average * %		
	Ladino		*Grass*
(1)	100	—	0
(2)	95	—	5
(3)	80	—	20
(4)	50	—	50
(5)	30	—	70
(6)	10	—	90
(7)	5	—	95
(8)	0	—	100

Everyone agrees (1), (2), and (3) need *NO* Nitrogen.

Everyone agrees (7) and (8), particularly (8), must apply 100 lbs. *N* to get 5000-6000 pounds. Without *N*, you would get less than a ton.

Conditions (4) and (5): could use extra N but no way to supply it efficiently so poor return is the result. For example:

Apply **no N** and get 5000 lbs. dry forage.
Apply **50 N** and get 5300
Apply **100 N** and get 5800

Condition (6): need to decide whether to work back toward (5) and (4) —no N—or toward (7) and (8) —treat as (8).
Conditions (7) and (8):

Apply **no N** and get 2000 lbs. dry forage.
Apply **100 N** and get 5000
Apply **200 N** and get 8000

* Proportion of clover to grass fluctuates widely during any one growing season. Therefore, it is hard to define.

THE END

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