Better Crops
WITH PLANT FOOD

March-April, 1963

20 Cents

POTASH-HUNGRY ALFALFA

. . . appears first as many white or yellowish dots around the outer edges of leaf tips. With increasing deficiency, these edges begin to turn yellow and the chlorosis proceeds around the entire margin. This tissue then dies, becoming brown and dry. In the more advanced stages, the leaf edges become broken and ragged.

BORON-HUNGRY ALFALFA

. . . usually is called "yellow top", because a chlorosis occurs at the tops of the plants, as shown by the arrow on left. The internodes are shortened to give the top of the plant a rosette effect or bunched-up appearance. Lateral growth, shown by the right arrow, is typical of a boron-starved plant.

Better Crops WITH PLANT FOOD

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

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ON THE COVER

. . . the signs of potash hunger and boron hunger on alfalfa are clearly shown. They are important to know—and to *prevent*—if you want a successful alfalfa program. Starting on page 24, Wisconsin scientists explain what their state has done to develop quality alfalfa-management in an area where the Queen of Forages was not believed adaptable only 20 years ago.

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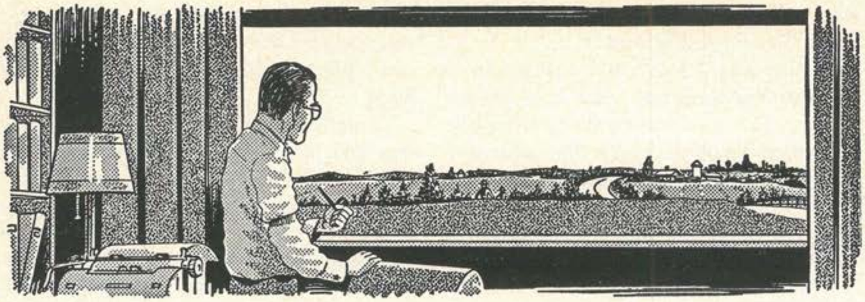


Rural Household Memories

By Jeff McDermid

(Elwood R. McIntyre)

MY PARENTS were raised in a log cabin clearing. What they possessed after marriage would now be almost worthless pieces of household gear.

But in their simplicity, the battered "truck" they had was the acme of comfort, happy living, and contentment.

They never had a stick of furniture that rabid antique hunters would tramp the trails to find.

But somehow, I have found a quick end to insomnia by calling back to mind's eye many of the long-gone treasures and what space they occupied within the walls of our little home on the prairie.

Can you respond in similar fashion to the sharpness of memory and the devotion to your childhood home that time and change and modern luxury have not driven forever from your ken?

At the front of our 5-room frame house built in 1899 was the sitting room, about 18 by 25 feet.

In the southeast corner was a little parlor organ a neighbor had given us when he went away. It had seen long usage. The keys were yellowed and the foot treadle carpeting worn down. It had a red plush stool, a half dozen stops and a knee bellows for sound effects.

Sister and I played "chop sticks" on it and a traveling preacher named Elijah Beardsley gave me a few elementary music lessons.

There were two cane-seat maple chairs and an armless sewing rocker where Mother patched and sewed and darned.

Our oldest relic was in this room also: A wooden, high back, clumsy rocker with a back pad on it and a crochet doiley at the top. It came from mother's home originally. It was usually drawn up near the oak burner stove in winter time, altho it was anything but comfortable.

The stove burned "chunks" of oak tossed in at a side door, and it rested on a zinc platform to protect the faded ingrain carpeting.

Naturally, we had a "center table." It was covered with a square of red plush drapery. It held the 5-pound family Bible with gilt embossed covers, steel engravings, a sacred dictionary, and the "illuminated" family-record pages.

Many a rainy day I lay on the floor looking at Noah and the Flood and other full page engravings by Gustav Dore. We took Bok's *Ladies Home Journal*, one of whose regular contributors was Rev. T. DeWitt Talmadge who also wrote my favorite travel book, The Earth Girdled.

I must not forget the old soldier's weekly, *The National Tribune* of Washington, D. C.—my father's reliable reference through which he searched for cards of pension attorneys through whom he hoped to get a bill through Congress granting him more than the $20 a month stipend he then received.

In the northeast corner was a wide branched fern on a light stand. On a book shelf screwed to the wall were Mother's recipe and scrap books, a one volume encyclopedia, a cheap dictionary Father won at a raffle, and hero books I got at Christmas: T. B. Aldrich, Cap Marryat, and the precious adventures by T. A. Henty, filled with the daring and glory of earlier boyhood days.

These, and my weekly *Youth's Companion,* I would love to see and read again.

