Better Crops WITH PLANT FOOD

July-August, 1959

20 Cents

. . . Crimson clover, when grown with Coastal Bermudagrass, can be seriously limited or die out. . .

WITHOUT POTASH

WITH POTASH

. . . Crimson clover, grown with Coastal Bermudagrass, can thrive—increasing the grass yield about ½ ton per acre over the grass grown without the clover.

WITHOUT POTASH

. . . Crimson clover, grown with Coastal Bermudagrass, may give way to weeds as shown here.

ON THE COVER . . .

. . . the effect of potash on crimson clover when grown with Coastal Bermudagrass is graphically shown.

During the past 6 years, some 150,000 acres of Coastal Bermudagrass have been planted in Piedmont Alabama, Georgia, and South Carolina. An estimated 60% of this acreage is seeded to crimson clover for early spring grazing, according to William E. Adams and R. A. McCreery, University of Georgia soil scientists.

Because of the importance of crimson clover and Coastal Bermudagrass as forage crops, the Georgia scientists have conducted extensive research on the soil fertility needs of crimson clover when grown with Coastal Bermudagrass and the fertility needs of Coastal Bermudagrass when grown alone. Their results are reported in companion articles starting on page 6.

Among the results they found were these:

1—That potash was the one nutrient most frequently limiting the stand and production of crimson clover.

2—That Coastal Bermudagrass can make efficient use of nitrogen only when other nutrients are adequately supplied.

3—That increasing nitrogen rates greatly stimulate potash uptake and removal from the soil.

4—That increasing fertilizer levels *decrease* the amount of water used (or demanded) by each ton of Coastal Bermudagrass forage.

Better Crops WITH PLANT FOOD

The Whole Truth—Not Selected Truth

Santford Martin, Editor
Selma Bushman, Assistant Editor

Barbara Ott, Circulation

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CONTENTS FOR THIS ISSUE

THE LAMBS

Better Crops with PLANT FOOD

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For many moons we've been

IN DEBT TO INDIANS

Jeff McDermid

(ELWOOD R. MCINTYRE)

ONE of the fellows who went to the Indian boarding school at Pine Ridge long ago while I worked for Trader Corder was arguing with me lately over the native ability of his race. But he didn't act mean or touchy—just proud and assured about it.

He had studied at Carlisle awhile and his thesis was that the American aborigines of all latitudes have given the encroaching white man a lasting and varied legacy. He claims that it is often as much as the white man handed to the red men, and often less corrupting.

"It is in the form of things to say and use and eat and wear and enjoy," explained my companionable Sioux, named Horned Lark Wing.

"My race has contributed much to yours and we have never let a food surplus go unused and get unmanageable."

Thereupon Horned Lark Wing made his points as he talked by cutting angular notches in a stick.

"Transportation is first," he said. With facility he quoted the historian Turner when he wrote "the buffalo track became the Indian trail, which then became the trader's trace (the Natchez trace), then the settler's rude roads, followed by the improved turnpike, and finally the railways and the motor free-ways."

Slashing another notch, my bronzed seminarian remarked that many Caucasians would still be lost in forest or mountain or sunk at some river portage were there no skillful Indian guides along.

"Your original settlers in the clustered places had the building of cities in view," he resumed. "All these pioneer trading posts became the natural sites for your Chicago, Detroit, Kansas City, St. Louis, and St. Paul.

The ancient trail of the proud Iroquois nation has turned into the New York Central route.

"The Virginia Warrior path was the same road taken by your backwoodsmen across the Appalachians. Hennepin Avenue in Minneapolis follows the Indian trail from Lake Harriet to the Father of Waters. The whole stretch of lakeshore railroad from Chicago through Milwaukee to Green Bay and north to Mackinac Island was a beaten path for the redskins 200 years ago."

To all of this I agreed. Cutting another notch, my Sioux informer continued with the popularity of place names borrowed by the white man from the usage of those who lived there first.

I answered with a mere few of the prodigious list so widely adopted. Such were Miami, Wabash, Winona, Saginaw, Oshkosh, Ontario, Quebec, Manitoba, Saskatchewan, and Ottumwa. Of our states the Indian derivatives include Alaska, Arkansas, Arizona, New Mexico, Massachusetts, Illinois, Connecticut, Michigan, Minnesota, Wisconsin, Utah, Nebraska, and the Dakotas.

But my astonishment gave way when Horned Lark Wing stated that our language has taken over at least 500 other Indian words. Many of these have been adopted so long that their Indian origin is generally unheeded.

"Pick the words which have their roots with the red men of different climatic zones. If you think I've included a few foolers," exclaimed my friend, "see if you can find them."

This is the list he offered:

Barbeque, bayou, buccaneer, caribou, catalpa, chinqupin, chinook, chautauqua, caucus, coyote, cougar, hammock, hickory, hominy, hurricane, mugwump, jaguar, ocelot, opossum, paw paw, peon, persimmon, pemmican, petunia, pone, toboggan, quinine, tamarack, tarpon, wigwam, woodchuck and squash.

"Most American white people think that Hiawatha is the keystone of literary work representing Indians," he laughed. "These are often the same folks who imagine that Buffalo Bill Cody, Wyatt Earp, and Wild Bill Hickok comprise the best of the West."

My Sioux associate then cut another big notch in his stick to mark the point where he proclaimed the most important contribution of all that his forbears had made to the white race.

"Despite the fact that plains Indians were not known much for farming and gardening, there were other tribesmen elsewhere who discovered and domesticated numerous edible plants," he explained. "In fact, about three-fourths of the U. S. total farm production in farm values is derived from plants donated to the palefaces by the red men."

Hereupon he started reeling them off—corn and beans, Indian cotton grown in both hemispheres, fibers from sisal, and from leatherwood bark, pumpkins, squash, tobacco, white potatoes, sweet potatoes, agave, avocado, arrowroot, cacao, pepper, cashew nuts, gourds, prickly pear, guava, and tomatoes.

He began to recite the agricultural assistance given to the Pilgrims by the local red brothers who put fish in every corn and bean hill—thus setting the stage for commercial fertilizer salesmen many moons afterwards.

But then, of course, Lark Wing hadn't heard that Squanto, noble redskin who came to the relief of the Massachusetts Bay immigrants, was the patron saint and chief sachem of the American agricultural agents.

For it was he who sacrificed all he had to engage in demonstration extension projects for the backward Englishmen. History says that Squanto "showed them both ye manner how to set ye corn, and after how to dress and tend it." Neither Smith

nor Lever have any larger niche in the memories of our busy county agents than Squanto and his succotash.

"When the Spaniards entered Mexico," my Indian friend continued, "they saw little boys playing a game with rubber balls. This was the start of the white man's knowledge of the tropical rubber plant.

"Now take irrigation. Indians of the Southwest engineered irrigation projects from what is now Arizona clear through to Peru. They left plans and old ruins, from which later systems were built."

I was sure he wouldn't omit the healers. He recited the story of the native doctors with roots, herbs, barks, leaves, and juices, and mentioned cascara and quinine in passing. Coca as a pain killer and fatigue easer was also mentioned.

But finally my weary Oglalla reached the end of his tale. Knowing that it required something attractive to hold those with sport page appetites, Lark Wing chose recreation.

"My race has contributed also to the lore of the great outdoors and the zest of games and vacation sports," he concluded. "This is evident by scanning these pertinent words: canoeing, tobogganing, snowshoeing, lacrosse playing, the sleeping bag, the moccasin, the fish spear, moose calling, trail tracking, campfire building and quenching—a la the Boy Scouts."

Much more could be written and absorbed about the human side of Indian life. And the way to get it is to spend a little time with the modern, educated Indians—not with TV interpretations alone. In no other way will the false rub off and the true remain.

THE END

DO YOU READ THESE JEFF ESSAYS? LET US KNOW BY CARD.

sm-editor

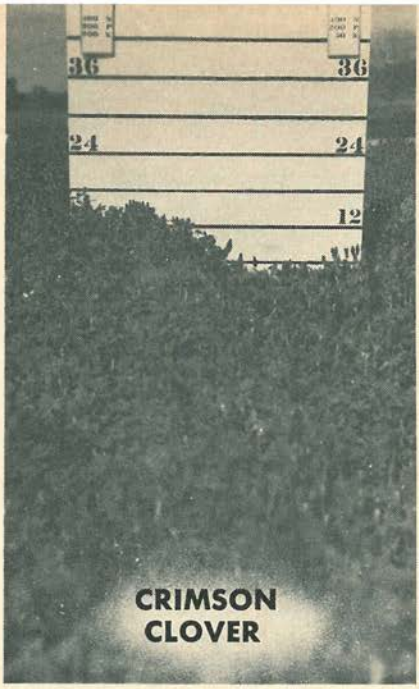
CRIMSON CLOVER GROWN WITH COASTAL BERMUDAGRASS SHOWED:

THAT potash was the one nutrient most frequently limiting the stand and production of crimson clover.

THAT 100 lbs. per acre of nitrogen applied to coastal bermudagrass increased the crimson clover's forage production.

THAT the first 50 lbs. of phosphorus per acre increased crimson clover forage production almost 50% over the no phosphorus level.

THAT increasing rates of potash increased total uptake of both phosphate and potash, largely because of more forage produced.



Left: 400 lbs N 200 lbs P 200 lbs K Right: 400 lbs N 200 lbs P 50 lbs K

WHAT ARE THE FERTILITY NEEDS OF CRIMSON CLOVER

by WILLIAM E. ADAMS

and R. A. McCREERY,

COASTAL BERMUDAGRASS GROWN ALONE SHOWED:

THAT it can make efficient use of nitrogen only when other nutrients are adequately supplied.

THAT forage production increases with increasing fertilizer rates—4.23 tons per acre from 100-50-50 (NPK) level, 5.26 tons from 200-100-100, 7.5 tons from 400-200-200 lbs. NPK.

