Better Crops

WITH PLANT FOOD

March-April 1961

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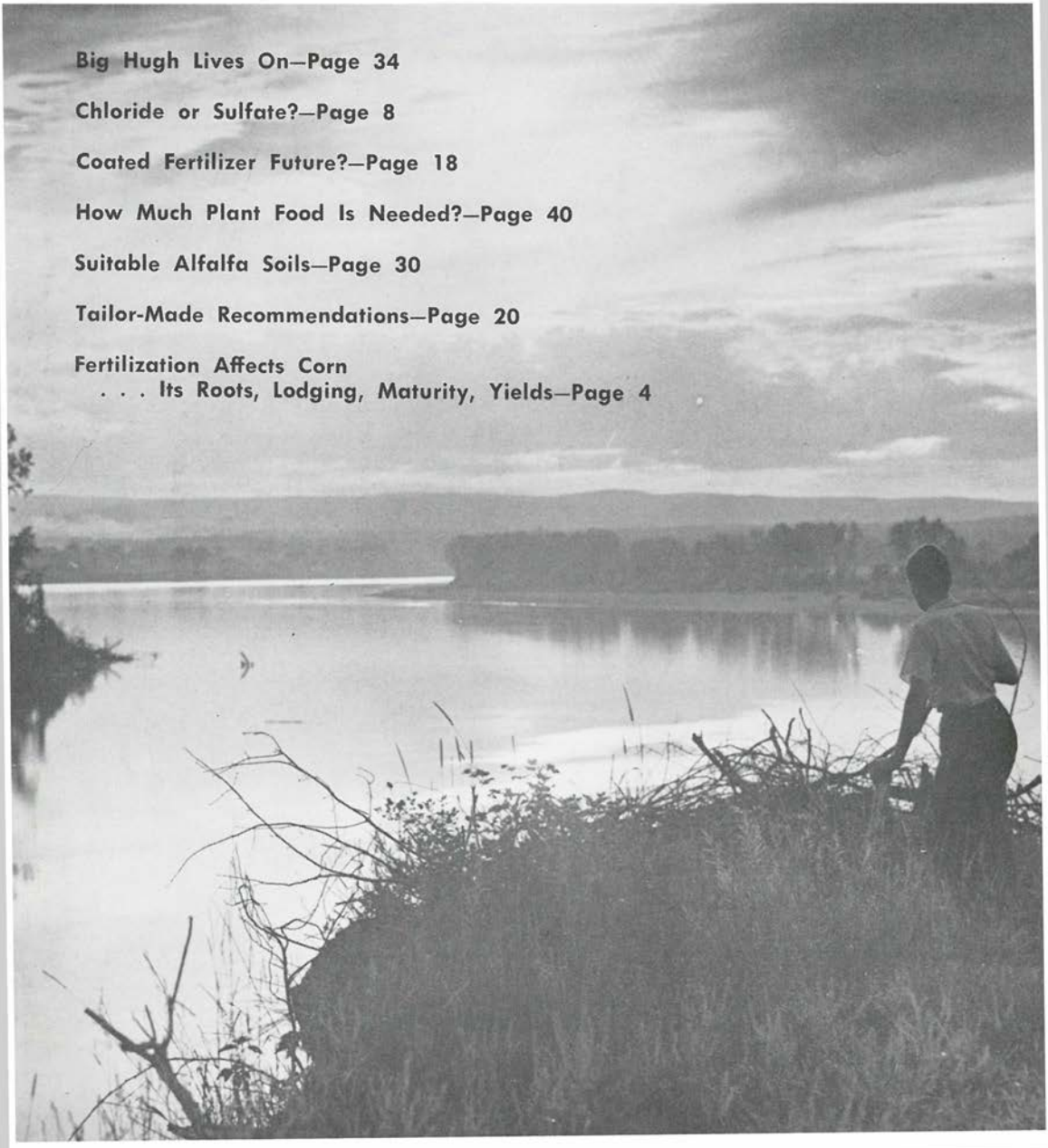

Better Crops
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The Whole Truth—Not Selected Truth
$1.00 for 6 Issues, 20¢ Per Copy

Santford Martin, Editor
Selma Bushman, Assistant Editor
Barbara Martin, Circulation

Published bimonthly by
The American Potash Institute Inc.
1102 16th Street, N.W.
Washington 6, D. C.

Vol. XLV Washington, D. C. No. 2

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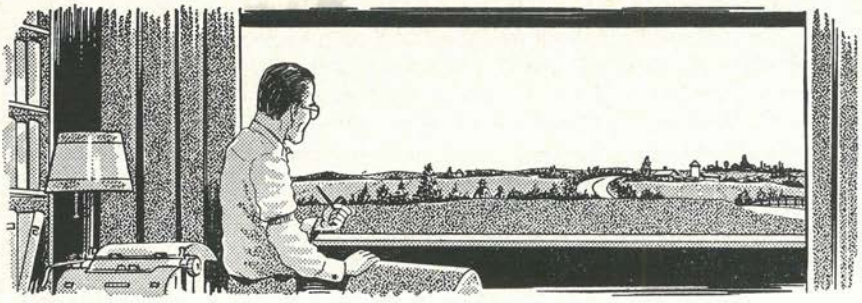


Preserve those faded letters to

"DEAR CARRIE"

By Jeff McDermid

(Elwood R. McIntyre)

BECAUSE of Civil War century observances, committees in every state are reaching into old attics and ancient desks and bureaus to collect the living history of many teenagers and their officers swept into the vortex of pathetic combat.

They were "jining up" from remote settlements far in the raw interiors, dressed in uncomfortable, ill-fitted uniforms at the mustering places. They came into camp under home-made flags, sometimes clutching mementos of unuseable things thrust upon them on that last, dusty tramp down the village road, saluted by tearful kinfolk as heroes and defenders. As time went on and the glamour and glory diminished, they forgot they were heroes and stumbled on through heat and thirst, mouths black with cartridge biting, sick from frightening wounds or dysentery—hoping, praying, sometimes cheering, often dying.

Typical among the collections of Civil War soldier writings are a set of 30 or more, called the "Dear Carrie" letters. They were written by a country boy named Bob and sent to his "little sister" hungry for news. He was 19, she 17, made strangely mature by the nation's crisis. Many of the letters were enclosed in the brown envelopes of the Christian Commission, with a carrier pigeon pictured winging the soldier's missive home.

(From Jefferson Barracks, Mo.) I have left the gangrene ward and now in Ward 10 where I want you to direct my letters after this . . . the doctor here is one of the best little fellows that ever lived. His name is C. L. Randall. I got the chills and he would not let me go away for fear I might be put in a ward that had a careless doctor. When I was the sickest, I told him I wanted him to cure me up for my army time was about out. And he says, "Never fear, I'll straighten you out, old fellow," and he knocked the chills higher than a kite and is giving me doses to keep it down . . . I was so glad to get the money and the envelopes. I wanted to buy a pencil so I could write when I was a mind to, but I hadn't money enough until your letters came.

My wound is looking pretty well. I am gaining strength slowly. Take it all around, I think I am doing about as well as I can expect . . . Mother talks foolish when she says she would come down and see me and take me home. Her coming here would not cure my wound any, and as for getting me, she could get the state of Missouri just as easy. I am in the service yet, remember.

I am going to take a piece of paper and mark out the size and shape of my wounded knee so you can see where the burning was done in the gangrene ward. That double mark is to show where it has eaten under, but I did not have room enough on the paper, as it has eaten in about twice as far. It seems as though it would kill me to touch it.

(From Jefferson Barracks, Mo.) When Doctor Randall was here today, he had my wound dressed with a weak solution of bromine (called bromene) which is the stuff they burn out the gangrene with . . . I think I may be paid off when pay day comes. I suppose it will really come some day.

There follows an example of the menu served in the army hospital. He reported breakfast of coffee and bread with a piece of boiled beef, or else mush and molasses. For dinner they served beef soup, a chunk of boiled pork that a well man could hardly swallow, and a mess of turnips. At supper time the orderlies brought in bread and tea, some applesauce, a "hunk" of johnny cake and butter. This letter also reported about putting on his pants and trying to get up and walk two hours at a time being the limit of his strength.

(Jefferson Barracks, Mo.) My wound is healing up fast. Some of the boys say it is not more than half as large as it was, but it looks bigger to me than one-half . . . You and Mother must divide this letter between you. I just wrote to Charley (a brother) and told him if it was possible for him to send some money to Mother to do so by all means . . . (after supper) the mail man has come and no letter for me and only two for the whole ward . . . Two funerals were held today right in this ward. Some mornings there is over 20 in the death house . . . there is something the matter with the gas lights, so I will have to quit writing.

(Jefferson Barracks, Mo.) I was going to answer you yesterday but when I got ready to write, one of my old chills come onto me. It lasted from 11 in the forenoon to 5 o'clock. I took quinine last night and more at daylight . . . You say it must be dreadful to see so many soldiers dying. I suppose it would be to you or anybody else but a soldier . . . My tobacco give out and would have been out before but one of the First Cavalry brought some in for me . . . I had my wound dressed again, as it did not do so well for a few days lately. I hope it will do better right along as I want to be on the road home on a furlough next week.

In the next letter, Bob told Carrie that he had hoped to be able to get work on a farm or at the local mill. But he found out that he would not be able to help on the spring work, because he could not straighten his stiff knee. He planned to try and get work but if not he would take what money he got and start out west to file on a homestead claim.

Western Branches, U.S. Christian Commission; Chicago, J. V. Farwell, chairman, J. W. McIntyre, St. Louis chairman—letterhead. (Sent from Jefferson Barracks, Mo.) I have been having another hard old time with my wound. It turned black and began getting larger . . . the doctor burned it out with caustic

and put a flaxseed poultice on it. But when they dressed it some burnt flesh came off . . . I was about discouraged and I could not sleep for thinking what a time I have had since I was shot . . . But today the wound looked much better and the black was gone. Then I got your letter and after that I felt as well as anybody in the army. The wound dresser told me that if I wished to get well I must keep still . . . They took the names for the transfer but they would not take mine because I couldn't walk to the depot . . . The next one will be on April 1 and I shall then be ready to go, and by that time the river will be open and we can get home fast . . . Tell Freddy to take good care of that calf, for I want all the cattle I can get to take out west when I go . . . I see by Charley's letter that he must be an important person in the Fourth Cavalry.

In his letter dated April 20, 1865, Bob reported that his wound was entirely well. He had been using one crutch but it was not easy to walk on a crooked leg that "you have not put to the ground for five months."

Sister Carrie asked Bob to write about the people who came to trade and barter in the army camps.

The women come nearly every day, often 20 in a group. They are loaded down with apples, peaches, green corn, and a jug or two of buttermilk—once in awhile a pint cup full of very poor butter . . . They fetch heaps of tomatoes, which they call "tom-matusses." They want to trade their stuff for flour, meat, coffee, sugar, rice and anything else we can spare . . . Many of them have lived on the over-plus rations of the army which the soldiers had to sell or trade. But what they will do God only knows, for the federal government is raising our wages and cutting down our rations—and what little rations we have we are ordered not to sell to citizens except on certain days.

Bob said the pint cup was the regular measuring article of trade. He listed current prices as follows: butter, 50 cents per pound, sugar 25 cents, coffee 50 cents, rice 5 cents per half pound, sweet milk 10 cents per pint and cider 5 cents.

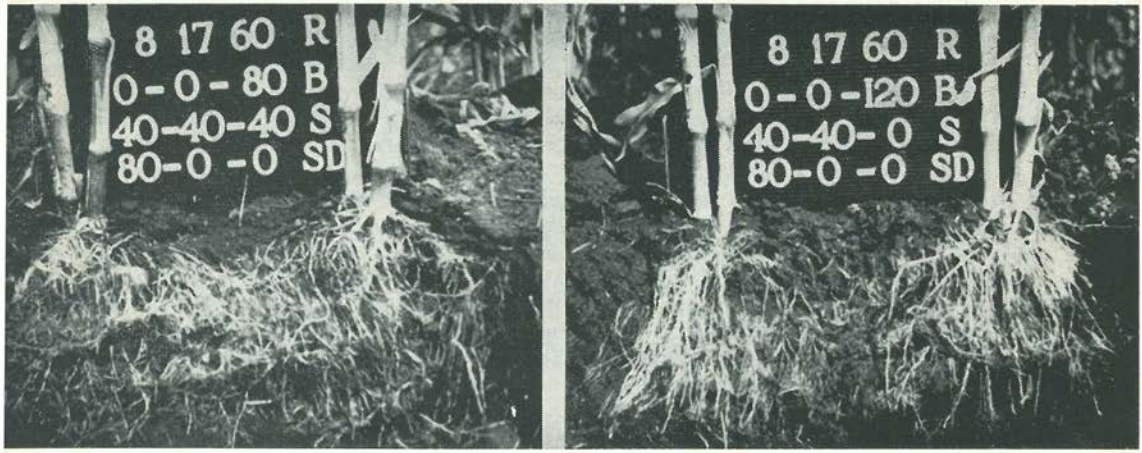
"Some women who come in to barter are well educated and fine appearing," he explained. "Before the war many of them were independently rich . . . One fine looking young woman traveled all through camp trying to sell sweet corn, and I could tell by her looks she was humiliated."