Mainspring of our reading circle on cozy nights (until 9 o'clock) was the midroom attraction—the hanging lamp. Its large bowl was filled with kerosene and a wide wick. It had a big red globe cover from which dangled white glass pendants. The lamp could be raised or lowered by a chain system to suit the occasion. The lamp cast a rosy glow over the walls and ceiling as we gathered to read aloud of Poe and Dickens, Civil War yarns, and poems by Will Carlton and James Whitcomb Riley.

It was such moments of family life that made up to our folks for all the enjoyment they had missed in their youth. The evening hour ended in prayer, which is another touching remembrance to think about.

On the west side of the living room was an archway through which we entered the downstairs guest bedroom. The bed with coverlet in place and the "commode" in the corner with wash bowl and pitcher, and a built-in wardrobe constituted all I recall of this sleeping room.

From the sitting room's northwest corner, a door led to the steep, narrow stairs which led to the small hall and two bedrooms on the second floor.

Directly north of the sitting room was the combination kitchen and dining room—the cupboards, chairs, cistern pump and sink, the cook stove and dinner table.

It was pretty close quarters there when the dinner table was set out full length, next to the cook stove. This had a front metal extension shelf or porch on it from which the draft slides operated.

When my brother and his new bride came to see us, she laughed and suggested that I might sit on the stove shelf to make more table room at meal time. Our cooking and serving facilities handled countless visiting relations and a half dozen ministers at one time who were boarded by us during the regional church conference.

Ma bustled around with wispy locks and red cheeks trying to be a gracious hostess to all and sundry. I kept the wood-box filled with chunks and kindling—most of the time—and toted in water for the reservoir at the back of the cook stove.

Upstairs we had a single bed and a wardrobe and table for a small room to the west, reserved for me. I did my school work there and absorbed many of my hero tales in my "den."

I experimented with cigars and pipes there and was discovered and disciplined there.

But what still is a delightful memory are the views across the hills at sunset, seen from my little room on the west. Enjoying this with boyhood energy and yearning I dreamed of an artistic career—just another dream destined to remain unfulfilled.

What happens to old home furnishings and furbelows—once the joy and comfort of your past? Can they be salvaged as the changing years pass? Too often, if successful in this venture, your place would resemble Ford's display at Dearborn.

Today I can produce little or nothing of those lares and penates we so long loved and used, and the pictures we had on the walls—such horrors as the surrender of Cornwallis and the Battle of The Wilderness. All scattered and gone except the same old 5-pound Bible.

This still attracts my grandchildren—that and a few old albums of diverse family characters.

As you scan their faces, they look forth from the stilted studio seats in a sort of bewildered way at the strange age we are in and the activities we belong to.

Thus, after all, it is probably better to think back and remember what our rural homes were like than to move back there ourselves. **THE END**

MOISTURE

AND

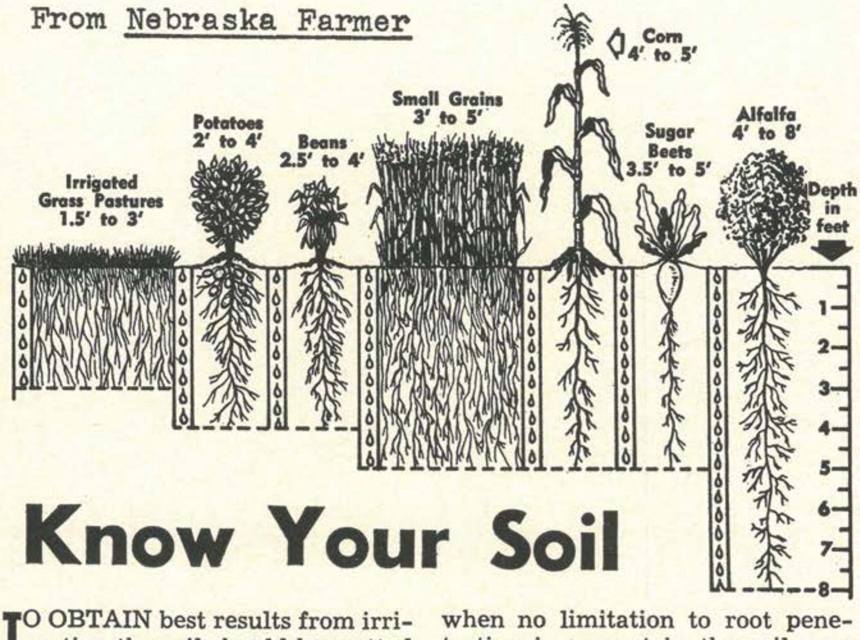
FERTILITY

NEW

HANDBOOK

PAGE 29

From <u>Nebraska Farmer</u>



Know Your Soil

TO OBTAIN best results from irrigation the soil should be wetted throughout the root zone depth. There are wide differences in the root depths of mature crops. Because of differences in variety and climate, root depths will vary generally within the range shown when no limitation to root penetration is present in the soil profile. When factors like hardpan or rock are encountered they will limit root development. Only by knowing your soils and crops can good practices be selected for irrigating on your farm.