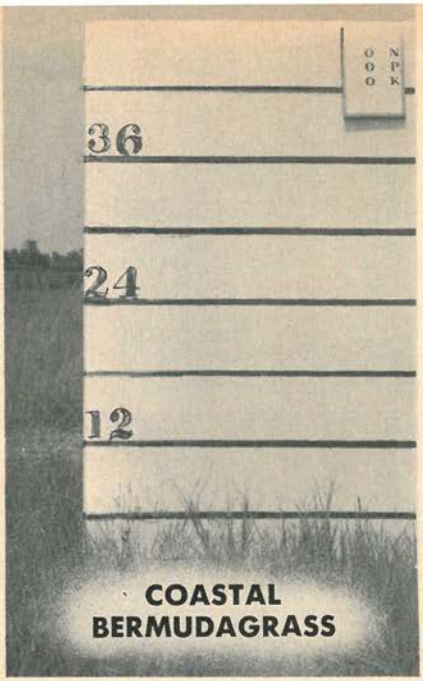
THAT increasing nitrogen rates greatly stimulate potash uptake and removal from the soil.

THAT rising fertilizer levels decreased the amount of water used (or demanded) by each ton of coastal bermudagrass forage.

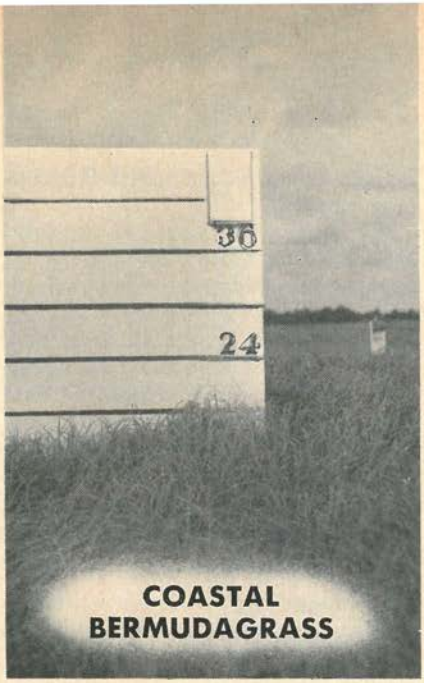
PART I—FERTILITY NEEDS

OUT of the 150,000 acres of Coastal Bermudagrass planted in Piedmont Alabama, Georgia, and South Carolina during the past six years, an estimated 60% is seeded to crimson clover for early spring grazing.

To study the fertility requirements of crimson clover when grown in association with Coastal Bermudagrass, we initiated an experiment in Georgia in April 1954 on Cecil sandy loam soil. Our goal: to answer some of the practical management problems.



With no nitrogen, no phosphate no potash



With 400 lbs nitrogen, 100 lbs phosphate, 200 lbs potash

WHEN GROWN WITH COASTAL BERMUDAGRASS? ... AND COASTAL BERMUDAGRASS GROWN ALONE?

University of Georgia

OF CRIMSON CLOVER WHEN GROWN WITH COASTAL BERMUDAGRASS

We limed the soil to pH 6.5. We planted certified Coastal Bermuda sprigs in 30-inch rows about 18 inches apart in the row. The first year, we applied a total of 100 lb/acre N from ammonium nitrate in three applications in 30-day intervals to establish a stand. We seeded crimson clover on all plots each fall at 50 lb/acre, a rate thought to approximate volunteer seeding. We harvested clover at full bloom stage to prevent re-growth. Thus, the first harvest of Coastal Bermudagrass each year contained no clover.

The fertility level of the area, University of Georgia soil tests showed us, was 33 lb/acre P_2O_5 and 66 lb/acre K_2O. We started the fertility variables in 1955 on an established stand. We used four rates each of nitrogen (0, 100, 200 and 400 lb/acre), P_2O_5 (0, 50, 100 and 200 lb/acre), and K_2O (0, 50, 100 and 200 lb/acre). We took forage clippings at about 5-week intervals except during drought

periods when we extended the clipping interval.

We applied nitrogen (in the form of ammonium nitrate) in three equal applications, following (1) *Crimson clover harvest,* (2) *the first grass harvest,* and (3) *the second grass harvest.* We applied half the P_2O_5 and K_2O *in the fall following the last grass harvest,* when crimson clover was seeded, and the remaining half *in the spring following clover harvest.*

RESPONSES TO NITROGEN FERTILIZATION

We found that 100 lbs. of nitrogen per acre (ammonium nitrate) applied to Coastal Bermudagrass in the summer increased the yield of crimson clover grown the following winter much more than O-200, 400 lbs. of nitrogen per acre (Figure 1). We also found forage production of the associated crimson clover declining 10 to 20% for each additional 100 lbs. nitrogen above the first 100 lb. N level.

As nitrogen rates on the Coastal Bermudagrass increased, three things happened: (1) grass yields rose, (2) very much potassium and calcium were removed from the soil, (3) the heavier N rates had an acidifying effect on the soil.

Other studies have shown that both soil pH and level of exchangeable bases were affected to a depth of 18 inches. *Annual soil tests indicated that soil pH and available K_2O declined rapidly with increasing nitrogen rates above the 100 lbs. N level.*

Table 1.—How phosphorus applied to Coastal Bermudagrass affected the phosphorus and potassium percentage in crimson clover forage. 2-year average, 1956–1957.

Treatments NPK Lb/acre	P_2O_5 %P	K_2O %K
400–0–200	.231	2.39
400–50–200	.299	2.20
400–100–200	.340	2.18
400–200–200	.381	2.20

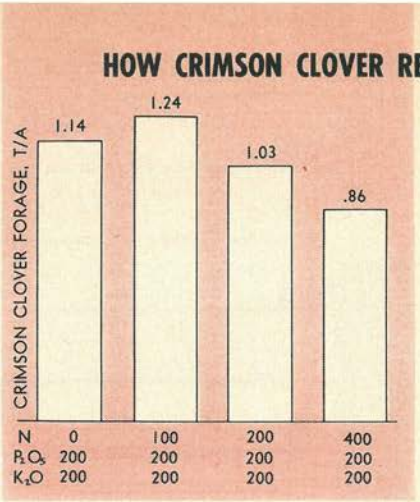


Figure 1. How crimson clover responded to nitrogen applied to Coastal Bermudagrass.

RESPONSES TO PHOSPHORUS FERTILIZATION

We observed almost a 50% increase in crimson clover forage production from the 0 lbs. P_2O_5 level to the 50 lb. P_2O_5 level (Figure 2). In these studies, the first 50 lbs. per acre of P_2O_5 seemed sufficient, since the crimson clover did not increase with additional increments of P_2O_5. (Soil tests indicated an increase in available soil P_2O_5 with increasing rates of P_2O_5.)

But the per cent phosphorus (Table 1) in the crimson clover forage was another matter. It increased with each additional P_2O_5 rate, while the per cent potassium declined from the 0 lb-P_2O_5 level to the 50 lb-P_2O_5 level and remained relatively constant for additional increments of P_2O_5.

The total amount of phosphorus *taken up by the plant* also increased with increasing P_2O_5 rates (Figure 3), while K_2O uptake (Figure 3) increased from the 0-lb. P_2O_5 to the 50

William E. Adams is soil scientist with the Eastern Soil and Water Management Research Branch of the Agricultural Research Service, USDA, at the University of Georgia. Specialist in crop rotation and forage crop fertility, he earned his B.S. and M.S. from N. C. State.

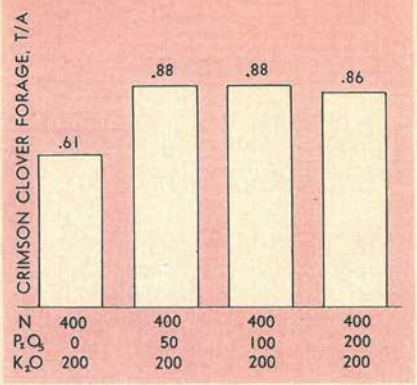


Figure 2. How crimson clover responded to phosphorus applied to Coastal Bermudagrass.

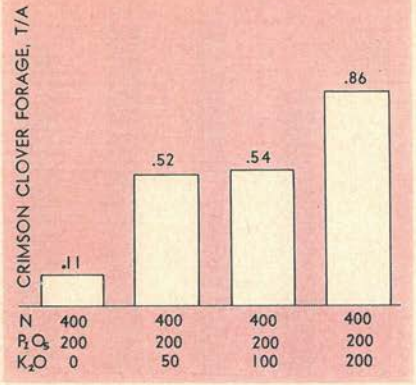


Figure 5. How crimson clover responded to potassium applied to Coastal Bermudagrass.

lb. P_2O_5 levels and remained relatively constant with additional increments of P_2O_5.

We noticed with interest that although potassium rates did not affect the per cent of phosphorus in crimson clover forage (Table 2), the total uptake of phosphorus was increased nearly eight-fold (Figure 4). As increasing potassium rates boosted crimson clover forage production, they also increased phosphorus uptake with each K_2O increment.

RESPONSES TO POTASSIUM FERTILIZATION

Response to potassium was even more marked than to phosphorus. We found that 200 lbs. per acre of K_2O produced eight times more crimson clover forage than no potash (Figure 5).

Potassium was the nutrient most seriously limiting the growth of crimson clover. We observed pronounced potassium deficiency on all *low K_2O plots with high nitrogen rates.* In fact, all clover plants died on plots that received high nitrogen and no potassium in 1956 and 1957.

Other studies indicate (1) that crimson clover will increase the yield of Coastal Bermudagrass about *one-half ton per acre* over Coastal Bermudagrass grown alone, (2) that the clover itself will supply an average of one ton of forage, (3) that the clover will extend the grazing period from four to six weeks longer than Coastal Bermudagrass grown alone.

Potassium rates had very little effect on the per cent of phosphorus in the crimson clover forage (Table 2), but potassium percentage increased rapidly with increasing rates of K_2O (Table 2). The potassium percentage almost doubled from the 0-lb. K_2O level to the 200-lb. K_2O level, while crimson clover's forage production increased almost eight-fold from

Dr. Robert A. McCreery is Assistant Professor of Agronomy at the University of Georgia. An authority on soil mineralogy, he earned his B.S.A. and M.S.A. at Georgia, his Ph.D. from State College of Washington. He teaches elementary soils, soil physics, and soil chemistry and conducts research on forage production, utilization, and analysis.

Table 2.—How potassium applied to Coastal Bermudagrass affected phosphorus and potassium percentage in crimson clover forage. 2-year average, 1956–1957.