In lieu of the every-ready comics that put heart into our own boys in recent wars, Bob had doggerel and jokes to send along with his letters to Carrie. The left hand verse and the right hand one repeat the same theme, but by reading straight across a different idea appears:

I always did intend
Single my life to spend
It much delighted me
To live from woman free,
It's sure a happy life
To live without a wife.
A female to my mind
I ne'er expect to find
A bachelor to live
My mind I freely give.

To take to me a wife
Would grieve my very life
To think upon a bride,
I can't be satisfied.
'Tis woman is the thing
Such troubles on us bring.
The joy I can't express
So great is singleness
I never could agree
A married man to be.

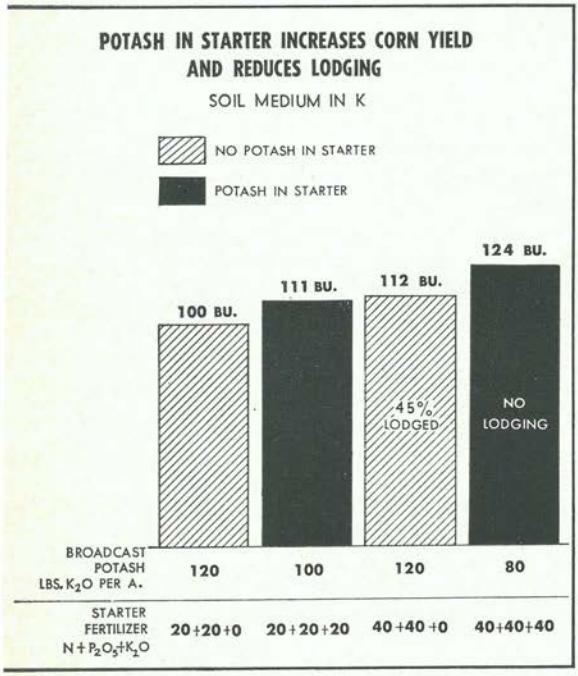
THE END



K IN STARTER **NO K IN STARTER**

Figure 1—Potash in starter greatly increased root development. Left: 40 lbs. K_2O per acre in starter, 80 lbs. K_2O broadcast. Right: 120 lbs. K_2O per acre broadcast, no K_2O in starter.

FERTILIZATION AFFECTS CORN PRODUCTION



FERTILIZERS markedly influence corn development and yield.

The fertilizer can be applied in many ways. The safest, most efficient type of row or starter placement is in a single band, to the side and below the seed (2″x2″ usually recommended).

With such placement, the fertilizer salts do not contact the seed or seedling, but readily intercept the branching feeder roots in a nutrient-rich moist soil zone.

For *top yields and profits*, a combination of broadcast and/or side-dressed and starter fertilizer usually gives best results.

Figure 3—Even with broadcast potash, potash in starter fertilizer increased corn yield 11 and 12 bushels per acre. Soil tested medium in K. Total of 120 lbs. N applied.

K IN STARTER **NO K IN STARTER**

Figure 2—No potash in starter resulted in 45% lodging. Left: 40 lbs. K_2O per acre in starter, 80 lbs. K_2O broadcast. Right: 120 lbs. K_2O per acre broadcast, no K_2O in starter.

Including

. . . Root Development

. . . Lodging

. . . Maturity

. . . Yield

By

Paul M. Burson
R. D. Curley
C. O. Rost*

In 1959, trials were conducted at the Rosemont Station soils farm on a limed Port Byron silt loam in fourth year corn, testing medium to low in available phosphorus and potassium. Rates of broadcast 0-20-20 (300 and 600 lbs. per acre) and rates of starter fertilizer (5-20-20 and 30-10-0) were used, with or without side-dressed nitrogen, depending on the analysis of the starter fertilizer.

Trials in 1960 were conducted on an Ostrander silt loam soil, testing high in organic matter, medium in available phosphorus and potassium, and pH 6.0 to 6.4. All phosphorus was applied in the starter fertilizer, while 120 lbs./A of nitrogen was applied all in the row or as a combination of starter and side-dress. Potassium (120 lbs. K_2O/A as KCl) was applied broadcast or a combination of broadcast and starter.

The starter fertilizer ratios used were 1:1:0, 1:1:1, 1:4:0, or 3:1:0. When the 3:1:0 ratio was used, all the nitrogen was applied in the starter and when 1:1:0, 1:4:0 or 3:1:0 ratios were used, 120 lbs. K_2O was broadcast.

** Professor; Fertilizer Distribution Analyst, Tennessee Valley Authority; and Emeritus Professor of Soils, University of Minnesota, respectively.* *Acknowledgment is due Edmond G. Bonnell, Plot Supervisor, University of Minnesota. From Misc. J. Series 1063.*

Paul M. Burson is Professor of Soils at University of Minnesota. He organized the soil testing lab, heads the Rosemont Soil Research Farm, is chairman of the Grassland-Beef Cattle Research Committee, conducts soils research in legume seed production, and teaches beginning soils to all agricultural students. A Minnesota native, he earned his B.S. and M.S. from Iowa State University.

Root Development and Proliferation

Root response to fertilization has received relatively little study. Most attention has been focused on crop yield rather than root response to applied plant food. This is probably because roots are difficult to wash out for proper study. Work that has been conducted indicates applied plant nutrients may affect root development in these ways:

1 Encourage *extensive*, widespread root system.

2 Encourage *intensive*, concentrated root system in the zone of high nutrient concentration as found with banded starter fertilizer.

3 Encourage a combination of 1 and 2.

The type root system can influence the way growing corn utilizes soil nutrients and moisture, as well as the resulting yield.

Root development and proliferation were studied by washing and exposing the root systems. The following observations were made:

1 Superior root development was found when nitrogen, phosphorus, and potassium were present in the starter fertilizer (Figure 1).

2 Because nitrogen and phosphorus applied in the starter stimulate root development and proliferation in the region of the fertilizer band, the roots do not move out to pick up sufficient amounts of broadcast potash. This increases the need for starter potash (Figure 1).

3 Broadcast treatments produced *extensive* root systems, while starter treatments produced *intensive* root development.

4 Sidedressed nitrogen produced additional root growth and shifted the pattern of root distribution to between the rows.

Lodging

The most severe stalk lodging occurred when potash was omitted from the starter fertilizer. This occurred with a medium potassium soil test and broadcast potash applications up to 120 lbs. of K_2O per acre. In 1959, with potash in the starter and P-K broadcast, only 23% lodging occurred. However, when potash was omitted from the starter, and all broadcast, 52% of the corn lodged.

In 1960 when potash was omitted from the starter and all the potash was broadcast, 45% of the corn was lodged. With 40 lbs. K_2O in the starter and the remainder broadcast there was no lodging (Figure 2).

With intensive root proliferation in the fertilizer (N-P) band containing no potash, the roots cannot obtain enough of the broadcast or soil potassium. A low amount of starter phosphorus also contributed to lodging.

Maturity

Maturity was markedly influenced by the method of applying nitrogen and potash. On September 8th treatments were classified based upon the stage of ear maturity, milk, early dent, and late dent stages. (Below is the percentage of ears.)

Starter fertilizer.*	Milk %	Late dent %
No fertilizer	50	2
40–40–0	30	65
40–40–40	2	90
120–40–0	20	45

*** All treatments had a total of 120 lbs. N and 120 lbs. K_2O. That not in the starter was broadcast.**

Corn in the milk stage would be 100% damaged by early frost while that in late dent would not be. Hence, in some seasons unfertilized or improperly fertilized corn could be badly damaged by frost, while properly fertilized corn would be mature. *Potash in the starter was particularly important in speeding up maturity.*

Corn Yield

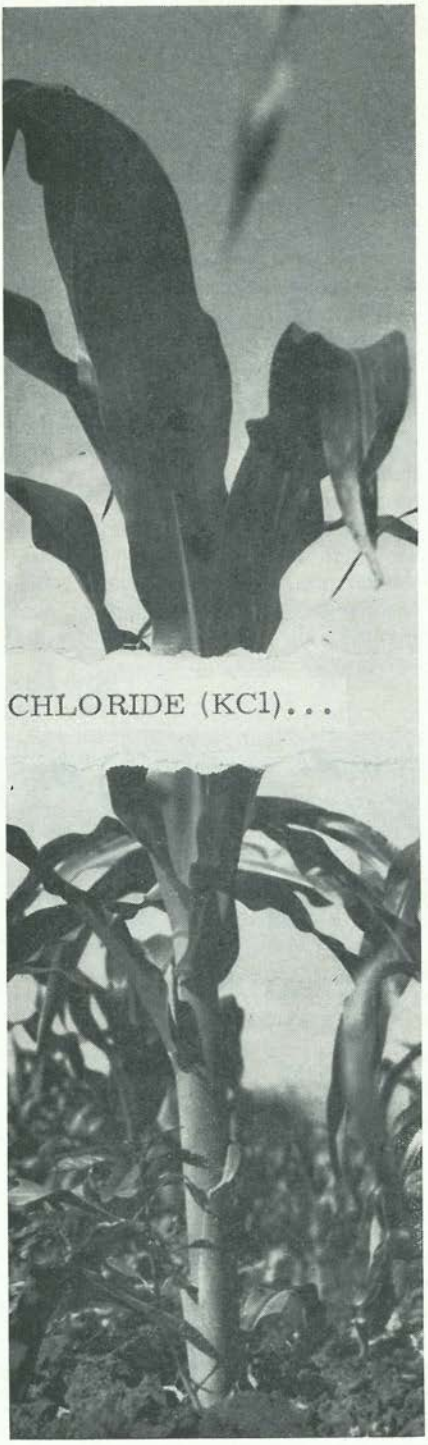
1959: Fertilized plots yielded a minimum of 20 bu/A more than the unfertilized plots (check yield=31.3 bu/A.) *Yield increases ranged from 49.5 bu/A* (300 lbs. 0-20-20 B.C., 200 lbs. 5-20-20 starter, 50 lbs. N S.D.) to *68.1 bu/A* (600 lbs. 0-20-20 B.C., 200 lbs. 5-20-20, 110 lbs. N S.D.).

1960: Yield increases ranged up to 35.8 bu/A above the check yield of 88.2 bu. With a total of 120 lbs. K_2O applied, switching 20 lbs. K_2O from broadcast to the starter (20+20+20) *increased yields 11 bushels per acre (Figure 3).* Switching 40 lbs, K_2O to the starter (40+40+40) increased yields about the same, 12 bushels. This was by far the best quality corn.

When all the nitrogen was applied in the starter (120+40+0), with all the potash broadcast and plowed down, the yield was 122.7 bu/A. However, 15% of the corn lodged, and the ears were of poorer quality than those from the 40+40+40 starter treatment which produced no lodging.

An interesting observation was that all or most of the nitrogen in the starter produced higher yields than low amounts in the starter, even though all plots received equal amounts of nitrogen.

THE END



POTASSIUM IN FOR

Chloride? Or Sulfate?

By G. A. Wickstrom
American Potash Institute

APPROXIMATELY eight years ago, suggestions that chlorides might be detrimental to corn production began to appear. This caused a rash of speculation that all muriate of potash should be plowed down or even that other sources of potassium, such as sulfate, should be used in corn fertilizer.

The need for potassium and the particular salt form it can be in has to be determined by RESEARCH. Research—in its cautious, careful approach—takes time. Several interested in the chloride problem began new research on corn about seven or eight years ago, and the results are just now beginning to be released.

In canvassing the experiment stations to date, we have found the evidence that the *chloride form KCl, is safe and economical for use on corn,* both as a row fertilizer and as a broadcast application. Here are summaries of research conducted at several of our nation's experiment stations:

Iowa State University
John R. Webb

A total of nine field experiments

ROW FERTILIZER CORN

A careful canvass of research projects conducted at official experiment stations labels the chloride form both safe and economical for row fertilization of corn.

have been conducted in Iowa since 1957 in which KC1 and K_2SO_4 were compared in NPK fertilizers for hill or row fertilization of corn. All experiments included such rates of fertilizer as 100 lbs. 5-20-20 or 6-24-24 per acre. Some variations in effectiveness of the two sources have been noted, but the differences have not been consistent nor of much practical significance.

In three of the nine experiments, KC1 was less effective than K_2SO_4 in promoting early growth and actually appeared to reduce growth when compared with the check treatments. This effect largely disappeared by mid-season and the two sources did not differ significantly in influence upon yields.

At each of these three sites, the fertilizer was concentrated in the hill and very little rainfall was received in the month following planting. These conditions led to the belief that the growth differences might have been associated with differences in salt concentration in the vicinity of the hill.

Fertilization with either source has consistently tended to reduce phosphate concentration in the growing plants. The two sources have *not* differed in this effect. Treatment with KC1 has tended to result in slightly higher levels of potassium in the growing plants than from equivalent treatments of K_2SO_4. In over half the experiments, potassium percentage in plants receiving KC1 has been significantly higher at one or more samplings during the season.

With one exception, any differences in plant growth or chemical composition due to source treatment have not been reflected in grain yields. In one 1959 experiment, KC1 was significantly superior to K_2SO_4 as measured by yields. In nine experiments, the average response to KC1 was 8.9 bushels compared to 8.5 bushels for K_2SO_4.

It appears that the potassium sources may vary to some extent in their relative effect upon plant growth and chemical composition, depending upon fertilizer placement, environmental conditions, and possible unknown factors. However, available data indicates no important differences occurring in this area. Both sources were effective in increasing corn yields. And use of either source at recommended rates in row fertilizers is an effective and profitable practice, current tests show.

Table 1. Corn Yield affected by K as sulfate and as chloride—1958.

Block No.	No Potash	K_2SO_4	KC1
	10,800 Plants per Acre		
	bu/A	bu/A	bu/A
1	110	104	112
2	113	111	114
3	111	109	116
4	109	113	115
5	106	112	112
6	112	111	111
Average	110 bu/A	110 bu/A	113 bu/A
	13,400 Plants per Acre		
1	127	115	135
2	130	128	130
3	121	128	130
4	134	135	137
5	125	127	144
6	128	125	126
Average	128 bu/A	126 bu/A	134 bu/A
Average of both populations	119 bu/A	118 bu/A	123.5 bu/A

LSD (.05) = 4.3 bu.

Fertilizer applications: 110 lbs. N, 40 lbs. P_2O_5. With both K_2SO_4 and KC1 150 lbs./A K_2O plowed down and 40 lbs./A K_2O in row.

University of Missouri

C. M. Woodruff

The chloride form of potassium was compared with both the carbonate and sulfate forms of potassium as fertilizer for corn. Field investigations of the subject were initiated in 1953 and terminated in 1958. Seasonal conditions ranged from exceedingly dry to optimum. Under none of the circumstances of the investigation was either carbonate or sulfate superior to chloride.

In fact, the results suggest that the chloride form of potassium might be slightly better than the sulfate form. It is conceivable, of course, that the sulfate form of potassium would be desirable on soils deficient in sulfur. Where soils contain adequate amounts of sulfur and the objective is only that of providing potassium, the chloride form of potassium would appear to be one of the better forms of potassium for corn.

For example, in each of the twelve comparisons in the 1958 experiment (Table 1), the yield of the corn treated with the chloride form of potassium was equal to or greater than that of the corn treated with the sulfate form. The average increase for the combined plant populations was 5.5 bushels per acre in favor of the chloride form of potassium.

The precision of the experiment was such that an average difference of 4.3 bushels per acre was significant. Thus, the results in 1958 would indicate that the chloride form of potassium tended to be slightly superior to the sulfate form.

Table 2. How rate and source of row fertilizer treatment affected yield and mineral content of corn leaves.

5–10–10	Cl	1957, Yields		1956, Wooster				
lbs./A	lbs./A	Wooster bu/A	Columbus bu/A	Yield bu/A	%N	%P	%K	%Cl
0	0	90.1	62.1	100.9	4.24	0.33	2.12	0.97
300	0	118.7		115.9	4.41	0.36	4.43	1.38
300	23	115.5		115.9	4.40	0.38	4.40	2.11
300	60	112.2		110.6	4.42	0.39	4.02	1.98
450	0	119.3	71.7	117.3	4.35	0.38	4.50	1.43
450	34	119.9	66.3	120.0	4.49	0.39	4.27	1.89
450	90	116.5	66.9	112.8	4.51	0.43	4.12	2.03
600	0	116.1	65.0	115.3	4.49	0.39	4.61	1.36
600	45	117.5	60.1	115.7	4.44	0.41	4.48	1.93
600	120	120.1	71.1	108.3	4.58	0.44	4.25	2.07
LSD 5%		7.7	NS	6.3				

Teater, R. W., Mederski, H. J., and Volk, G. W. Yield and Mineral Content of Corn as affected by NH_4Cl Fertilizer. Agron. Journ. 52:403–5. 1960.

Ohio Agricultural Experiment Station

H. J. Mederski

Intensive studies were made on the yield and mineral content of corn grown in the field as affected by chloride (Table 2). Fertilizer was applied 1.5 inches to one side and 1.5 inches below the seed. All nutrients were applied in this manner except for 33 lbs. N plowed down.

This study was primarily directed toward the use of NH_4Cl, but actually combinations of NH_4Cl, NH_4NO_3, KCl, and KNO_3 were used. In 1957 at Wooster and Columbus, rate of chloride had no effect on corn yields. In 1956 at Wooster, the highest rate of chloride, 120 lbs. per acre, reduced yields. It should be remembered that 200 lbs. of 6-24-24 per acre with all K from KCl supplies *only 38 lbs. of chloride.*

Increasing rate of chloride increased the chloride content of the leaf, but had no significant effects on content of N, P, or K. Soil analyses showed that chloride added in the spring leached out over winter.

Purdue University

A. J. Ohlrogge

Three experiments are reported in Table 3. The K_2O, 10 lbs. N, and 40 lbs. P_2O_5 was placed in a band 1½ inches to the side and 1½ inches below seed level. The nitrogen requirement was taken care of. While there were no significant differences, yields with KCl tended to be higher than with K_2SO_4 at the 20 and 40 lb. rates of K_2O and lower at the 80 lb. rate.

Higher rates of potassium in the row tended to delay tasseling, with KCl having more effect than K_2SO_4. There were no effects on early plant heights, however.

Table 3. How rate and source of K affected yield and earliness of corn tasseling.

K_2O lbs./A	Source	Yield of Corn			Tassel Count*		
		Exp. 1	Exp. 2	Exp. 3	Exp. 1 July 23	Exp. 2 July 23	Exp. 3 July 23
		bu/A	bu/A	bu/A			
0		132.8	113.0	135.9	7.3	10.8	9.6
20	KCL	131.2	116.2	136.6	5.0	8.5	10.5
20	K_2SO_4	126.2	114.6	135.5	7.0	10.4	10.5
40	KCl	140.2	118.2	130.3	4.5	7.1	8.3
40	K_2SO_4	138.2	114.0	130.5	6.8	7.3	10.9
80	KCl	138.1	117.0	132.2	4.3	7.6	7.6
80	K_2SO_4	140.1	120.0	135.4	5.3	8.8	8.9
** LSD (.05)		11.5	N.S.	5.3	N.S.	2.5	1.8

*** Tassels fully unfolded per 24 feet of row.**
**** Calculated for total experiment consisting of 32 treatments and eight replications.**

Combination of all KC1 treatments in all experiments gave a yield of 130 bu. and all K_2SO_4 treatments a yield of 129 bu. per acre.

Studies with P_{32} indicate very early, important depression of fertilizer phosphorus uptake by adding salts to the fertilizer band. Chloride salts contribute more than sulfate salts to this depression. This early depression appears to have no practical significance, however, when measured by the harvested yield of corn grain from carefully conducted field experiments.

Cornell University

S. E. Younts and R. B. Musgrave

Results of two field experiments are reported in Table 4. The K_2O, 20 lbs. N, and 40 lbs. P_2O_5 was banded 3 inches to one side and slightly below seed level except for broadcast treatments as noted. Sources of K had no effect on yield in Experiment No. 1.

At the other location, yields were low but KC1 in the row produced a higher yield than K_2SO_4 at the 20 lb. rate of K_2O but a lower yield at the 120 lb. rate.

Time of tasseling was not affected by source of K at the low rate but with 120 lbs. K_2O in the row, KC1 delayed tasseling. This rate is the equivalent to the K_2O in 500 lbs. of 6-24-24. There was no consistent effect of chloride on plant composition.

At a third location, source of K had no effect on yield at 40, 80, and 120 lb. rates of K_2O. K_2SO_4 gave earlier silking and maturity, however.

It is of interest that increasing the rate of KC1 decreased stalk rot incidence.

Table 4. How placement, rate, and source of K affects yields and plant height.

	K_2O		Yield		Tasseling %	
					Exp. 1	Exp. 2
	lbs./A	Source	Exp. 1	Exp. 2	61 days	65 days
Check			94.4	26.5	46.9	15.4
In row	20	KC1	95.2	44.3	56.4	27.9
In row	20	K_2SO_4	94.8	37.4	54.1	23.4
Broadcast	20	KC1	95.0	38.7	42.7	19.2
Broadcast	20	K_2SO_4	96.3	32.7	52.8	20.4
In row	120	KC1	98.2	48.4	31.2	22.7
In row	120	K_2SO_4	101.4	55.9	40.9	31.3
Broadcast	120	KC1	100.1	45.4	52.1	30.7
Broadcast	120	K_2SO_4	100.4	47.1	56.6	23.3
LSD (.05%)			5.8	6.4	10.2	7.2

Younts, S. E., and Musgrave, R. B. Growth, maturity and yield of corn as affected by chloride in potassium fertilizer. Agron. Journ. 50:423–426. 1958.

Summary

From these diverse studies one can conclude that muriate of potash (KCl), the chloride form of potassium, is equal or superior to the sulfate form for row fertilization of corn. With either form, it is essential to place the fertilizer in a band to the side of and slightly below the seed.

On soils requiring more than 40 to 50 lbs. K_2O per acre, a portion of the K_2O is best broadcast and plowed down. Labor requirement, economics, safety, and efficiency all enter in. **THE END**

THE FARMER: A MAN OF MANY BLESSINGS —AND CHALLENGES

George D. Scarseth, American Farm Research Association

1. He may be the first to go broke, but the last to starve.
2. He must stay close to home, has much privacy, and is free from Time Cards.
3. He knows storms, cold, rains and mud, but his air is free from cancer-producing gases.
4. He uses labor saving machines, but farms bigger, so works as hard as ever. Hard work doesn't kill anyone with a good heart—good in spirit and good by use.
5. His work is steady, so he isn't soft. (Many city people in the North die shoveling snow.)
6. He can forego comforts and have much freedom, or he can trade his independence for more things. (His family and others keep him on the treadmill—most of us will do anything for our family.)
7. He does not need a vacation in the country, but would like to see the "bright lights" occasionally.
8. He hasn't time to go fishing, but there is nobody saying —"you can't go."
9. He used to be regarded as a "hayseed," but many of our national leaders got started from hard times on the farm.
10. He can't hide his property from the tax collector, and is taxed to death for the tools he uses to produce a taxable income.
11. Inflation increases the value of his land, but in turn increases the taxes and the cost of farm supplies.
12. If he conserves his soil or builds its productivity, he gets no tax deduction; instead, the taxes go up because the farm is worth more.
13. He is a disciplined man. He can't cheat on the laws of nature, and as such doesn't like orders from confused man-made regulations; he hates bureaucrats, and is suspicious of "do-good leadership."
14. He believes in God. Of all men, the farmer must still work with God as a partner who will not strike.