Treatment NPK Lb/acre	P_2O_5 %P	K_2O %K
400–200–0	.373	1.21
400–200–50	.390	1.19
400–200–100	.377	1.67
400–200–200	.381	2.20

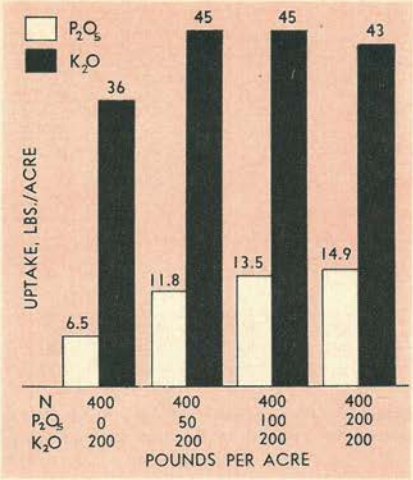


Figure 3. How phosphorus rates on Coastal Bermudagrass influenced the phosphate and potash uptake in crimson clover. 2-yr. Avg., 1956-57.

0 to 200 lbs. potash. (Figure 5).

The total amount of K_2O taken up by the crimson clover plant (Figure 4), as well as the total amount of P_2O_5 (Figure 4), *increased with increasing K_2O rates due to the greater amount of forage produced.* But potassium uptake increased much more rapidly than phosphate uptake.

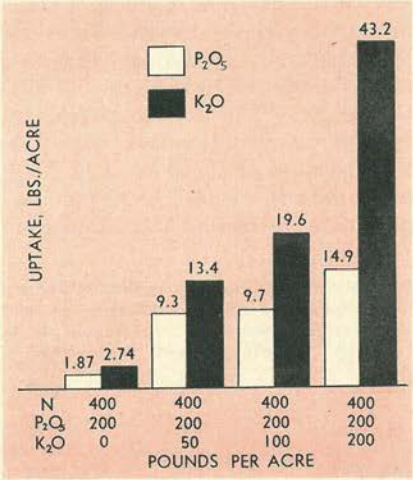


Figure 4. How potassium rates on Coastal Bermudagrass influenced the phosphate and potash uptake in crimson clover. 2-yr. Avg., 1956-57.

SUMMARY

In studying the fertility needs of crimson clover grown with Coastal Bermudagrass, we found . . .

1 That 100 pounds per acre of nitrogen (from ammonium nitrate) applied to Coastal Bermudagrass increased the forage production of the associated crimson clover. Other nitrogen rates reduced crimson clover forage to levels below the check plots.

2 That the first 50 lbs. of P_2O_5 (phosphorus) per acre increased crimson clover forage production almost 50 per cent over the no phosphorus level. But additional increments of P_2O_5 did not affect clover production.

3 That increasing phosphorus rates boosted phosphorus percentage in the crimson clover forage but had little effect on the potassium percentage.

4 That total uptake of phosphorus increased with increasing rates of phosphorus.

5 *That potassium was the one nutrient most frequently found to limit the stand and production of crimson clover.*

6 That increasing K_2O (potassium) rates produced a marked increase in the potassium percentage in the crimson clover forage but had no effect on the phosphorus percentage.

7 That increasing rates of potassium caused an increased total uptake of both P_2O_5 and K_2O, largely due to *the greater amount of forage produced.*

THE END—PART I

PART II—FERTILITY NEEDS OF COASTAL BERMUDAGRASS GROWN ALONE

IN a companion article, we dealt with the soil fertility requirements of crimson clover when grown in association with Coastal Bermudagrass. In this article we shall discuss the fertility requirements of Coastal Bermudagrass. The details of the experiments have been given in the preceding article.

The average oven-dry forage yields of Coastal Bermudagrass varied widely with treatments for the two-year period, 1956-1957. The yields varied from *1.59 tons* per acre for the *0-0-0* fertilizer level to *7.52 tons* per acre at the *400-200-200 (N-P_2O_5-K_2O)* fertilizer level. The 100-50-50 treatment yielded 4.23 tons per acre and the 200-100-100 treatment 5.62 tons.

Although nitrogen is the most critically limiting plant nutrient in the southeastern United States, Coastal Bermudagrass can make efficient use of it *only when other nutrients are adequately supplied.*

Forage production increased with each 100-lb. addition of nitrogen up to 400 pounds per acre (Figure 1), *though the efficiency of nitrogen utilization declined as the rate of nitrogen increased.* For example, Coastal Bermudagrass forage production per pound of nitrogen was 49.2 lbs. forage at the 100 lb.-N level, 43.2 lbs. at the 200 lb.-N level, and 27.2 lbs. at the 400 lb.-N level. *The 100 lb.-N level was the most efficient.*

But, the 200 lb.-N level was almost as efficient as the 100 lb.-N level, while producing 40% more forage. Even at the 400 lb.-N level, we produced a ton of hay (15% moisture) for each 73.4 pounds of nitrogen.

Coastal Bermudagrass did not respond to P_2O_5 (phosphorus) (Figure 2) as readily as it did to nitrogen. The greatest response to P_2O_5 was at the first 50 lbs.-per-acre level. The pounds of forage produced per pound of phosphorus were 39.2 lbs. forage at the 50 lb.-P_2O_5 level, 24.6 lbs. at the 100 lb.-P_2O_5, and 17.3 lbs. at the 200 lb.-P_2O_5 level. The 200-lb. phosphorus level was only about half as efficient as the 50-lb. level for forage production. Where nitrogen and potash were adequately supplied, *but phosphorus was limiting,* we noticed a *reduction in the height of the Coastal Bermudagrass at harvest.*

Coastal Bermudagrass responded better to potash (Figure 3) than to phosphate, but again not as readily as it did to nitrogen. Though forage production increased with each increment of potash, the greatest response was at the 100-lb. potash level. After that, the response curve begins to flatten.

The pounds of Coastal Bermudagrass forage produced per pound of potash were 28.8 lbs. forage at the 50 lb.-K_2O level, 35.4 lbs. at the 100 lb.-K_2O, and 20.5 lbs. at the 200 lb.-

Table 1.—The effect of nitrogen rates on percent nitrogen, phosphorus and potassium in Coastal Bermudagrass forage. 2-year average, 1956–1957.

Treatment NPK Lbs/acre	N %N	P_2O_5 %P	K_2O %K
0–200–200	1.52	.250	1.59
100–200–200	1.62	.237	1.77
200–200–200	1.91	.238	1.72
400–200–200	2.50	.259	1.74

Table 2.—The effect of phosphorus rates on percent nitrogen, phosphorus, and potassium in Coastal Bermudagrass forage. 2-year average, 1956–1957.

Treatment NPK Lbs/acre	N %N	P_2O_5 %P	K_2O %K
400–0–200	2.39	.171	1.94
400–50–200	2.49	.226	1.82
400–100–200	2.45	.235	1.78
400–200–200	2.50	.259	1.74

K_2O. Thus, the 100 lb.-K_2O level was 25 per cent more efficient in forage production than the 50 lb.-K_2O level.

We noted with much interest that although the first increment of both nitrogen and phosphorus was the most efficient, the *second increment* of potash was the most efficient. *Potassium deficiency was observed on all plots with high N levels and low potash.*

PLANT COMPOSITION AND NUTRIENT UPTAKE

Nitrogen rates

The percentage of nitrogen in the Coastal Bermudagrass forage increased with increasing nitrogen rates (Table 1). Nitrogen percentage almost doubled from the *0 lb.-N* level to the *400 lb.-N* level. Phosphorus percentage was not greatly affected by nitrogen rates, while potassium percentage did not increase after the 100 lb.-N level.

The total nitrogen taken up by Coastal Bermudagrass forage (Figure 4) increased rapidly with each 100-lb. addition of nitrogen. Other studies have indicated that the protein content of Coastal Bermudagrass increases with nitrogen rates. Thus, higher nitrogen fertilization means a better quality forage through increased nitrogen content.

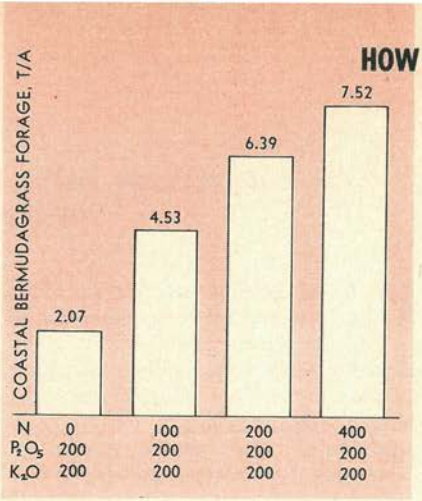


Figure 1. How Coastal Bermudagrass responded to nitrogen.

Coastal Bermudagrass utilizes nitrogen very efficiently. For example, we recovered 84.5% at the 100 lb.-N level, 92.4% at 200 lb.-N, and 77.7% at 400 lb.-N. We believe this high rate of recovery, even with heavy fertilization on Cecil sandy loam, is directly related to the heavier clay subsoil that slows leaching losses but is thoroughly permeated by Coastal Bermudagrass roots reaching down at least four feet.

The 100 lb.-N level was slightly more efficient than the 200 lb.-N level in forage production. But the much greater forage yield at 200 lb.-N makes that level the most economical on Piedmont soils.

Increasing nitrogen increased total uptake of phosphorus (Figure 4). For example, the 100 lb.-N rate caused the

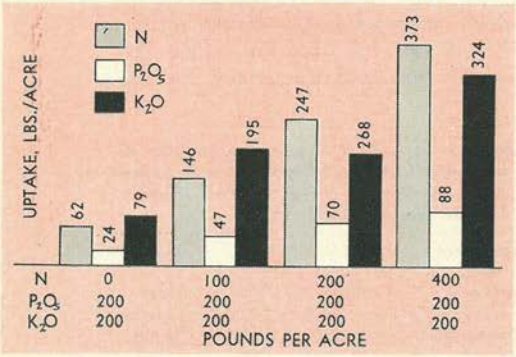


Figure 4. How nitrogen affected Coastal Bermudagrass uptake of nitrogen, phosphate, and potash. 2-yr. Avg., 1956-57.

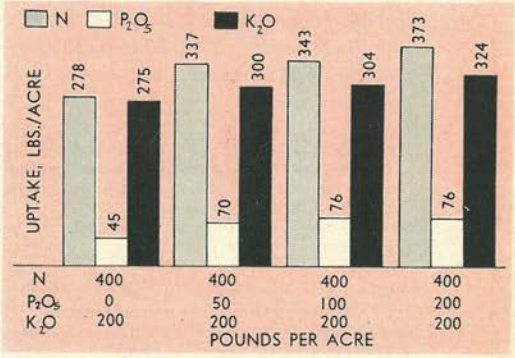


Figure 5. How phosphorus affected Coastal Bermudagrass uptake of nitrogen, phosphate, and potash. 2-yr. Avg., 1956-57.

BERMUDAGRASS RESPONDED TO NPK—2 YR. AVG., 1956-57

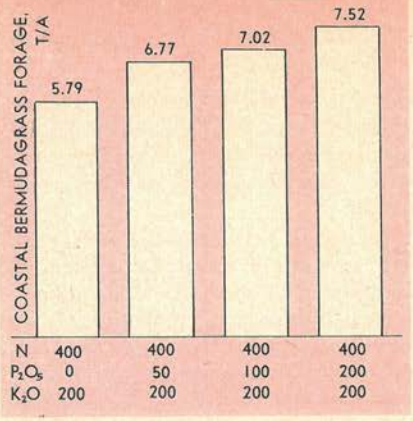


Figure 2. How Coastal Bermudagrass responded to phosphorus.

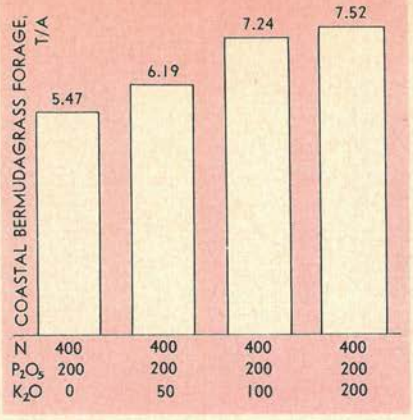


Figure 3. How Coastal Bermudagrass responded to potassium.

Coastal Bermudagrass to absorb .23 lb. phosphorus per pound of nitrogen applied, the 200 lb.-N rate removed .23 lb. phosphorus per pound of N applied, and the 400 lb.-N rate .18 lb. phosphorus.

Increasing the nitrogen rate *greatly stimulated the removal of potash from the soil (Figure 4).* For example, the 100 lb.-N rate caused the Coastal Bermudagrass to absorb 1.16 lbs. potash per pound of nitrogen applied, the 200 lb.-N rate removed .73 lb. potash per pound of N applied, and the 400 lb.-N rate .56 lb. potash.

These data show that Coastal Bermudagrass will remove about one pound of potash for each pound of nitrogen up to 200 lbs. per acre of nitrogen. At higher N levels, the ratio of K_2O to N may not be quite as great.

At the 100 and 200 lb.-N levels, the K_2O removal was about equal to the applied K_2O. However, at the 400 lb.-N level, the removal exceeded the applied potash considerably. Although the potassium percentage (Table 1) was not greatly affected by nitrogen rates, the total uptake or removal of potash (Figure 4) showed a marked increase with each additional increment of nitrogen.

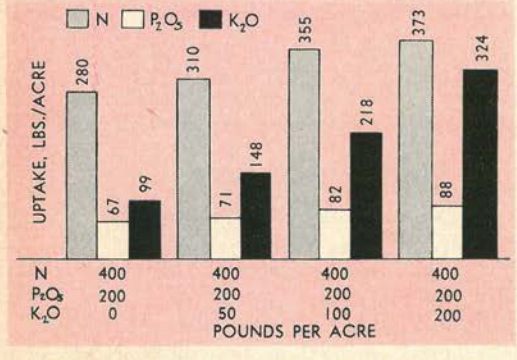


Figure 6. How potassium affected Coastal Bermudagrass uptake of nitrogen, phosphate, and potash. 2-yr. Avg., 1956-57.

Phosphorus rates

As more phosphorus was applied, the phosphorus percentage increased, while the potassium percentage decreased (Table 2). This indicates that when one nutrient is increased, *the others must also be adequately supplied.*

Total phosphorus uptake (Figure 5) increased rapidly with increasing rates of P_2O_5, as may be expected. The percentage of phosphorus recovered in Coastal Bermudagrass forage and the associated crimson clover was 72% at the 50 lb.-P_2O_5 level, 43% at 100 lb.-P_2O_5 level, and 27% at 200 lb.-P_2O_5 level. The amount of nitrogen absorbed by the Coastal Bermudagrass increased rapidly up to the 50 lb.-P_2O_5 level. But additional increments of phosphorus did not stimulate nitrogen uptake to the same degree.

Total uptake of potash also in-

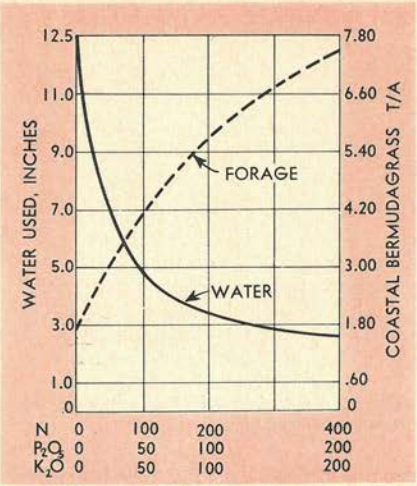


Figure 7. How rising fertilizer decreased the amount of water used by each ton of Coastal Bermudagrass forage.

creased with phosphorus rates, but not as rapidly as the uptake of phosphorus and nitrogen. Thus, the potassium percentage (Table 2) declined with increasing phosphorus rates, while the total uptake of potash increased because of the yield response Coastal Bermudagrass was making to the increased applications of phosphorus.

Potassium rates

As might be expected, potassium percentage increased with increasing rates of K_2O (Table 3). The potassium percentage more than doubled in the Coastal Bermuda forage from the 0 lb.-K_2O to the 200 lb.-K_2O levels.

Total uptake of potassium (Figure 6) increased rapidly with increased increments of K_2O. For example, at the 50 lb.-K_2O level, the potash uptake was .97 lb. per pound of potash applied, at the 100 lb.-K_2O level 1.18 lbs. per pound of potash applied, and at the 200 lb.-K_2O level, 1.12 lbs. potash.

Table 3.—The effect of potassium rates on percent of nitrogen, phosphorus and potassium in Coastal Bermudagrass forage. 2-year average, 1956–1957.

Treatment NPK Lbs/acre	N %N	P_2O_5 %P	K_2O %K
400–200–0	2.56	.268	.75
400–200–50	2.52	.247	.99
400–200–100	2.47	.251	1.26
400–200–200	2.50	.259	1.74

Increasing rates of potash increased total uptake of both nitrogen and phosphorus (Figure 6), but neither element increased in uptake nearly as much as potash. For example, the amount of nitrogen uptake per pound of applied potash was .62 lb. N at the 50 lb.-K_2O level, .75 lb. N at 100 lb.-K_2O, and .46 lb. N at 200 lb.-K_2O. The phosphorus uptake per pound of applied potash was .08 lb. P_2O_5 at the 50 lb.-K_2O level, .15 lb.-P_2O_5 at the 100 lb.-K_2O level, .11 lb.-P_2O_5 at 200 lb.-K_2O.

The increased forage production of Coastal Bermudagrass, brought on by the increasing potash rates, caused the total uptake of nitrogen and phosphorus to rise.

We observed with interest that approximately twice as much potash was taken up in the Coastal Bermudagrass forage (Figure 6) as was applied. The calculated percentage of potash recovered by the Coastal Bermudagrass and the associated crimson clover was 111% at the 100 lb.-K_2O level, 132% at the 200 lb.-K_2O level, and 131% at the 400 lb.-K_2O level.

Some luxury consumption may have occurred at the higher applied rates, since the potash content of the forage increased more rapidly than yields.

From observations, we concluded that *at least 200 pounds of potash per acre* are needed to maintain stands when high nitrogen rates are applied.

WATER UTILIZATION

Another very interesting observation concerned the water requirements of Coastal Bermudagrass. This is closely related to fertilizer level. As fertilizer level increased (Figure 7), the amount (inches) of rainfall used (or needed) by each ton of Coastal Bermudagrass rapidly decreased. At

the same time, forage production increased with the rising fertilizer level.

SUMMARY

In studying the fertility needs of Coastal Bermudagrass, we found . . .

1 That Coastal Bermudagrass forage production increased with increasing rates of fertilization.

2 That 100-50-50 (N, P_2O_5, K_2O) fertilizer level produced *4.23 tons per acre*, 200-100-100 produced *5.62 tons per acre*, and 400-200-200 *7.5 tons per acre*.

3 That increasing rates of N, P_2O_5, or K_2O often decreased the percentage of either one or both of the other two nutrients, though total *uptake* was always increased.

4 That Coastal Bermudagrass used water much more efficiently as fertilization levels increased.

THE END—PART II

AGRICULTURAL RESEARCH—*WHAT IS IT?*

In 1939, when World War II broke out in Europe, American farmers produced a 2½ billion bushel corn crop on 88 million acres. Last year, they produced 32 percent more corn on 17 percent *less land*.

Since 1939, the national wheat crop has risen from 740 to 940 million bushels, but harvested acres have gone down, from 52½ to 43½ million.

Compared with 1939, farmers last year reduced cotton acreage by 45 percent, and still produced 95 percent as much cotton. In 1956, dairymen had nearly 3 million fewer cows than in 1940, but each cow produced two-thirds of a ton more milk.

For every two eggs a hen laid in 1940, her descendant is laying about three today. Nearly 100 million cattle and horses grazed the same acreage that in 1940 supported only 83 million head. A pig crop of 90 million in 1956 compares with only 80 million produced on the same farm plant in 1940. In World War I, our farm commodities were produced by 13½ million workers; in World War II, by 10½ million workers. Today, there are only 7½ million farm workers.

—Byron T. Shaw, Administrator, Agricultural Research Service, USDA

POTASH HELPS REDUCE CORN LODGING

Potash fertilizer and an insecticide can sometimes help reduce lodging in corn.

In extension demonstrations in Nobles County, Minnesota, last summer, a group of specialists found that spraying 1½ pounds of dieldrin per acre resulted in less corn down than on untreated plots.

Forty-seven pounds of potash per acre also resulted in less lodging.

And dieldrin and potash together resulted in fewer broken and leaning plants than where dieldrin was applied alone.

The degree of "water solubility" of potassium fertilizer apparently has no effect on corn yield. Corn fertilized with potassium metaphosphate and potassium pyrophosphate—two "low solubility" fertilizers—yielded as well as fields getting potash in conventional high-watersoluble form.