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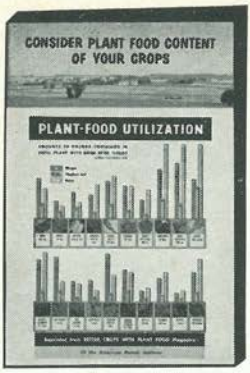

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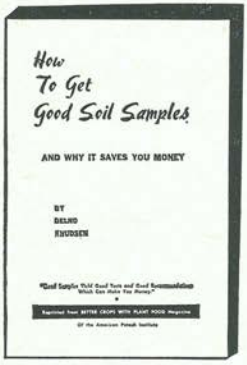

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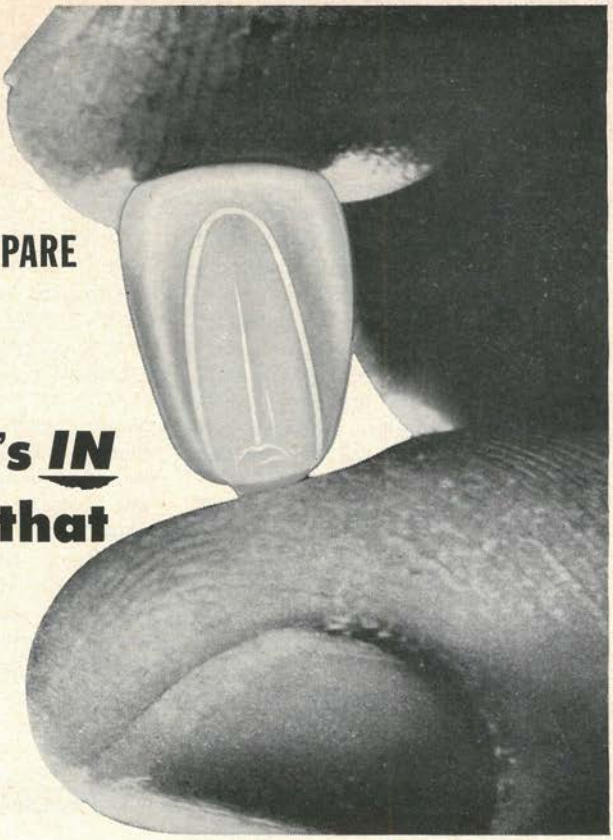

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COATED FERTILIZER

By Kirk Lawton

Michigan State University

A VERY interesting and recent development in fertilizer technology is the covering or encapsulating of fertilizer granules with water resistant or impermeable coatings.

In fact, research in both the search for coatings and agronomic evaluation of fertilizer so treated has been underway for a year or two. Limited reports on progress with coatings indicate considerable success, but much study is needed in selecting specific coatings, developing coating techniques, and testing the treated fertilizers.

Benefits from coated fertilizer will vary with the type of fertilizers being coated and the soil and crop conditions and management practices under which they are used. However, these benefits as related to the more soluble fertilizers can be listed as follows:

(1) Lengthen or prolong the effect of large applications of fertilizer, particularly those high in nitrogen.

(2) Reduce luxury consumption of nutrients, especially potassium, by crops when large amounts of fertilizer are applied.

(3) Alleviate injury from seed-fertilizer contact when large amounts of high analysis fertilizer are placed close to or in contact with seed.

(4) Reduce leaching losses of nitrogen and potassium in sandy soils at a time when the root systems of plants are small or non-existent.

(5) Improve the storage and drilling characteristics of high analysis mixed fertilizers.

The majority of these purported advantages of coatings relate to reduction in the rate at which soluble fertilizers dissolve in soils. The fact that fertilizers (including the more soluble phosphates) do dissolve rapidly even in soils not particularly moist has been demonstrated in experimental work at Michigan, Purdue, and Wilson Dam, Alabama (T.V.A.).

Most Satisfactory Material?

What material will be most satisfactory in accomplishing this objective? Considering the wide variety of fertilizer materials where coating may be desired, probably no one single substance may serve for all. Economics as well as the purpose for which a coated fertilizer is used may be the determining factors. Materials now being investigated include various plastic or resin substances such as polyethylene, acrylic resins, and vinyl acetate as well as wax emulsions, waxes, paraffin compounds, and asphaltic substances. The range in price for these materials runs from a few cents to about fifteen cents per pound.

Although there is little supporting information, it appears that coatings from 2 to 5 percent or more by weight may be needed to reduce significantly the dissolution characteristics of fertilizers.

Two Kinds of Coatings

Coatings may be of two kinds: (1) one allowing a gradual but retarded movement of dissolved salts through the membrane, (2) one consisting of a water resistant material that would gradually erode or disintegrate, releasing the fertilizer nutrients.

Gradual dissolution of nutrients in the second case would probably depend on a lack of uniformity in thick-

ness of the coating, thus nutrients from some fertilizer granules would be released sooner than from more uniformly covered particles. The nature of the fertilizer salt or salts, their combination, as well as the character of the particle surface will influence the selection of the type of coating.

For example, the author has found it extremely difficult to coat granular KC1 and significantly change its solution properties without making it completely insoluble. On the other hand, an 0-20-20 or 5-20-20 fertilizer can be coated much more easily. These fertilizers present a rather porous surface into which coating material can penetrate.

In addition, since the components of the granule are present as fine, intermixed crystals of different solubility, this matrix does not present continuous channels or pores for dis-

Continued on page 24

IN THE FUTURE?

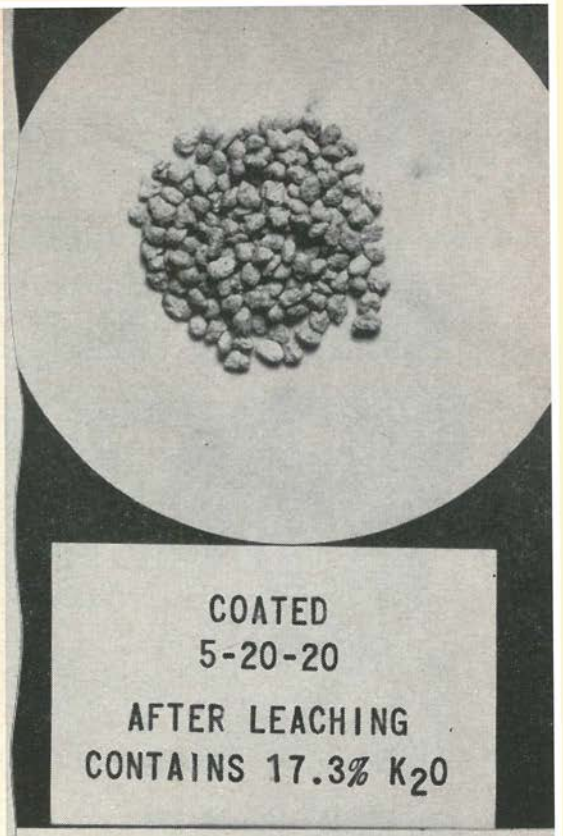
To prolong effect of large applications?

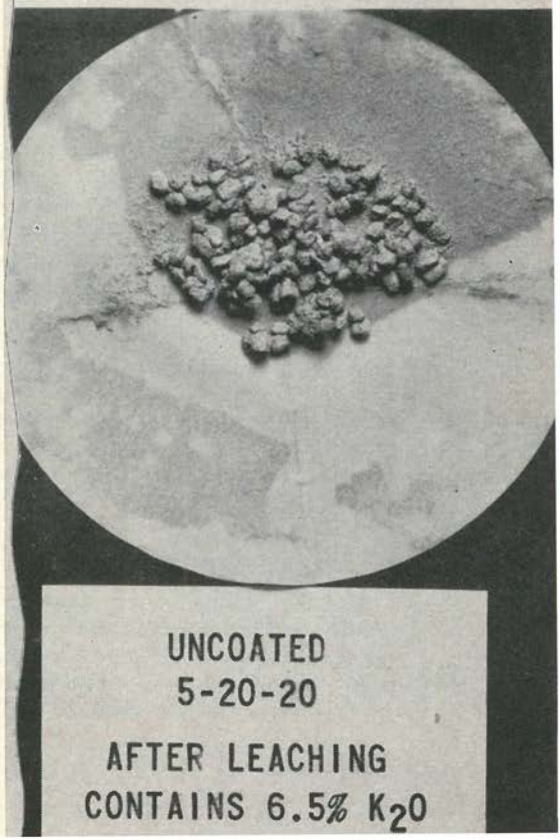
To reduce luxury consumption of nutrients?

To eliminate injury from seed-fertilizer contact with large quantities of high analysis fertilizer?

To reduce leaching losses when plant roots are small or non-existent?

To improve storage and drilling characteristics?





FROM THE SAMPLE . . . **. . . TO THE LA**

TAILOR-MADE RE

By W. W. Lewis

WHAT is the best way to make a fertilizer and lime recommendation?

We in Virginia have found the soil test to be an excellent tool for making such recommendations. But we realize soil test results are just one of several factors to be considered in advising what grade and amount of plant food the farmer should use.

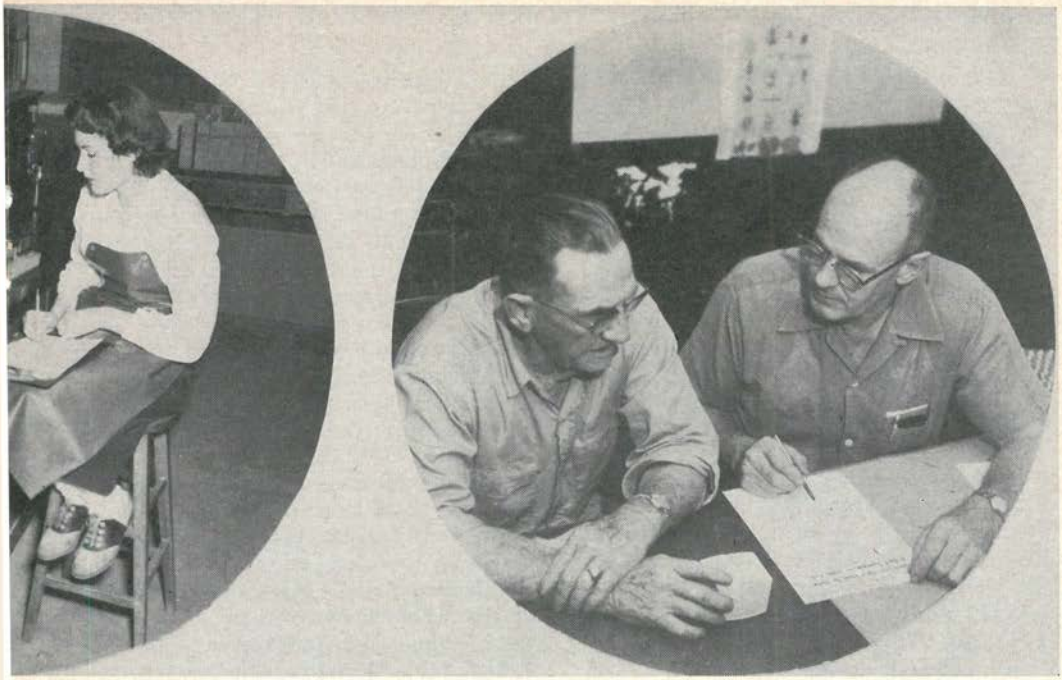
To know the kind of soil he is farming, the past history of his fertilizer and lime treatment, the yield and quality of previous crops, the nutrient requirement and feeding habits of crops to be grown—all these are important to an accurate recommendation.

Local Advantage

The advantage of being reasonably familiar with the local farmer's production habits is one reason Virginia's county agents and other agricultural workers were first assigned 13 years ago the job of making fertilizer and lime recommendations based on soil tests.

We have found this practice to be a very practical one. Many county agents say it keeps them "on their toes" in agronomic recommendations. But, even more important, making recommendations from soil test results gives them an excellent tool with which to work with the farmer—(1) to show the farmer he has a fertilizer and lime need, (2) to teach sound fertility management, (3) to guide him in using better production practices.

This duty has brought most agents



ORATORY . . . **. . . TO THE ADVICE**

COMMENDATIONS

Blacksburg, Va.

in close contact with many farmers whose response has been the most gratifying experience of the whole program. In many cases—although it meant doing a complete about-face in fertilizer practices—farmers have followed soil test findings to their own profit.

In a sense, the Virginia system makes the local recommender something of a doctor—a soils doctor in this instance — prescribing certain treatments for the farmer's soils.

How well the system serves the individual farmer is reflected in the experiences of Farmer A. F. Hoback of Roanoke County. What happened to Mr. Hoback *before* and *after* he adopted soil testing in his operations speaks volumes:

Before Soil Testing . . .

. . . for a 6-year period about 20 years ago he averaged 4 to 5 tons of lime per acre to all fields, twice that amount to some fields, on dark red limestone soils known as Decatur and associated soils.

With his corn, wheat, and alfalfa crops, he was realizing the following returns: 40-50 bu. per acre of corn from 200 lbs. 5-10-5 per acre; 10-12 bu. per acre of wheat from 200 lbs. 5-10-5 per acre; and 2 tons per acre of alfalfa from 300 lbs. 5-10-5 at seeding only. (He never topdressed until after soil testing.)

He didn't like these yields, thought they were too low, especially from fields receiving that much lime and adequate (he thought) fertilizer. He asked his county agent, who suggested

he send some soil samples to the VPI soil test laboratory. The tests showed he had been applying too much lime, not enough of the right kind of fertilizer.

After Soil Testing . . .

. . . with his corn crop, he averaged as high as 136 bu. and 128 bu. per acre in two different years from 1,000 lbs. of 10-10-10 (or equivalent) per acre. This record made him second each year in his county's 100 Bushel Corn Club. He does not grow corn now.