Minnesota Feed Service—May, 1959
What's New in Farm Research

Soil Test Predicts—PRO

AS MODERN AGRONOMISTS WORK TO STANDING OF THE FERTILIZER

By Lowell Hanson Univ

Forty bushels of corn from 80 pounds of potash! Only $4 to $5 worth of potash! This happened in an experiment on a central Minnesota farm.

Eighty pounds of potash, along with 100 pounds each of nitrogen and phosphate, pushed corn yields up to 67 bushels per acre. When the potash was omitted, the yield dropped to only 26 bushels.

In addition to increasing yield, potash also had other important effects:

1 *Nearly a third of the corn lodged on plots that did not receive potash.*

2 *Corn ears from plots with no potash were small, poorly filled, and chaffy.*

3 *They also averaged 10% higher in moisture at harvest.*

These effects of potash were demonstrated on the cooperation with Howard Agricultural Agent.

The experiment was the need for adapting fert soil conditions and to ch tests in predicting fertilize

SANDY SOILS NEE

Many acres of these rat the Crow River are much characteristics than the cla

The upland soils are ge and medium to high in a lighter-textured, sandier s in phosphorus and low in p

FORTY BUSHELS OF CORN FROM 80 LBS. OF POTASH—OR ONLY $4 TO $5 W

FERTILIZER APPLIED LBS. PER ACRE			CORN YIELD BU/A	VALUE OF ADDITIONAL CORN	FERTILIZER INVESTMENT	VAL
N	P_2O_5	K_2O				
—	NONE	—	25	—	—	
100	100	0	26	$ 1.00	$23.00	
100	100	40	55	30.00	25.00	
100	100	80	67	42.00	27.00	
100	100	160	65	40.00	29.00	

*DOES NOT INCLUDE AN ADDITIONAL COST OF APPROX. 20c PER BU. FOR HANDLING AND STORAGE

**OR $1500 ADDITIONAL DOLLARS FROM 100 ACRES OF CORN

FITS FROM POTASH

CORRECT WIDESPREAD MISUNDER-
NEEDS OF SANDY SOILS

ersity of Minnesota

on corn yields and quality
Oscar Ruprecht farm, in
Grant, Meeker County's

designed to demonstrate
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D MORE POTASH

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different in their fertility
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ORTH OF POTASH!
UE OF EXTRA CORN OVER FERTILIZER INVESTMENT*
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$−22.00
5.00
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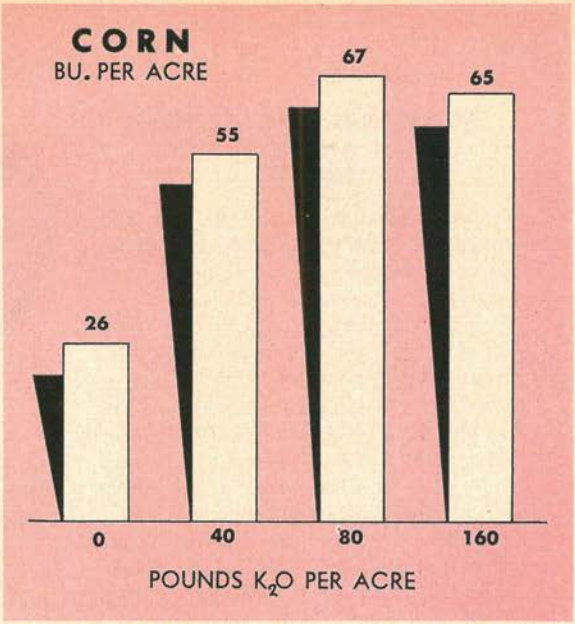


Figure 1. Potash gave excellent return on this soil low in K. All plots received 100 lbs. each of N and P_2O_5.

But farmers are wrongly using grades of fertilizer, such as 5-20-20 and 6-24-12, on the lighter-texture soil. Such grades as 5-20-20 and 6-24-12 are well adapted to the heavy soils, but not the sandier ones. *More appropriate grades would be 3-9-27 or 6-12-24, balanced with additional nitrogen.*

SOIL TESTS PREDICT NEEDS

Fortunately, University of Minnesota soil tests predict soil differences quite accurately. Tests from this experimental area indicated that the soil was medium in available phosphorus and low in exchangeable potassium (80 lbs/A.)

A fertilizer recommendation for good corn yields with this soil test would be 80 lbs of nitrogen, 40 lbs of phosphorus, and 80-100 lbs of potassium (135-165 lbs of muriate of potash or its equivalent) per acre.

As the graph (Figure 1) shows, potassium is a critically needed element in fertilizers on these soils.

COMBINATION OF ROW AND BROADCAST BEST

Row application of fertilizer generally showed an advantage over equal amounts of broadcast fertilizer. However, over most of the state a combination of both row and broadcast fertilizer has proved best.

ADDITIONAL DOLLARS FROM K—N AND P_2O_5 NOT ENOUGH

Adapting fertilization to soil and crop needs really affects the economics of corn production. How much so is shown in Figure 2.

Proper fertility balance really paid off in this case, for the 100-100-80 treatment produced *$15 per acre above the fertilizer investment.* That would be $1500 (*additional dollars*) from 100 acres of corn. (No consideration is given to the carryover effects that may occur the next year.)

What were the next limiting factors after potash needs were met? Probably nitrogen and moisture. Plots with adequate potash showed a need for additional nitrogen. Rainfall was below normal during the season, but distribution was fair.

FARMERS CAN USE SUCH INFORMATION

Farmers visited these plots twice during the season—one summer meeting to observe the early effects of fertility on growth and fall meeting to evaluate the yield and quality effects of the treatments.

Lowell Hanson, extension soils specialist with the University of Minnesota Soils Department, works primarily on soil testing and fertilizer recommendations for Minnesota farmers. He earned his B.S. and M.S. from Minnesota, where he has taught general soils and soil physics. He once served as an extension soil conservation agent.

Farmers were very surprised at the differences. This and other work in Minnesota has shown that there is *widespread misunderstanding of the fertilizer requirements of sandy soils.*

High potash and nitrogen rates, balanced with moderate phosphate rates, can make these "low value" soils nearly as productive as many of the finer-textured southern Minnesota soils.

Widespread use of soil tests, and a demand for the *right grades* of fertilizer, make these soils capable of high-profit production.

THE END

WRONG FERTILIZER PLACEMENT CAN COST BUSHELS, STANDS—*AND DOLLARS*

Soybean growers can lose up to 20 or 30 dollars an acre by improper placement of fertilizer, according to research findings by the Ohio Experiment Station.

Poor stands and 10 to 15 fewer bushels were produced per acre when fertilizer was placed one inch directly below the seed or as close as half an inch from the seed. In some fields, as much as half of the beans never came up.

Agronomist H. J. Mederski of the Ohio Station says soybean seeds cannot absorb enough water for normal germination when the fertilizer is too close to the seed. Of four methods of soybean fertilization tested by Ohio researchers, they found that best bean yields and stands can be expected when fertilizer is placed about 1½ inches to the side and 1½ inches below the seed.

The soybeans in the Ohio tests were fertilized at the rate of *200 and 400 pounds of 0-20-20 per acre,* but even at the lower rate of application, damage to plants was severe when the fertilizer was improperly placed.

—Stanley Gaines, USDA

COLOR FOLDERS FOR YOU TO DISTRIBUTE AND USE IN TEACHING • AT MEETINGS • FOR EXHIBITS

FOLDER C-59

Do you want to prevent hidden hunger in crops? If so, this folder will acquaint you with that all-important hidden hunger zone on the yield curve and how to deal with it. It points out how crops often do not show definite deficiency symptoms but still need extra plant food.

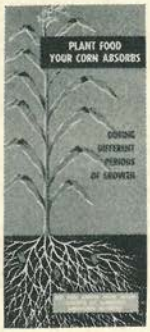
FOLDER E-59

Here are graphic pointers on safe, efficient fertilizer placement. How to avoid injury to seedlings. How to use nutrients efficiently from start to finish. How *right* placement *pays* on specific crops. How to get the right start, to build fertility, to maintain it, etc.

Quantities above free policy (stated below) *only* $1 per 100, $10 per 1000

FOLDER B-59

Here is shown the role of potash on yield and quality. How much potash certain basic crops take from the soil in a year. How heavy nitrogen treatment can cause crops to use up available potash *fast*. How potash affects quantity, quality, drought and disease resistance.



FOLDER D-59

This folder capsules plant food corn absorbs during different periods of its 4-month growing season—the minerals used by corn producing 100 bushels per acre. It shows what corn ears look like when they suffer from shortages of nitrogen, phosphate, and potash.

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Forty Extra Bushels --on Less Land

"Those who can't count on 100 or more bushels (of corn) per acre had better be thinking of other crops or other things to do. I believe a cornbelt farmer should set his specifications for 150 bushels per acre."

So says Dr. George Scarseth, a veteran agricultural scientist known for his ability to make men think.

TODAY'S cost-price squeeze constantly pressures farmers to increase their production efficiency.

Only through increased efficiency can a profit be made on farming operations.

Applying this problem to corn, Dr. George D. Scarseth (of *402 Northwestern, West Lafayette, Indiana)* has prepared a booklet entitled "Forty Extra Bushels—On Less Land" (Series 3, American Farm Research Association, January, 1959). In this booklet, he stresses the need for producing more corn per acre to make a profit.

The "normal yield" bushels may pay for the *fixed cost* of growing an acre of corn. But it is the *extra* bushels above this that pay off.

Dr. Scarseth predicts, "Those who can't count on 100 or more bushels per acre had better be thinking of other crops or other things to do. I believe a cornbelt farmer should set his specifications for 150 bushels per acre."

Increased total production is not advocated in this increased efficiency program. Land less well adapted to corn would be put in "moth-ball storage" or planted to other crops.

Dr. Scarseth bases his suggestions on research findings and on his personal experience of how to get the extra bushels that pay off. He says there is no one best over-all method. A *good stand* is the first necessity for a high yield. As he says, "A poor stand kills all chances for a profit."

Another big requirement is that the plant receive optimum nutrition throughout its entire growing period. High amounts of nitrogen, phosphorus, and potassium are needed. In most cases, this means *generous* fertilization.

Pest control is also necessary. If any factor is missing, that factor sets the ceiling for yield.

As usual with material presented by Dr. Scarseth, this booklet is provocative. Some readers will not agree with all he says. He expects that. But he makes people think, and this is what he really wants to accomplish. He is a foe of complacency. In his booklet, he presents the challenge of producing high and profitable yields and how to meet the challenge.

For copies of this booklet, write Dr. George Scarseth, 402 Northwestern, West Lafayette, Indiana.

THE END

ORCHARDGRASS + LADINO

IN RECENT TESTS, GRASS-CLOVER MIXTURE PRODUCED 9% MORE MILK PER COW DAY THAN NITROGEN - FERTILIZED PURE GRASS.

HOW LEGUMES BOOST

By H. M. AUSTENSON, F. R. MURDOCK,
State College

ORCHARDGRASS + NITROGEN

IN recent years, considerable research interest has arisen over comparing high level nitrogen application on grass to the conventional grass-legume mixtures.

Various experiments with *clipped plots* have shown that nitrogen increases grass yields linearly up to quite high levels. In many instances, nitrogen-fertilized grass has exceeded grass-legume mixtures (at least for a period) in both yield of dry matter and in crude protein percentage.

But although clipping experiments and chemical analyses give useful information, they do not always predict animal performance. The ultimate measure is with *grazing animals*.

With this in mind, we designed an experiment to determine whether the advantages of high rates of nitrogen would carry through when milk production was used as the criterion.

PROCEDURE AND FERTILITY PROGRAM

We seeded plots of Akaroa orchardgrass and Akaroa orchardgrass with Ladino clover in September, 1954 and began grazing in July, 1955. The experiment was continued for three years, until 1958, to evaluate any seasonal variations. Our fertility program on these plots was this:

The *pure orchardgrass* plots received 30 pounds of nitrogen per acre in March and after each grazing period. This amounted to 120 pounds of nitrogen per acre in 1955 and 210 pounds of nitrogen per acre annually in 1956 and 1957.

The *orchardgrass-Ladino clover*

plots received 30 pounds of nitrogen per acre in March.

All plots received 130 pounds of phosphorus and 60 pounds of potassium per acre split between March and September applications.

These levels of fertilization resulted in *approximately equal* yields from *irrigated orchardgrass* and *orchardgrass-Ladino clover* in clipping experiments at this station.

Each treatment was grazed by milking Holstein cows, using rotation grazing. In addition to measuring milk yields, we also measured dry matter yields to assist in stocking each plot and to determine any possible correlation between dry matter and milk production.

The orchardgrass-Ladino clover treatment averaged 48% clover during the 1955 season. In 1956, it averaged 30% clover. In 1957, the clover varied from 3% in early spring to 27% in mid- and late summer. The average for 1957 was 11%.

In the orchardgrass-nitrogen treatment, a trace of volunteer white clover was noted—never over 3% on an oven-dry basis.

MILK PRODUCTION

and A. S. HODGSON,

of Washington

RESULTS: DRY MATTER AND ANIMAL PRODUCTION

Dry matter production averaged 14% greater on the nitrogen-fertilized grass than on the grass-clover.

But forage consumption was higher on the grass-clover *both in amount of forage eaten per cow per day and in percentage of the available forage that was grazed.*

Fig. 1—Production costs and returns from two 20-acre farms, one in nitrogen-fertilized orchardgrass, the other in orchardgrass-Ladino clover.

	ORCHARDGRASS +NITROGEN	ORCHARDGRASS +LADINO
Size of farm, acres	20	20
Number of cows	34	30
Milk/cow/day	38.0	41.4
Milk produced, cwt.	2,132	2,049
Value of milk @ $4.25	$9,061	$8,708
Grain fed, tons	15.2	14.6
Cost of grain @ $70	$1,064	$1,022
Ammonium nitrate, tons	6.3	0.9
Cost of ammonium nitrate @ $95	$ 599	$ 86
NET RETURN	**$7,398**	**$7,600**

DIFFERENCE IN FAVOR OF ORCHARDGRASS + LADINO $202

FACTS ALL DAIRYMEN SHOULD KNOW

Fig. 2—Production costs and returns from two 30-cow herds, one grazing 17.5 acres of nitrogen-fertilized orchardgrass; the other grazing 20 acres of orchardgrass-Ladino clover.

	ORCHARDGRASS +NITROGEN	ORCHARDGRASS +LADINO
Size of farm, acres	17.5	20
Number of cows	30	30
Milk/cow/day	38.0	41.4
Milk produced, cwt.	1,881	2,049
Value of milk @ $4.25	$7,994	$8,708
Grain fed, tons	13.4	14.6
Cost of grain @ $70	$ 938	$1,022
Ammonium nitrate, tons	5.5	0.9
Cost of ammonium nitrate @ $95	$ 522	$ 86
NET RETURN	**$6,534**	**$7,600**

DIFFERENCE IN FAVOR OF ORCHARDGRASS + LADINO $1,066

Dr. H. M. Austenson, associate agronomist at the Western Washington Experiment Station, is an authority on forage crop production and management. He earned his B.S.A. and M.Sc. from the University of Saskatchewan and Ph.D. from Washington State College. Before joining the Washington staff, he was extension agonomist at Cornell.

Chemical analyses of both forages showed no great difference in protein percentage.

Table 1 shows total production data on a per-acre basis for the duration of the experiment. This covers a period of 2.33 grazing seasons—that is, one third of a season in 1955 and full seasons in 1956 and 1957.

The most important finding in this experiment was that the grass-clover mixture gave higher milk production per cow than the nitrogen-fertilized pure grass.

This was true in each of the three years—in 1955, when dry matter production was equal in both treatments; in 1956, when the cows on straight grass had 20% more feed available to them; in 1957, when the grass-clover mixture was reduced to only 11% legume.

Table 1.—Production levels of orchardgrass-Ladino clover and nitrogen-fertilized orchardgrass during 1954–1957 seasons. All comparisons are on a per acre basis.

Production Factor	Orchard-grass-Ladino	Orchard-grass-Nitrogen
Dry matter produced, lbs.	19,630	22,380
Cow days grazed	669	764
Milk produced, cwt.	277	290
Milk per cow per day	41.4	38.0

During the full length of the experiment, *the grass-clover mixture produced 9% more milk per cow day than the pure grass.*

What do these forage and milk production figures mean to the farmer who is interested in efficient production?

We can use the results of these experiments to calculate the returns under two different sets of circumstances: (1) *constant herd acreage,* with nitrogen-fertilized grass carrying more cows; (2) *constant herd size,* with nitrogen-fertilized grass requiring fewer acres of land.

Example 1—Constant Acreage

In Figure 1, we are comparing two 20-acre farms; one in *orchardgrass-Ladino clover,* carrying 30 cows; one in *pure grass,* carrying 34 cows because of its higher productivity.

The orchardgrass-Ladino clover farm uses 30 pounds of nitrogen per acre and the orchardgrass farm uses 210 pounds of nitrogen per acre annually. Both farms feed grain at 1 pound per 7 pounds of milk produced and both have a 165-day grazing season. The prices of milk, grain, and ammonium nitrate are approximately those in effect in September 1958.

The farmer with 20 acres of orchardgrass-Ladino clover pasture would be *$202.00 better off* than he would have been with nitrogen-fertilized orchardgrass. Furthermore, he would have accomplished this with *four fewer cows.*

It costs $300 a year to keep one cow, according to recent estimates. Figuring half of this amount for the

pasture season, the actual difference in returns would be around *$802.00 in favor of the orchardgrass-Ladino clover.*

Example 2—Constant Herd Size

In Figure 2, we are comparing two farms with 30 cows each. These could be grazed on 20 acres of orchardgrass-Ladino clover or on approximately 17.5 acres of nitrogen-fertilized orchardgrass, according to the production obtained in this experiment.

With lower production per cow, the pure grass farmer would net $1,066.00 less during the grazing season than the grass-clover farmer. He would save 2.5 acres of pasture land, but this would be a rather small cost in comparison.

From these examples, it is clear that the extra milk produced by cows on the grass-legume mixture is very important to the farmer. *Even if the nitrogen fertilizer were free, it would still be better economics to grow grass-legume mixtures. Unfortunately many dairymen are not taking advantage of legumes for milk production.*

With most farmers who have difficulty maintaining legume stands, the fault usually lies either with *soil fertility* or with *management practices.* Legumes require more mineral nutrients (*phosphorus, potash, calcium, etc.*) than grasses.

Modern soil testing can easily spot deficiencies of these nutrients today. Following soil test recommendations, dairymen can improve their legume growth and persistence through proper fertilizer and lime applications.

Dr. F. R. Murdock is associate dairy scientist at the Western Washington Experiment Station. He earned his B.S. at the University of Idaho, his Ph.D. from Pennsylvania State University. Before joining the Washington State College faculty, he was engaged in feed research for the Borden Company.

Legumes generally require more restrictive management than grasses. *A good rule is to manage the pasture or meadow to favor the legume.* This will usually not affect the grass adversely because most grass species are more adaptable.

Very often when farmers find their legumes have *"gone out"*, a closer look will show the most *productive grasses have also gone.* In humid areas of the northern U.S., high-producing grasses such as bromegrass, orchardgrass, and timothy tend to be replaced by lower-yielding bluegrass, quackgrass, and broadleaved weeds.

On land where erosion is not too great a problem, pastures should be plowed up regularly and rotated with grain or cultivated crops. *By doing this, farmers can maintain high-producing pastures and build production on all of their cropland.*

THE END

A. S. Hodgson is assistant dairy scientist at the Western Washington Experiment Station. He graduated from Washington State College, and his Station work is concentrated on dairy cattle nutrition.

By T. S. BUIE,

Columbia, South Carolina

A QUARTER-CENTURY

Showing how a family of two or three generations has farmed successfully through many eras . . . and economic changes . . . by practicing soil conservation, by using new technical knowledge, and by applying plenty of plant food—such as 900 lbs. of 5-10-10 per acre of cotton and 100 lbs. each of ammonium nitrate and potash sidedressed.

Here is graphic proof of how the Wootens carefully fit contour strip crops to each field on their farm. This picture was taken almost two decades ago. The Wootens have followed this pattern of land use with exacting care every year since.

THIS is the *25th year* that travelers on S. C. Highway 72—formerly U. S. 21—between Rock Hill and Chester, South Carolina, have viewed rolling hillsides fitted with broad alternating contour strips of small grain-lespedeza and cotton just after they passed the York-Chester county line.