With his alfalfa crop, he started averaging about 5 *tons per acre* on good years, about 4 tons on average years, from 800 lbs. 3-18-18 plus borax per acre at seeding and 300 lbs. 0-20-40 plus borax per acre topdressed each year.

The Hoback experience clearly shows how soil testing pays when properly used as a farming tool. Today he often explains, "Because of soil tests, I have changed my fertilizer and lime practices and now take samples about every two years. The soil test helped me put my money where it counted the most."

Mr. Hoback is not alone. Many progressive farmers have learned how soil testing helps them watch the fertility level of their soil, make quick and profitable changes when needed.

During the 21 years our VPI Agronomy Department has conducted soil testing, annual sample totals have increased from about 3,000 in 1939 to 74,000 samples last year. Table 1 shows the interesting growth trend in the Virginia soil testing program. But even with these increases, only about one out of 10 farmers sends in samples today for a complete soil test.

Individual farmer participation is not the whole value of such a program. When data from soil tests are studied and analyzed in regional summaries, they often point out certain areas of the state where particular ratios should be stressed in educational media and sales programs. Such surveys often serve future fertility research and extension programs.

TABLE 1. NO. SAMPLES OF SOIL TESTED IN AGRONOMY DEPARTMENT AT VIRGINIA POLYTECHNIC INSTITUTE

Year	No. Samples Tested
1939	3,000
1940	4,381
1941	4,359
1942	—
1943	—
1944	—
1945	2,431
1946	5,175
1947	8,648
1948	—
1949	16,868
1950	22,797
1951	20,557
1952	26,746
1953	26,055
1954	35,138
1955	49,340
1956	46,099
1957	45,580
1958	53,283
1959	73,330
1960	73,991

The high jump in late years is due to ASC tests made for lime recommendation in cooperation with State Committee—about 30,000 in 1960.

The Logical Man

For 8 years before we turned the recommendation work over to the county agents and other agricultural workers, two or three of us Extension Agronomy Specialists did the job of going through the soil test record sheets and making the recommendations.

Every Friday when we would get back to the office, there would be a "mile-high" pile of the sheets. We would spend week ends going through them. As the tests increased, we began to realize our approach was somewhat stereotyped. We didn't know the particular farmer. We didn't know his special problems. We didn't know what his alfalfa crop was like or what his field was like.

It occurred to us that agricultural workers in the field were the logical persons to make the recommendations.

Our laboratories could test it, could tell what the farmer's soil showed, but the local workers knew the farmer and his conditions.

When we first suggested it to a few county agents, the early reaction was mixed. Some wondered if they could do it effectively. But before long, they began to express widespread approval of the opportunity.

One of them told me recently, "When a farmer comes in and sits down across from me asking for a recommendation, I'm going to make sure I make the nearest right recommendations I can because I can't blame later results on anyone at the College."

I personally do not believe we could wisely remove soil test recommendation work from county agents now, even if we wanted to. The reason is obvious. He knows much about the soils, the farmer, and the individual situation, which puts him in the position to recommend for specific needs.

This service strengthens the local agricultural workers' position with their farmers, gives them a very tangible service to render, and keeps them more closely linked with the over-all management conducted on many farms.

2-Week Soils Schools

The VPI Agronomy Department conducts training schools to keep local agricultural workers abreast of current recommendations. They keep constantly before the workers one basic fact—that there is no such thing as a permanent plant food ratio and per acre rate of usage, because soils and conditions are different with different responses to treatments.

We have held 2-week soils schools over the entire state. This strengthens the soil test program, largely by re-emphasizing periodically the importance of knowing the soil, of using it properly, and managing it profitably.

In the early days, we were often asked by other states if county workers were qualified to make such recommendations. This question is seldom asked today. The record made speaks for itself. Only in special cases are Extension Specialists called in to make recommendations. Out of the 74,000 samples tested last year, I may have been requested for recommendations on 150 of them.

W. W. Lewis is Extension Agronomist, Project Leader, at VPI. He earned his B.S. from VPI, his M.S. from Michigan State. Member of Epsilon Sigma Phi, he has done additional work at Maryland, Cornell, and Arkansas.

Latest Lab Approach

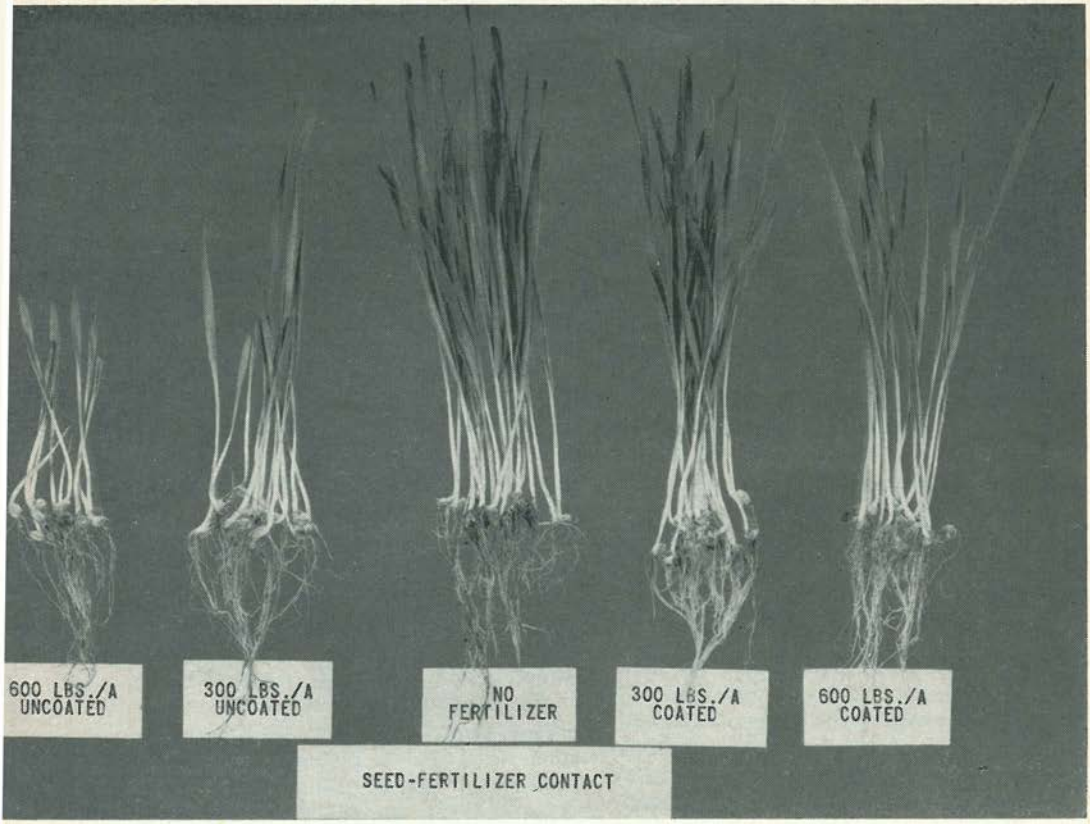
Our Soil Test Laboratory, headed by Prof. E. D. Reynolds since it first opened in 1939, can handle 500 samples a day. In 1954, we modernized our system, changed the test, and added many pieces of equipment, such as a flame potentiometer for registering potash content of the samples. The lab makes analyses for pH, calcium, magnesium, organic matter, phosphoric acid, and potash.

When a sample arrives, it is opened, carefully numbered, and filed. After being thoroughly pulverized and put on a tray by individual samples, it is sent to the testing room. A check sample is sent through the lab about every 200 samples, 1 or 2 a day, to insure quality control and consistent accuracy in testing procedure.

Research Agronomists work with the laboratory on methods and procedures while on the local scene, county workers have more than chemically analyzed soils to work with. They have the total picture—the soil, the crop, and the farmer. It works well that way in Virginia.

THE END

Continued from page 19



solution and outward diffusion. Optical examination of the surfaces of granules of mixed fertilizers usually shows the presence of an extremely rough appearance with pits, crevices, and extruding crystals. It is not difficult to understand why such granules are more difficult to coat uniformly than fertilizers such as prilled ammonium nitrate or urea.

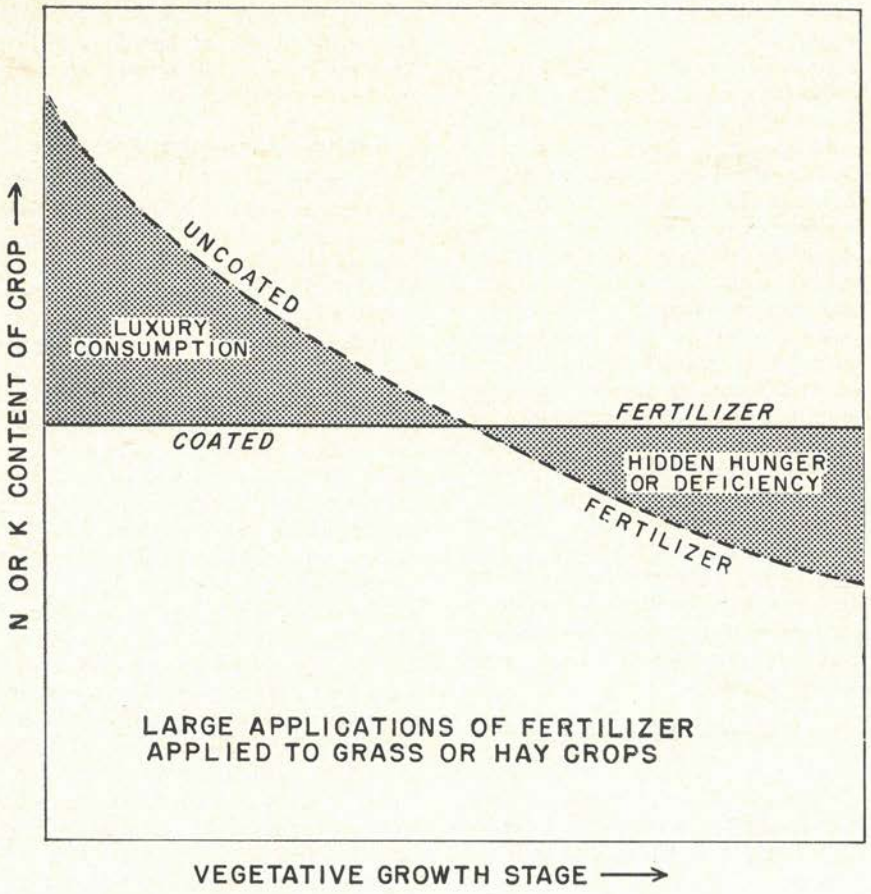
"Metering Out" Nutrients

It is quite probable that within a year or two coated fertilizers will be available commercially. The direction this new development will take will depend largely on studies of the agronomic evaluation of coatings now being developed.

Without doubt, the use of coatings to slow down the dissolution of nitrogen carriers such as urea and ammonium nitrate will be exploited first. This would be logical for the fertilizer industry since it would permit coated fertilizer to be introduced on a small scale for use on lawns, gardens, and possibly in greenhouse management.

Since some of the coating materials initially selected may involve increased costs of from $5 to $20 a ton, sales promotion for this type of market could be successful. In this respect, the coated nitrogen fertilizers would compete with the already established urea-formaldehyde formulations.

The idea of coating fertilizers to alter their dissolution characteristics in most soil is not a new one. Al-



though the amount of published information on such a technique is almost nil, agriculturists have often expressed interest in coatings which would control the rate of release of nutrients from soluble fertilizers.

The concept of *metering out* nitrogen or other nutrients to be used by plants more nearly as they are required during a crop season is rather intriguing. Actually delayed action nitrogen fertilizer is not new, since natural organic materials have long been recognized as slow releasers of nitrogen and urea-formaldehyde has been more recently introduced.

Facing Fixation Problems

The soil itself acts to some extent to reduce excess plant uptake of dissolved salts through fixation processes. Considerable quantities of nitrogen as ammonium ions may be held in exchangeable or non-exchangeable forms, and the same may be said for potassium. Slow release of nutrients from these soil reserves tends to minimize peak absorption.

In the case of soluble phosphate ions from fertilizer, fixation processes are at a maximum and may be considered in a sense to be detrimental. Nevertheless, with larger application of soluble fertilizers now being used, a high proportion of the nutrients (particularly nitrogen and potassium) may be too concentrated at a period

when plant requirements are rather small.

Certainly, most of the fertilizer used in American agriculture is applied before or at the time a crop is planted or starts to grow. Since the nutrient requirements of seedlings or transplants are low, the components of soluble fertilizers are largely free to create zones of very high nutrient concentration or to react with soil minerals and organic matter. With only a small part of the root system developed, it is possible that significant leaching losses of nitrates and potassium may occur on sandy soils.