During the winter months, the bright green grain strips contrast with the brown lespedeza stubble.

In the early summer, the heavy-headed oats are brown as they await the combine, while the bright green cotton plants continue the vivid contrast of alternating bands.

And in the fall the green lespedeza stands out between the white strips of opening cotton.

For nearly a quarter of a century, now, travelers have viewed with admiration the farming of a family named Wooten along Highway 72.

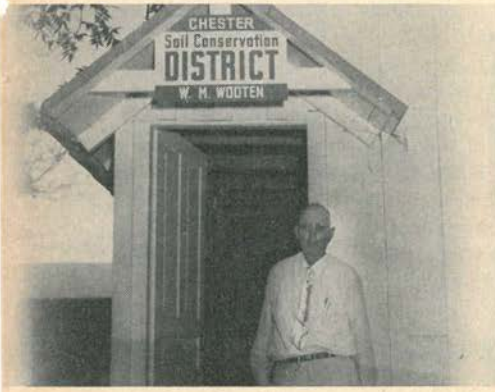
Mr. L. M. Wooten, father of the present owner, was an outstanding leader in his community. He, also, was one of the first South Carolina farmers to develop and put into effect even a limited conservation plan on his farm—a plan based on the *proper use and treatment of each acre.*

But the practical, conservative man of the land and his son, W. M., the present owner, would not fully accept the idea of strip cropping at first.

THE BEGINNING OF A CONSERVATION PLAN

Approached by technicians of the nearby C C C Camp at Rodman in 1936, they readily agreed to terrace all of their crop land and to follow other soil and water-conserving practices suggested. But they agreed to strip crop *only one field*—a decision

OF SOIL CONSERVATION WITH THE WOOTENS



W. M. Wooten of Chester, S. C., is a businessman, as well as a farmer. He operates out of a neat office just back of his home. There he plans his work, records what he has done, files his farm records for many years. He can check back and see how well he did—or didn't do—20 years ago.

Farmers learn by observing—and then doing. Here some of Mr. Wooten's neighbors look over his strip cropped fields. By using better cropping, fertilization, and cultural practices, he now makes the same number of cotton bales on about half the acres he used to plant.

reached with more than a little reluctance.

But it took only one rain—a real gully-washer which came the first year—to convince the skeptical father-son partners that strip cropping was a worthwhile practice. As soon as the ground dried, they requested help in working out a pattern of strip cropping for each field. And the pattern they laid out then has not been substantially changed in a quarter of a century.

(Wooten now follows a four-year rotation—two years of oats-lespedeza and two years of cotton.)

When the local soil conservation district was organized a few years later, the conservation farm plan was rewritten as a district agreement. And Mr. W. M. Wooten, who came into full possession of the farm and land bought from other heirs upon the death of his father in 1938, has been a conscientious district cooperator ever since.

Down the road toward Chester a few miles are the farms of Mr. Wooten's two sons, Milton and Ira. They are following in the conservation footsteps of their father and grandfather.

The Wootens keep up on new practices, too. Milton recently installed parallel terraces on several fields where the slope is gradual and uniform. By "giving and taking" just a bit here and there on the grades, he found it possible to keep the terraces the same distance apart across the whole field. The wide-based, equally-spaced ridges are exactly 96 feet apart. This makes the space between adjacent terraces adaptable to many row widths and permits the use of different types of equipment of varying widths. And there are no short rows

to take up time and space in turning.

Until they began "conservation farming", the Wootens planted most of their cultivated land to cotton each year. And they still can be classed as cotton farmers.

FEWER ACRES—AS MANY BALES

"My father and I used to plant about 130 acres of cotton every year and made about four-fifths of a bale per acre," says the senior Wooten. "Last year I planted only 68 acres. But my yield was almost one and a half bales per acre. So I made about as much as when I used to plant twice as many acres."

This mild-mannered, low-voiced farmer is convinced that strip cropping is essential if cotton is to be grown profitably on land such as his. But he makes use of all other appropriate technical knowledge as well.

BETTER FERTILIZATION PRACTICES

Take the kind and amount of fertilizer he uses, for example.

"I fertilize my cotton better than I used to," he says. "I apply about 900 pounds of 5-10-10 per acre and sidedress with 100 pounds of ammonium nitrate and 50 to 100 pounds of muriate of potash."

The oats benefit from the residue of the fertilizer applied to the cotton. In addition, Mr. Wooten uses 100 pounds of ammonium nitrate and 100 pounds of muriate of potash as a topdressing on his small grain. His oat yields have been as high as 90 bushels per acre when everything hit "just right."

Although the Wootens—father and sons—are cotton farmers, they do not plant cotton on land not suited to it. Their farms are in what is known as the "Blackjack" section. The principal types are Mecklenburg (good for cotton) on the hills, and Iredell (better suited for pasture) in the depressions.

PASTURES AND LIVESTOCK, TOO

The Iredell areas are largely in pasture. Mr. Wooten, Senior, has developed an excellent 100-acre pasture out of land formerly cultivated. He has introduced a unique method of "sharecropping" dairy cattle. One of his tenants milks 15 to 20 cows regularly. Mr. Wooten owns the cattle as well as the land. The tenant raises the home-grown feed, pays for one-half of that bought, provides the labor, and they share equally in the profits.

Down the walk from the Wooten home, which stands on a hilltop, there is a neat, well-kept building. The green and white sign above the door

Here W. M. Wooten and his sons, Milton and Ira, display the certificates of award they received from the South Carolina Bankers Association, for the outstanding soil and water conservation programs on their farms. They are loyal cooperators of the Chester (S.C.) Soil Conservation District.

bears the name of the owner and proclaims him to be a *co-operator with the Chester Soil Conservation District.*

This is Mr. Wooten's office, where he plans his work and records what he has done. Farm records for many years are neatly packaged, labelled, and filed for reference as needed. It is easy, therefore, for this careful, painstaking farmer to check back at

any time and see just how well he did five, ten, or twenty years ago.

As one enters this neatly kept office, he sees framed pictures of the farm taken by Mr. Wooten's daughter. On the opposite wall are certificates awarded him in 1948 and 1953 by the State Bankers' Association in co-operation with his local soil conservation district.

The first of these certificates reads: "In recognition of outstanding performance in planning, applying, and maintaining a soil and water conservation program for his entire farm."

Just above these certificates are two others given Mr. Wooten in recognition of his work in the Shrine Hospital Program for Crippled Children.

Mr. and Mrs. Wooten stand in front of their spacious farm home, relaxed in the peace of knowing that their children and grandchildren are following in their conservation footsteps. Such people are the salt of the earth without whom a rocketing population could not eat nor clothe itself.

And in the house, Mrs. Wooten modestly displays to visitors the "Master Farm Family" bronze plaque awarded them by the PROGRESSIVE FARMER and the South Carolina Extension Service some years ago.

Among Mr. Wooten's prized possessions are the original soil survey made of his farm in 1935, the land-use maps, and plans for terracing each field, made just a little later.

Mr. and Mrs. Wooten have two daughters, both of whom continue to express their love for their land.

Roberta, working in ballistics research at Aberdeen Proving Ground in Maryland, has introduced nandina and iris from her mother's well-kept flower garden into her own small dooryard plot—proving to skeptics that these plants can be successfully grown that far north.

The other daughter, Carrie, is the wife of a dairy farmer—J. M. Cope of Cope, S. C. Just recently they moved to a new home on their farm where they are busy landscaping the grounds —and raising two daughters and a son in the tradition of their parents and grandparents.

THE FOURTH GENERATION

Both of the Wooten sons have teenage boys. And they appear headed along the steps of their fathers, grandfather, and great-grandfather—driving the tractors, performing multiple chores, while weaving in plenty of Little League baseball.

Intense love for the soil seems to be an ingrained family trait of the Wootens—both inherited and acquired. They know that only if they use their land well will it continue to produce abundantly and with profit.

First Mr. L. M., from young manhood was interested in caring for his land.

Then his son, the present owner of the "homeplace", followed in his conservation footsteps.

Now, down the road a ways, his sons—and elsewhere his daughters—are continuing the example of grandfather and father.

And their youngsters, as they grow, undoubtedly will develop an intense interest in farming and display a similar regard for the land. How could they help it with such a heritage?

THE END

POTASH IN ALFALFA PRODUCTION

Dr. W. L. Parks, agronomist for the University of Tennessee Agricultural Experiment Station, has led projects in irrigation and soil moisture, in nitrogen and potash fertilization of farm crops, and in dark tobacco fertilization. He did graduate training at Tennessee and Purdue.

By W. L. Parks and E. J. Chapman University of

ALFALFA is an important forage crop in Tennessee. Over 250,000 acres of alfalfa were grown in Tennessee in 1958, *nearly twice the acreage grown in 1952.*

HAY YIELDS

At the Middle Tennessee Experiment Station, we recently conducted experiments on the nutrient requirement of alfalfa grown on a Maury soil. The soil pH was 6.5 and the experimental plots received annual applications of 20 lbs. borax per acre.

One purpose of this experiment was to determine the hay yields produced by annual topdressings of *100, 200, 300,* and *400 lbs.* K_2O per acre. Before we started the experiment, the soil potassium level was 330-350 lbs. K per acre, *due to previous potash additions* (See Figure 3).

Figure 1 shows the average yearly hay yields produced by these fertilizer treatments during the years 1954 through 1957. Annual potash applications obviously caused greater hay yields. The potash-treated plots yielded about *one ton more hay per acre per year* than the plots receiving no potash.

These results also indicate that annual applications of 100 lbs. K_2O per acre produced as much forage as larger amounts. This, however, is not

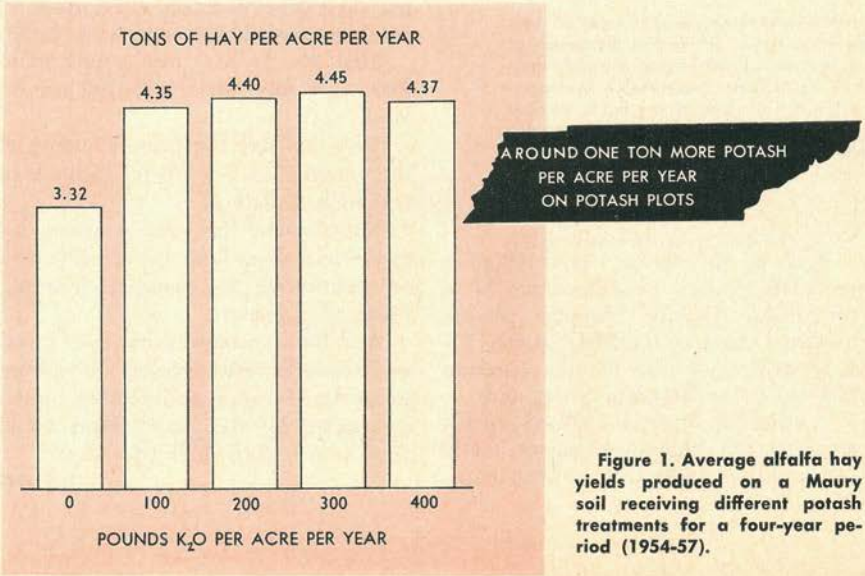


Figure 1. Average alfalfa hay yields produced on a Maury soil receiving different potash treatments for a four-year period (1954-57).

E. J. Chapman is Superintendent of the Middle Tennessee Experiment Station. After earning his M.S. from University of Tennessee, he served as assistant agronomist at the West Tennessee Experiment Station before joining the Middle Tennessee Station as superintendent 10 years ago.

EXPERIMENTS SHOWING:

1.—How potash-treated plots yielded almost one ton more potash per acre per year than the no-potash plots.

2.—How soils are seldom able to supply the full potash requirement for prolonged alfalfa production.

3.—How soil test values at the start and end of an experiment help tell the true need.

Tennessee

the entire picture, as will be shown later.

POTASH ADDED—POTASH REMOVED.

When a crop is removed from the soil, *the nutrients contained in this crop are also removed.* These nutrients were supplied to that crop by added fertilizers or taken from the native fertility present in the soil.

In this experiment, the hay from each cutting was chemically analyzed to determine the amount of potash removed in the hay produced by each of the fertilizer treatments.

It is wise to compare the average amount of potash removed in the forage each year with the amount of potash added to the soil each year, as shown in Figure 2. This enables us to determine approximately how much of the potash removed came *from the soil* and how much came *from the applied fertilizer.*

We have found that soils differ in their capacity to supply potassium to plants, but *few soils have the capacity to supply the full potash requirement for prolonged alfalfa production.*

These data show that where the soil had a high level of potassium at seeding but received no annual topdressing, an average of 119 lbs. K_2O per acre were removed in the hay each year or 476 lbs. K_2O over the 4-year period. The treatment that received

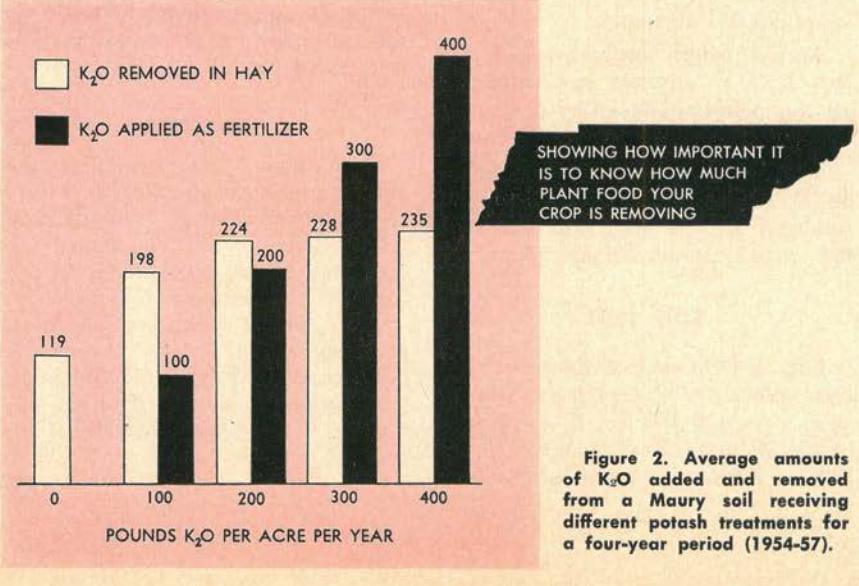


Figure 2. Average amounts of K_2O added and removed from a Maury soil receiving different potash treatments for a four-year period (1954-57).

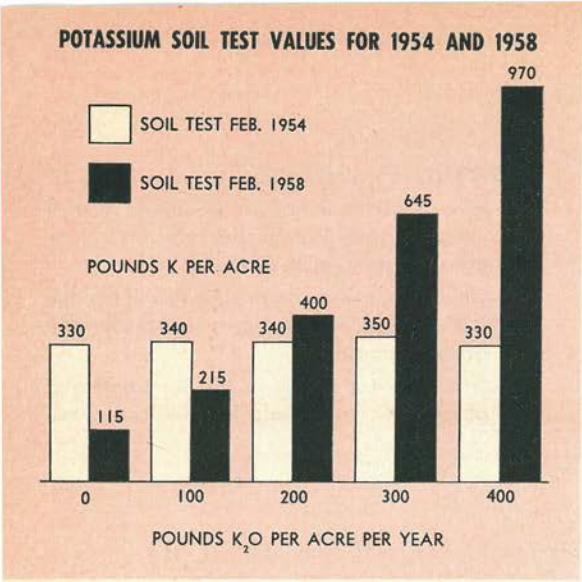


Figure 3. Levels of exchangeable potassium in a Maury soil receiving different potash treatments for a four-year period (1954-57).

100 lbs. K_2O/A annually had an average of 198 lbs. K_2O/A in the hay each year and the treatments that received 200 lbs. K_2O/A or more annually had about 230 lbs. K_2O/A removed in the hay each year.

Thus, each ton of hay contained approximately 36, 46, and 51 lbs. K_2O for the 0, 100, and 200 lbs. K_2O/A treatments, respectively. Additions of K_2O above 200 lbs./A did not bring about a further increase in the amount of K_2O removed.

Further examination of Figure 2 shows that an annual application of 100 lbs. of K_2O accounted for only half of the K_2O removed, as the soil supplied the remainder.

Annual potash applications of 200 lbs. K_2O/A supplied approximately all the potash removed each year in the hay crop.

The 300 lbs./A K_2O rate supplied about 75 lbs. more potash than was removed in the hay and the 400 lbs./A rate, about 165 lbs. more.

SOIL TEST

Figure 3 shows that the initial soil test values for exchangeable potassium were 330-350 lbs. K/A. In the check or unfertilized treatment, the soil test value at the end of the four years had dropped to *115 lbs. K/A.* This low soil potash level eventually caused loss of the alfalfa stand on this treatment.

In the 100 lbs./A potash treatment, the soil test values for potash dropped from 340 to 215 lbs. K/A. This indicates that 100 lbs. potash per acre a year was *not supplying the potash needs of alfalfa or maintaining the exchangeable potassium level in the surface soil.*

Annual applications of 200 lbs. K_2O/A caused a slight increase in the soil test values for potassium even though slightly more potash was being removed each year than was being applied. The alfalfa was probably utilizing some subsoil potash and some was being released from the surface soil.

Annual applications of 300 lbs. K_2O/A/yr., in addition to supplying all the potash removed in the hay for the four-year period, caused an increase in the soil test value from 350 to 645 lbs. K/A.

The 400 lbs./A/yr. rate of potash increased the soil test value from 330 to 970 lbs. K/A.

Thus, the residual potassium from the 300 lbs./A treatment approximately *doubled* the original soil test value for potassium and the 400 lbs./A treatment approximately *tripled* the soil test value for potassium over the four-year period.

SUMMARY

Plant and soil analyses indicate that annual applications of 100 lbs. K_2O/A were not sufficient for prolonged alfalfa production on the Maury soil and that annual applications of 200 lbs. K_2O/A were more than sufficient.

Some rate of K_2O over 100 lbs./A and approaching 200 lbs./A appeared to be the desired rate of annual potash fertilization for continued alfalfa production on the high phosphate Maury soil.

THE END

Abrams frantically dashed up the stairs of his home. "Sarah," he panted, "we got to move out of here right away. I just found out the most terrible thing. I just learned that the janitor from this house makes love to every woman in it but one."

"Yeh, I know," said Sarah. "That's that stuck up thing on the third floor."

A professor of botany was lecturing to a girls' class. "This twig, you will notice," said he, "is composed of bark, hardwood, and pith. Of course you know what pith is."

The class stared at him blankly. "Don't you know what pith is?" the professor repeated. "You, Miss Brown, you know what pith is, do you not?"

"Yeth, thir," said Miss Brown.

"IN KENTUCKY"

The praises of Kentucky have been sung by many men in many ways. Some of the names are household words in the nation's history. Stephen Foster, Irvin S. Cobb, Dan'l Boone, Alben Barclay. Some of the names are not as well known, perhaps. Like that of J. H. Mulligan—Judge Mulligan, that is. But the song he sang, printed on the back of an early Kentucky postcard shared recently with us by a good friend and loyal Kentucky wit in his own right, equals any song we've ever heard about the land of the Boone boys.

The moonlight falls the softest
In Kentucky;
The summer days come oftest
In Kentucky;
Friendship is the strongest,
Love's light glows the longest:
Yet, wrong is always wrongest
In Kentucky.

Life's burdens bear the lightest
In Kentucky;
The home fires burn the brightest
In Kentucky;
While players are the keenest,
Cards come out the meanest,
The pocket empties cleanest
In Kentucky.

The sun shines ever brightest
In Kentucky;
The breezes whisper lightest
In Kentucky;
Plain girls are the fewest,
Maiden's eyes the bluest
Their little hearts are truest
In Kentucky.

The bluegrass waves the bluest
In Kentucky;
Yet, bluebloods are the fewest (?)
In Kentucky;
Moonshine is the clearest,
By no means the dearest,
And yet, it acts the queerest
In Kentucky.

The dove-notes are the saddest
In Kentucky;
The streams dance on the gladdest
In Kentucky;
Hip pockets are the thickest,
Pistol hands the slickest,
The cylinder turns quickest
In Kentucky.

The song birds are the sweetest
In Kentucky;
The thoroughbreds are fleetest
In Kentucky;
Mountains tower the proudest,
Thunder peals the loudest,
The landscape is the grandest—
And politics—the damnedest
In Kentucky.

—J. H. Mulligan

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