Along this line, considerable interest has been expressed in the use of coating fertilizers for perennial crops grown in the tropics under conditions of high rainfall. Also reports indicate that such fertilizers are being used successfully in greenhouses on an experimental basis to reduce leaching losses and eliminate frequent application of nutrients.

Seed-Fertilizer Contact

Not only is it likely that the release of nutrients from our soluble fertilizers is more rapid than desired but cases of seed-fertilizer contact can be detrimental.

Evidence of such injury is most easily seen where high analysis fertilizers are applied directly with small grains or corn, resulting in poor or delayed germination and a reduced stand of the crop. The beneficial effect of coatings in reducing seed-fertilizer contact injury has been clearly demonstrated in the greenhouse, but not in the field at Michigan State University.

In fact, in trials conducted in 1960, no injury was found from contact of seed with fertilizer, probably because of adequate moisture levels. However, observations did show that fertilizer coatings applied to 5-20-20 fertilizer at 250 and 500 pounds per acre rates had no detrimental effect in terms of growth and vigor of small grains. Whether coated fertilizers will lessen the need for precision placement of fertilizer in relation to seed rows remains to be seen.

Special Phosphorus Problems

No reference has been made to phosphorus with respect to benefits arising from coatings of fertilizers containing phosphate. The concept of using coatings to prevent excessive fixation of phosphorus fertilizer by soil constituents also strikes the imagination.

It can be visualized that a protective layer around a granule might control soluble phosphate release so a higher efficiency of use or recovery by the plant would result. However, such contemplation just doesn't fit into the picture generally accepted for the soil-fertilizer phosphate-root system. Most agronomists feel that for maximum utilization of fertilizer phosphorus and highest yields by phosphate-responsive crops, at least 50 percent of the phosphate should be soluble in water. This creates a zone of high phosphate availability around the fertilizer granule or band, stimulating both root and shoot growth in the early development of young plants.

Under field conditions the bulk of the water soluble phosphorus in granular fertilizer moves out into the soil immediately adjacent in a day or two. The question remains then as to whether coatings on mixed fertilizer particles would be effective enough to delay nitrogen and potassium release, while allowing sufficient phosphate ions to penetrate and stimulate root growth.

To investigate some of this query, granules of concentrated superphosphate tagged with radioactive phosphorus were coated with a number of chemical compounds. The superphosphate was then incorporated by banding or mixing with soil in greenhouse pots at the rate of 100 pounds of P_2O_5 per acre.

Corn was seeded and during growth

plant tissue samples taken at two-week intervals for analysis of radioactivity. Essentially no difference was noted in growth of corn plants receiving coated or uncoated fertilizer. However, in early stages, the quantity of fertilizer phosphorus entering the plants was reduced by about 30 percent where coated phosphates were used. Eight weeks after planting, the activity of plants treated with both series of fertilizers was quite similar. This suggests that after 4 to 6 weeks the coatings had broken down.

Potassium on Legumes

Plant uptake of nutrients beyond normal needs is usually exemplified by excess absorption of potassium by legumes. In fact, recommendations for maximum alfalfa production on coarse-textured soils often call for topdressing small amounts of potash after every cutting. With coated fertilizers, it may be possible to apply a larger, single quantity in early spring to supply continuous potassium over a 4- to 5-month growing period.

This idea was tested last season at East Lansing, Michigan, where 1200 pounds of 5-20-20 per acre was broadcast on an established alfalfa stand about April 24th. At the time of first cutting, about June 15th, plants receiving uncoated fertilizer contained 2.89 percent potassium, while the average content for alfalfa treated with fertilizer having different coatings was 2.18 percent and unfertilized alfalfa contained only 1.3 percent. Hay yields for both uncoated and coated fertilizer plots were similar or about 2.3 tons per acre. Unfertilized plots yielded 1.65 tons per acre.

One month later at about the time of second cutting, the potassium content of plants receiving coated fertilizer was 2.37 percent, while that where uncoated material had been applied dropped to 2.05 percent. These figures point to a leveling of the nutrient absorption curve by the use of fertilizer coatings.

From this same experiment, fertilizer granules were recovered at four intervals during the first 73 days after topdressing and their potassium content determined. By May 19th, after 2.8 inches of precipitation, the partially disintegrated uncoated granules contained only 0.54 percent K_2O, while the average potash content of the coated residues was 10.8 percent. This percentage dropped to 5.3 percent by July 5th, while the uncoated granules had completely disappeared at this time.

Protecting the Fertilizer

Do coatings significantly improve the physical properties of fertilizers? Possibly, although many of the problems involved in the storage and handling of fertilizers, such as moisture absorption, caking, and dusting, have been largely solved by granulation and better quality bags. There is still a tendency for high analysis granulated fertilizers to pick up moisture. This would be especially true of bulk spread materials exposed to damp weather for some time.

Coatings will reduce the hygroscopicity of the fertilizer and thereby lessen absorption of moisture under unfavorable conditions. This can be demonstrated by placing uncoated and coated fertilizer in moist air.

For instance, after two days of exposure to a relative humidity of 96 percent, uncoated fertilizer absorbed 15 percent water while wax coated granules contained only 6 percent. It is interesting that during the initial stages of moisture absorption by this granular 5-20-20 fertilizer, water was taken up inside the uncoated particles. With coated granules, however, the moisture collected in minute droplets on the exterior granule surface wherever there was an imperfection or break in the coating.

Before any coating can be consid-

ered successful, it must undergo storage tests over a wide temperature range to determine its stability for a considerable time period.

The future of coated fertilizer appears to be a promising one. There is ample evidence that coatings can significantly alter the dissolution properties of soluble fertilizers. Progress in developing suitable coatings will depend largely on research carried out in commercial laboratories. However, cooperative studies with agronomists are needed to evaluate coated fertilizers under a wide variety of conditions.

It is hoped that before such fertilizers are promoted commercially they will be thoroughly tested and their performance related to specific soil management practices.

THE END

AND STILL SOME GRIPE!

"Henry Smith Leiper, by imagination, compressed our world neighborhood of 2½ billion people into a community of *one thousand.* As a result, this fictional community would emerge about as follows:

— There would be 60 Americans and 940 would represent the remainder of the world.

— The Americans would receive one-half the total income of the entire world community.

— The Americans would be riding in their cars, using 90 percent of the rubber produced by the impoverished in their neighborhood.

— At our coffee breaks, we would be drinking most of the coffee grown by the less fortunate.

— Practically all the cocoa produced would go into our chocolate cakes, pies and candy bars.

— The 60 Americans would have 15 times as many possessions as the other 940 neighbors combined.

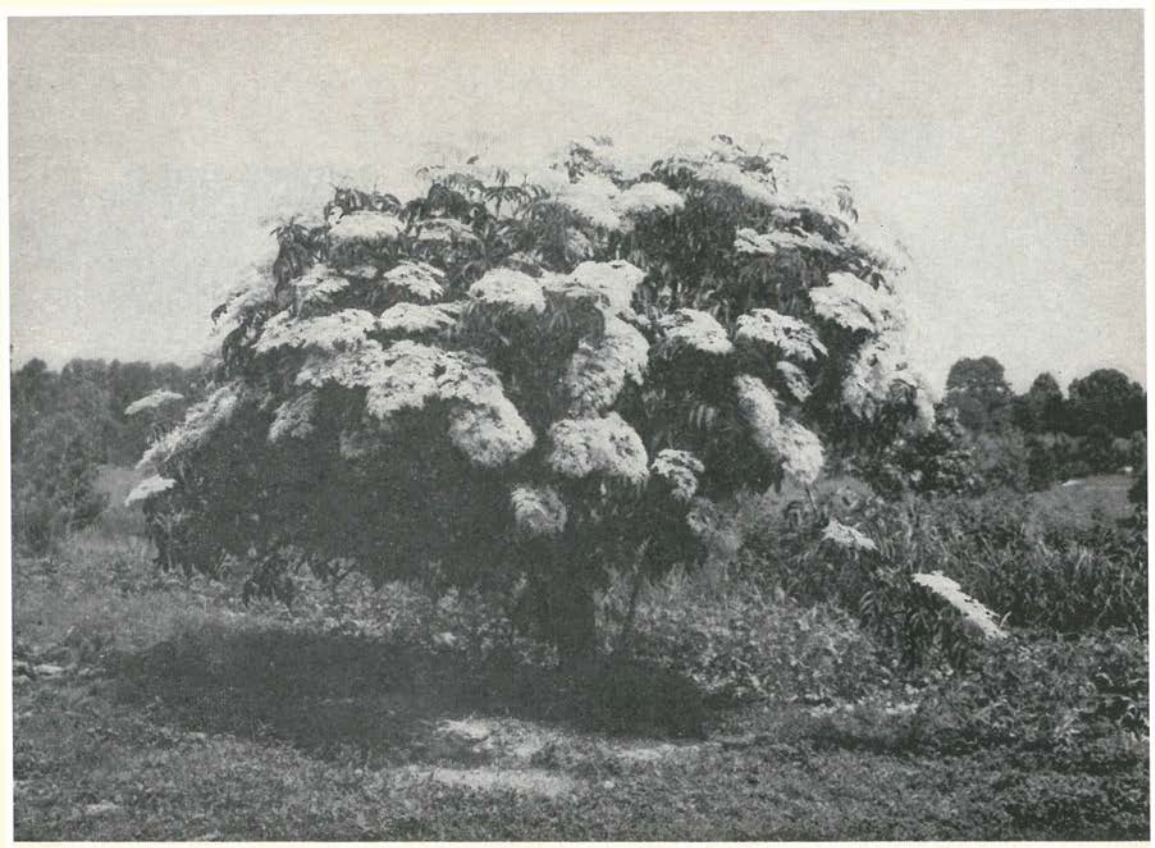
— The 60 Americans would be well-fed, comfortably housed and thoroughly amused while their 940 neighbors would be hungry, sick, ignorant and crowded 10 to a room.

— The neighbors would look with envy and resentment to the overpacked and expensive food storage facilities.

— More than half would never have heard of Jesus Christ.

— On the other hand, more than half would be hearing about Karl Marx, Lenin and Khrushchev."

—Michigan Muck Farmer's Newsletter, R. E. Lucas



ELDERBERRY... SAMBUCUS CANADENSIS

Picture and Comment By E. H. Bailey
Starkville, Mississippi

JUNE is the month of the elderberry shrub. The sweet-scented, white flowers of the elder plant adorn many a ditchbank, roadside, or country lane in June, to be followed later by clusters of dark purple or blackish berries. Spicy wine made from the berries was once considered a rare delicacy in many of the old-fashioned Southern households.

Elder belongs to the same family of plants as the honeysuckle. Not many people know that it can make a beautiful ornamental shrub in the home landscape. The unusual specimen shown in the photograph above was found growing in the backyard of an old plantation home. It is evidently very old. The trunk of the shrub is *more than three inches in diameter* and is covered with heavy bark similar to that found in the black gum tree. Most of the elder shrubs so common along ditchbanks and against fences are small, simply because they are cut down from year to year.

The elder plant prefers the well-drained, rich soils of ditchbanks, or protected fence corners, but thrives under a wide range of conditions. They grow well on similar soils in the home landscape and respond to good fertilization.

THE END

MISSISSIPPI SOILS SUITABLE FOR ALFALFA

By
H. B. Vanderford

Mississippi
State
University

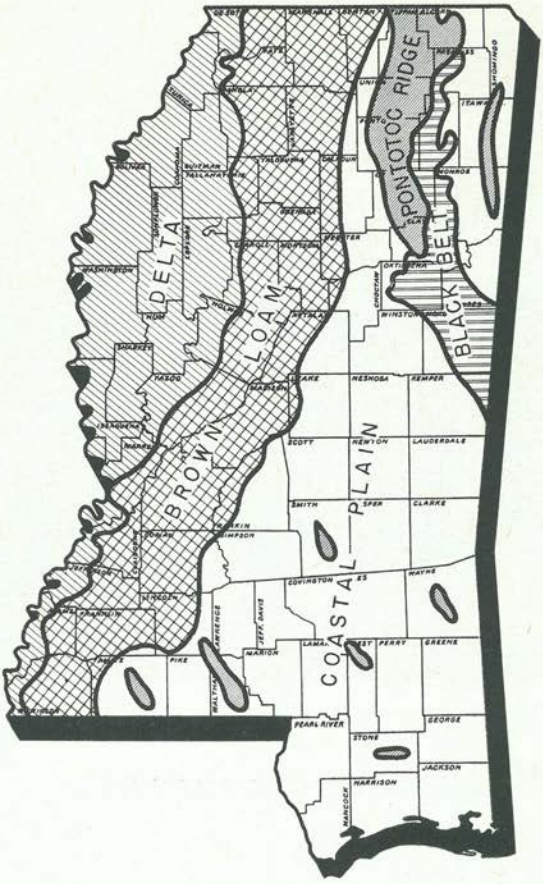


Figure 1—Major areas of Mississippi where large acreages of soils are suitable for alfalfa production.

ALFALFA is the queen of all feeds produced on farms. Its refusal to grow on soils low in plant nutrients or limited by some physical characteristic such as poor drainage, shallow depth, pan layers, etc. is an advantage, in a sense.

In fact, alfalfa might well be lower in quality if it could grow on poor soils. Some other forages will grow on a wide range of soils, with quality often varying according to fertility status of the soils. Alfalfa demands high fertility level to grow on any soil.

The need for alfalfa or some high quality forage has increased with the growing livestock and dairy industries of the South. Such enterprises naturally demand large quantities of high quality feed and forage crops. Alfalfa is finding a valuable place on the farms throughout our state where dairy herds are maintained.

When once established on suitable land, alfalfa has resulted in a high value crop, adding to the income of farmers producing it. Although its acreage in Mississippi is not yet great, alfalfa promises to become one of the important forage as well as cash crops of Mississippi.

State Soil Resources

Mississippi has a variety of soils and soil conditions. See Figure 1. The

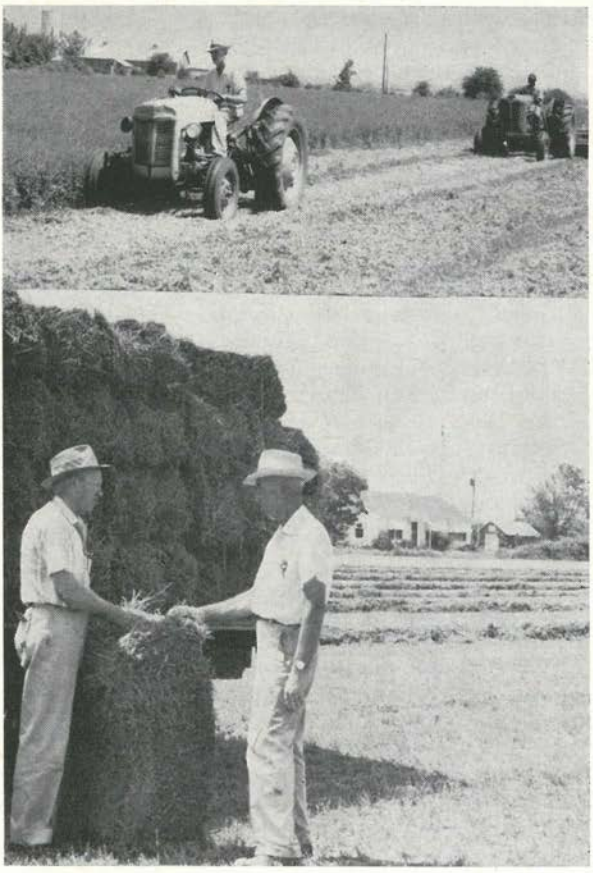


Figure 2—The dark clay, gently sloping soils of the Blackbelt can produce good alfalfa for long periods.

Alfalfa hay properly cured is one of the choice feeds for healthy and growing livestock.

climate does not vary greatly from one part of the state to another, although rainfall during growing season does. The southern part of the state usually gets much more rainfall during crop-growing season than the central and northern parts. This can mean a decided advantage in producing some crops, especially some of the forages.

More than half of Mississippi's 30 million land acres is in woods. And in recent years more and more land has been retired from row crops and planted to trees, causing timber production to become a chief enterprise of the entire hill section. What 15 or 25 years will bring remains to be seen.

Alfalfa production is increasing in several of our major Land Resource areas. Among these are: Delta, Brown Loam or Thick Loess, Pontotoc Ridge, and Black Belt. See Figure 1. In all these resource areas, many soils are suitable for producing alfalfa. Also in certain sections of the Upper and Lower Coastal Plain, large areas of deep, well-drained red soils are found. When properly treated and managed, these soils can produce large quantities of alfalfa forage.

In some counties, agricultural workers are stressing alfalfa as a nutritious feed for dairy cattle. Some demonstrational plots have been established by fertilizer people in cooperation with the Agricultural Extension Service. These demonstrations have (1) shown farmers alfalfa can be produced when planted on suitable land

and given proper treatments, (2) provided agricultural workers with a tool to promote more alfalfa production in their respective counties.

Much has been learned in recent years about fertilizing alfalfa for a long-lived stand. In some cases, only a 3- to 5-year stand is desirable, in other cases an 8- to 10-year stand. The farmer can do it if he is willing to apply sufficient quantities of lime, phosphate, potash, and borax required by this high quality forage crop.

The average fertilizer needed to establish an acre of alfalfa, except in certain Delta areas, may be as much as 200 lbs. P_2O_5, 200 lbs. K_2O, and 25 lbs. agricultural borax. This equals 10 bags of ordinary superphosphate and 3⅓ bags of 60 percent muriate of potash.

0-20-20 to Establish 0-10-20 to Maintain

Two special fertilizer mixtures carrying 3 percent borax are available to alfalfa growers in Mississippi. These are 0-20-20 to establish the crop and 0-10-20 to maintain it. The 0-10-20 for maintenance is recommended because large quantities of potash are removed by alfalfa hay. How much you apply depends on your soil test recommendations—varying from 300 lbs. per acre on some soils to as much as 1,000 lbs. on others.

The Mississippi Agricultural Extension Service recommends the following steps to successful alfalfa:

1. Select Land Suitable for Alfalfa
2. Use plenty of Lime and Fertilizer
3. Prepare a Compact, Weed Free Seedbed
4. Select a High-Yielding, Winter Hardy Variety
5. Inoculate Seed Properly
6. Do the Seeding Job Right
7. Manage the Land Carefully

In one particular field on our Black Belt Station at Brooksville, Mississippi, a field produced high alfalfa yields *each year for twelve years.* This was produced on Houston clay soil, a typical Blackland prairie soil type.

Mississippi Delta Area

The Mississippi Delta Area is one of the richest agricultural areas in the South. It has been called the Fiber and Grain Basket of the South, with many natural advantages for producing high yields of all our common crops.

The topography is level to gently sloping. There is enough water in the streams, natural lakes, and the ground to irrigate every acre of open land in that area. Under such intensified cropping of high value crops, these soils will develop future fertility problems on most plantations.

The Delta consists of approximately five million acres, largely open, cultivated land. Cotton occupies about 35 to 40 percent of this open land, leaving much land for other crops.

Alfalfa is finding its place here. The mineral content of Delta soils is higher than those of any other area. Some fertilization must be used even on rich Delta soils to maintain alfalfa stands for long periods.

With modern soil testing techniques, nutrient deficiencies can be detected and farmers have little excuse for not applying proper plant nutrients to every acre of alfalfa. Since alfalfa is a high value crop, it can help increase farm income on many farms where cotton acreage is limited by government programs.

Brown Loam Area

This area has a great acreage of soils suitable for producing good alfalfa. Livestock and dairy cattle production has increased in this area during the past decade, creating a great demand for high quality forage such as alfalfa hay and silage.

When these conditions are brought

together (suitable soils and demand for high quality feed), alfalfa can help solve the problem. Many area farmers have already started producing more alfalfa for their dairy cattle. In this program, they have asked the soil testing labs to help recommend proper amounts of lime and fertilizers for good alfalfa. *In every case, farmers following recommendations of the Soil Testing Service have experienced good results.* This trend in alfalfa production will increase, we predict, until the Brown Loam Area will be noted for producing alfalfa in the future.

Black Belt Area

The Black Belt area has a long history of alfalfa production. Originally, the area soils were high in organic matter and fertility, suitable for producing good alfalfa without any added plant nutrients. Early Mississippi farmers took advantage of this situation by producing alfalfa for many years.

After a time, as might be expected, alfalfa began to fail and the farmers started to decrease their acreage in it. The Soil Testing Service and field experiments soon started showing that good alfalfa could be produced on the degraded black prairie soils. Recent results have shown that alfalfa can now be produced on many Black Belt soils which were considered unsuitable for this particular crop at one time.

Soils people once thought that only the deepest, best drained soils of this area were suited for producing alfalfa. They have recently learned that most Blackland prairie soils can be made to produce good alfalfa *as long as surface water is not a problem.* This again emphasizes the importance of providing alfalfa with proper amounts of minerals, including borax and lime needed for profitable alfalfa production.

Other Areas

The three areas mentioned above

Dr. Harvey B. Vanderford, Mississippi native, is Professor of Soils at Mississippi State College. He earned his B.S. and M.S. from there, his Ph.D. from University of Missouri. His publications include two books, one just released on "Managing Southern Soils," and many scientific and popular papers on Soils and Crop Production.

are the ones where alfalfa production is making greatest progress. There are other areas where Mississippi soils are suitable for producing this important crop. Many Coastal Plain soils are deep, well-drained, and physically suitable for producing this deep-rooted legume.

The Pontotoc Ridge and other sections of the Upper Coastal Plain are potentially well suited for alfalfa production. Soils such as Atwood, Greenville, Orangeburg, Red Bay, Ruston, Ora, etc. are well adapted for the deep-rooted alfalfa crop.

Some sections in the Lower Coastal Plain have soils suited for alfalfa production. Some are noted for large areas of level to gently sloping deep, red, well-drained, loamy soils. Some farmers in certain counties are already producing this crop.

As more livestock and dairy enterprises develop, the need for more high quality forage will add alfalfa to many farming programs. Mississippi will then be growing a large acreage of this important crop in many parts of the state to provide nutritious feed and forage for an important industry.

THE END

Order Your Forage Booklet Before Supply is Gone—On Back Cover

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BIG HUGH LIVES ON

by s.m.

AGRICULTURAL leaders of North Carolina have taken a unique step to memorialize the name of Hugh H. Bennett, known in 48 nations as the "father of soil conservation" and founder of the U.S. Soil Conservation Service.

They have turned to farm ponds to help raise funds for a Hugh Bennett Professorship in Soils at N. C. State College.

From May 8 through June 10, farm pond owners of Bennett's native state are donating proceeds from fishing fees toward the Professorship. By press time, 550 well-managed, properly-stocked ponds all over the state had joined the project as Hugh Bennett Ponds for the month.

Although such a project will not raise the complete $100,000 needed for such a professorship, the approach seems singularly appropriate to us because of the truly down-to-earth man for whom it is sponsored.

On a hot July 7, 1960 in a small hospital in Piedmont, North Carolina, Hugh Bennett died from cancer after roaming the earth nearly 8 decades. That week, I happened to be in the same state gathering information for a profile on another leader of American agriculture, Clarence Poe.

Learning that Big Hugh had come home to die under the care of his son, I drove by the local hospital to pay what I hoped would be a helpful visit to Dr. Bennett. It was nearly 6 p.m. when I asked the young receptionist the number of Dr. Bennett's room and if he could have visitors.

Flipping lightly through her cards, she stopped abruptly, as in afterthought, and said, "Oh . . . you can't see Mr. Bennett . . . he expired 3 hours ago."

For a second I said nothing. Hugh Bennett had given me many hours of scientific facts and opinions, of personal prejudices and visions, of unforgettable memories from which a profile of the man and his conservation dream was developed for this magazine just 2 years ago.

In the process of developing that story, I spent many winter hours helping Hugh Bennett poke his fire on a huge hearth across the Potomac from Washington. Because he shared some of the intimate facts and struggles of his life with me—indeed, trusted me with them, even some I shall never put into writing—I felt a real friendship for Hugh Bennett.

Expire—nothing! A man like that doesn't just expire. He huffs and puffs and *fights to live,* with the same elephant-strength he gave to every cause for which he fought on earth.

Looking back at the young receptionist, I said, "Young lady, the grim reaper is worn out tonight, I can assure you."

A concerned question filled her face, as if to ask, what manner of visitor did Mr. Bennett nearly have? The road from the hospital to Clarence Poe's home rolls through Piedmont pastures and forestlands on which the sun goes down slowly in July. In the lengthening shadows, the pastures grew greener, the cattle fatter, the land richer, the homes brighter.

By the time I had reached the state's capital city, I had seen enough to realize that Hugh Bennett had not

died after all. I had seen enough to agree with the *Milwaukee Journal*: "Great men usually are memorialized in stone or metal, but the earth itself is being carved into a memorial to Hugh Bennett."

. . . enough to agree with the *Charlotte Observer*: "A sand fence in the Texas panhandle, a well-turned terrace in the Midwest, a row of trees in the South—these remain, for Big Hugh Bennett, prideful memorials."

. . . enough to agree with the *New York Times*: "Three volumes would be insufficient to tell in detail what Dr. Bennett has done during the last half century for his country and the world."

. . . enough to agree with Ezra Taft Benson: "Dr. Hugh Hammond Bennett's vision, his knowledge, and his determination helped establish, within our lifetime, a national awareness of the urgency of protecting the soil as an essential but perishable natural resource. He was a man who loved the land, but who loved mankind more."

In that last statement, Mr. Benson summed up the man I came to know in the long hours of developing the Potash Institute's profile on Bennett and conservation—more than the land, it was mankind that he loved first, and then the land.

I think that is the reason he stuck his neck out so many times . . . to continue calling soil erosion a national menace in the face of official rebuffs . . . to risk the laughs, the jeers, the grade of gossip that only academic intelligentsia can deliver with venomous innuendo . . . to reach his 30th, his 40th, his 45th, his 47th year before any "important" scientists would take him seriously or pay more than smirking attention to his claims.

That is the reason he rushed in where "angels" might fear to tread . . . to develop a new philosophy of land management based on the idea that land must be treated according to its natural capability . . . to create strip cropping, grassed waterways, contour rotations, modern farm ponds . . . to encourage tree planting where necessary, drainage of wet cultivated lands, irrigation land preparation, and improved methods of applying water.

That is why he proposed Soil Conservation Districts . . . to help the farmer help himself . . . field by field . . . as the most democratic, grassroots approach any scientific agency ever dared deliver to the working farmer.

That is why he never hesitated to use every means of democracy at his command—its publicity, its politics, its science—to sell the conservation idea as broadly and as soundly as possible.

And for this devotion, for this love of mankind first, and the land next, Hugh Bennett was finally cheered, but not before he had been maligned, laughed at, even betrayed.

Hugh Bennett carried many scars

to the grave with him. But not one of them ever dampened his sense of humor, his sense of humanity, or his sense of scientific simplicity that could pull the broad-tailed seats right out from under prestige-conscious "round-tablers" who talk and talk and talk, but seldom tramp across the land and up the gullies and into the little homes at the bottom of the fields or to the rear of the crossroads store for some country butter, as Hugh Bennett did most of his life.

For anyone who can look at the land about him today and see something of Big Hugh Bennett in it, we suggest an appropriate way to acknowledge that vision is to remember the Agronomy Department of your favorite agricultural college—in a tangible way that will help them improve their standards for future students.

For special friends of Hugh Bennett, the way has been made easy, simply by contacting the Hugh Bennett Professorship Fund, Department of Soils, N. C. State College, Raleigh, N.C.

But whether at N. C. State or Oregon State, the purpose is the same—higher standards of soil and water conservation through improved testing and teaching. **THE END**

A Kit-of-three For Your Soil Fertility Work See Page 16

New Forage Booklet—Order Yours Before Supply Is Gone—See Back Cover

POTASH NEEDED IN CATTLE DIET

STUDIES at University of Missouri's animal husbandry department show that growing ruminants need a ration that supplies more potassium than may be present in some feeds.

Up till now, according to William Pfander, animal nutritionist, it's been thought that potassium need not be included in mineral supplements. The reasoning was that animals' needs would be met from potassium stored up in leaves and stems of forage plants. Such roughages contain one to three percent potassium.

Pfander points to three trials by University of Missouri graduate student M. F. Brink of Golden Eagle, Illinois. Brink's studies set the need f r potassium in the ruminant growing-fattening ration at a level of 0.4 to 0.6 percent. Swine and poultry need less.

According to Pfander, a standard ration of corn, protein supplement, and three pounds alfalfa hay should meet this requirement. However, a ration based on corn and cob meal may be borderline. Corn or milo which contain about 0.3 percent potassium will be deficient in this mineral when fed without roughage unless the protein supplement is a good source of the mineral. Where urea supplies one third of the protein equivalent, says Pfander, the potassium level in the supplement will be reduced by one third. Soybean meal contains about 1.8 percent potassium, cottonseed meal 1.2 percent.

The Missouri animal nutritionist recommends that cattle fed on ground ear corn receive one to two pounds hay per day. If not given hay, cattle should be bedded on wheat straw or have access to a mineral mix containing potassium.

Since swine and poultry need less potassium, grain and supplements will supply their needs.

Missouri Farm News

"AND NOW, MAY I PRESENT . . ."

By R. L. Reeder

Director of Agricultural Information **Purdue University**

THERE is that dinner on which a half dozen committees have labored to get it just right. Comes the climax, the speaker of the evening stands up. Do you see him as a nobody, a fraud, a boaster, a joker—or are you ready to hear from a distinguished, competent speaker?

Your impression depends partly on his introduction, at least that's what Werner Nelson (American Potash Institute) and I decided the other night when we were comparing notes. We got to talking about the introductions we'd heard in our years as after-dinner listeners, (and speakers), and came up with four categories:

THE APOLOGY:

"Your committee had asked President Whozis to speak and he sends his best wishes *and* one of his assistants. . . . ."

"We have a substitute for President Whozis tonight—Josiah K. Blochheather, and I hope I have his name correct here. . . . ."

"The speaker . . . er . . . how do you pronounce your name? Oh yes, Carshed. He is with the United States Banana Company. (It is United Fruit Company). . . . ."

"Your committee wanted a good program tonight and considered several different things, but finally decided on a speaker. . . . ."

"That glee club will be hard to follow, but, let's see, the next thing on the program is a speaker. . . . ."

THE TOPPER:

"I knew the speaker in school because he was social chairman of his fraternity the year I was council president. . . . ."

"Our speaker is an authority on nitrogen, and I first met him when his company invited me to help them. . . . ."

"He's quite a story teller, which reminds me of one. . . . ."

"We're always glad to have someone here from a subsidiary industry, even though it may be somewhat smaller in size. . . . ."

"I'd like to give you a little background of the fertilizer industry (on and on for 10 minutes). . . . ."

THE DISCLAIMER:

"I hadn't known the speaker until this evening. . . . ."

"Now I don't know what the speaker will discuss but his speech is entitled:

'Three ways to grow corn'. . . . ."

"I'm sure all these honors are correct because he gave me the list himself. . . ."

"I'm told by people who know him that the speaker is well qualified. . . . ."

"He says he wants to talk to you about fertilizer. . . . ."

"The speaker is good—so now you shall see. . . . ."

THE EULOGY:

"If you've never heard this speaker tell his stories, you have the funniest experience of your life coming up. . . . ."

"Tonight's speaker has some 20 or 30 degrees and awards to his credit. Let me read them to you. . . . ."

"Your speaker has a world-wide reputation as the greatest authority now alive on the farm problem. . . . ."

"In social circles your speaker is known as quite a ladies' man, handsome, well-dressed, charming. . . . ."

"His publicity folder says each year he speaks to more than 2,300 groups all over the U. S. . . . ."

After going over some of our introductions that stop a speaker before he starts, Werner and I thought we ought to say what we liked to hear. We decided that there were some things we, as an audience, wanted to get from the introducer. *We want to know the speaker's name, his present position, where he came from originally, two or three selected qualifications from his experience, and a few comments about why his subject is important to us. We'd like to have the introducer give this clearly and quietly in about 1½ minutes, then quit talking, and let the speaker start while we are a little eager to hear him.* **THE END**

GRASSLAND HANDBOOK

IN grassland farming, is potash necessary . . . are there advantages in band-seeding . . . can a seeding be seriously injured by late grazing or late mowing . . . is there a good lowland pasture mixture . . . how much can the carrying capacity of your pasture be increased . . . when should grazing start . . . how is rotation grazing managed . . . has manure a place in meadow management . . . what is high-quality hay . . . what is the best way of handling baled hay . . . what crops may be ensiled . . . how should grass silage be fed . . . how can baled hay be stored . . . are special machines necessary for grassland farming . . . can forage harvesting be done by one man . . . etc.

These questions and nearly 90 others are answered for you in the latest edition of the *Grassland-Livestock Handbook*, published by The American Grassland Council.

Copies of the handbook may be had by writing to Dr. John B. Washko, President, American Grassland Council, Department of Agronomy, Pennsylvania State University, University Park, Penna.

Prices for copies of *Grassland-Livestock Handbook* are:

Quantity	Cost	Imprint Charges
less than 100 (postpaid)	25¢	no imprint
100—1,000 (postpaid up to 500 copies)	20¢	*$1.50 base fee plus .01 for each copy

Special prices for larger quantities

*** Add $5.00 to above imprinting charges if plate is used.**

NEW BOOKS

LIVING EARTH, by Peter Farb, 178 pages. Illustrated with black and white photographs and thumbnail sketches. Published by Harper and Brothers, 49 East 33 Street, New York 16, New York; 1959. Price $3.75.

The author observes, "We live on the rooftops of a hidden world. Beneath the soil surface lies a land of fascination, and also of mysteries, for much of man's wonder about life itself has been connected with the soil. It is populated by strange creatures who have found ways to survive in a world without sunlight, an empire whose boundaries are fixed by earthen walls."

A widely read contributor to such international journals as Reader's Digest, Farb has chosen the earth under three major surface types—forest, grassland, desert—to illustrate the animals, processes, and interactions that characterize soil life. The book is readable, interesting, informative and should be enjoyed by all interested persons from the mid-teens and older.

THE LAWN BOOK, By L. N. Wise. A popular book for the lawn lover. Published by W. R. Thompson, author of the Pasture Book, Box 297, State College, Miss.

Here is a guide to successful lawnmaking. It explains how to select grass, how to prepare a lawn area and plant the lawn. It devotes a whole chapter to the importance of fertilizing the lawn. The importance of watering is covered, including frequency and amount, rate and time, and the principles of plant-water and soil-water relationships.

Of equal importance is the mowing, the height and frequency, the shaded areas, mat and thatch, clippings, and mowing equipment. And the last three chapters are devoted to lawngrass diseases, insects, and lawn weeds—preventing and controlling them.

J. H. Roadruck, of Brookston, Indiana, averaged 166 bushels per acre on his 240 acres of seed production in 1960. He uses his 16-acre contest field as a laboratory, selecting the more effective practices to use over his whole corn acreage. Mr. Roadruck isn't satisfied in this photo. He wants to find out what he can do to produce even higher yields.

HOW MUCH PLANT FOOD IS NEEDED?

PLENTY FOR THE FORD ALMANAC EFFICIENT CORN PRODUCTION WINNER OF 1960!

SUCCESS in growing top corn yields does not happen over night! It takes time, capital, management. Much of this management is gained only through experience. We'd like to share a success story with you that we think you will find interesting.

It is J. H. Roadruck's corn story. During the past decade he has won the senior Indiana Five-Acre Corn Contest six times. Here are his yields:

1950	189 bu/A*
1951	199*
1952	155
1953	199*
1955	153
1956	203
1957	218*
1958	208
1959	210*
1960	231*

10-year average 197 bushels

*** State winner—(1954 hail).**

Mr. Roadruck believes it is important to give the corn a constant supply of nutrients from planting to maturity. Here is what he has applied on his contest fields:

	N	P_2O_5	K_2O
	lbs./A	lbs./A	lbs./A
1950–58 average	208	185	182
1959	400	280	240
1960	428	378	360

Mr. Roadruck started out in 1950 planting his corn after a legume, using 160 lbs. N and 120 lbs. each of P_2O_5 and K_2O per acre. Since then he has been following corn and gradually increasing the fertilization.

Soil tests from *Purdue* show a high buildup of fertility in his contest fields as one would expect—*but what does it take for yields in the 200-bushel class (below):*

	pH	P_2O_5	K_2O
		lbs./A	lbs./A
1957	5.8	435	530
1959	5.8	900+	680

What did Roadruck do on 240 acres of seed production to average 166 bushels per acre? Here are 8 practices:

1 Fertilizes adequately.

Rate lbs./A	Analysis	Plant Food lbs./A
100 Plowdown	45–0–0	45 N
100 Plowdown	33–0–0	33 N
200 Plowdown	0–47–0	94 P_2O_5
200 Plowdown	0–0–60	120 K_2O
146 Pre Plant	82–0–0	120 N
200 At planting	11–48–0	22 N, 96 P_2O_5
Total 220 lbs. N, 190 lbs. P_2O_5 120 lbs. K_2O		

2 Shreds stalks in fall and usually plows down with N.

3 Uses hybrids bred under high fertility conditions.

4 Obtains final stands of 18,000 to 19,000 plants per acre.

5 Usually plants 3-inches deep, using a slow planting speed of 2 to 3 MPH to get the high plant population.

6 Applies insecticides to control both the insects in the ground and the corn borer.

7 Continually watches for limiting factors and ways to do even better next year.

8 *Pays extreme attention to details.*

THE END

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Also See Inside Cover and Pages 15 and 16

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