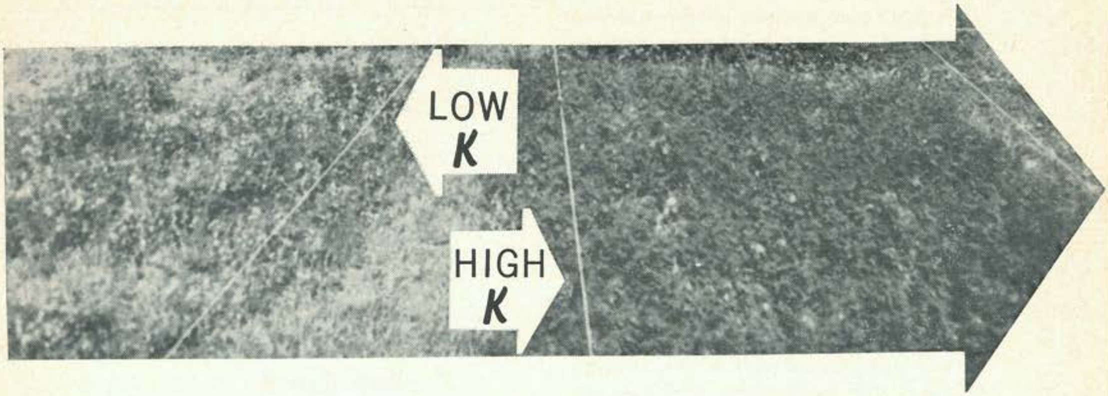


Figure 1—High lime plots receiving 160 lbs. K_2O annually maintained excellent alfalfa stands even on somewhat poorly drained soil area.

Historically alfalfa has given ample evidence of its responsiveness to fertilizer and lime. Could this response to minerals be more fully exploited to simplify field management and speed adoption of this perennial legume? So far, our research has shown that high fertility transforms alfalfa into the most easily managed forage on the farm . . .

1 By helping extend the range of alfalfa-growing soil.

2 By helping spread out the capital investment in lime.

3 By helping insure the seeding year.

By Cecil S. Brown
University of Maine

Speed Alfalfa Adoption With Fertilizer

NEARLY a decade of research and demonstration with high fertility alfalfa has completely changed our attitude, and the attitude of leading farmers, toward this *amazing* legume.

Historically, Northeastern dairymen have been slow to recognize the superiority of alfalfa and its importance in a quality forage program. As recently as 1950, only 10 percent of the total harvested hay in New York and New England was alfalfa, in contrast to over 50 percent in Wisconsin.

During the late 1950's, farmer interest began to awaken, as improved alfalfa varieties and increased lime-fertilizer usage came along.

By 1961, over 20 percent of the hay in Vermont and 40 percent in New York were alfalfa or alfalfa mixtures. By the same time, Wisconsin had expanded alfalfa usage to nearly 80 percent of its total hay tonnage.

The Key: Mineral Nutrition

High mineral nutrition has been the key to the "new look" of alfalfa in Maine.

Ten years ago we were not sure alfalfa would tolerate more than two harvests annually in our climate. Today, three cuts are readily

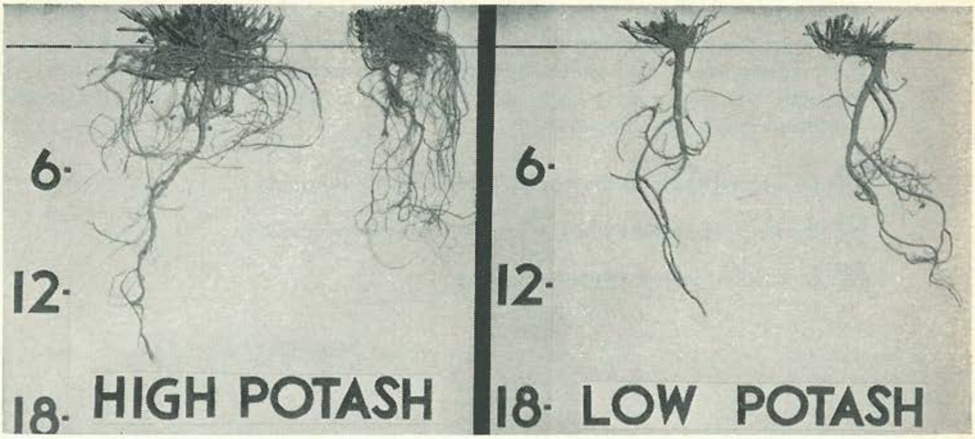


Figure 2—The surprising tolerance of high fertility plants to soils of imperfect drainage appeared related to their extensive rooting habit, in contrast to the low potash plants . . .

Figure 3—. . . and to the broad, spreading crown of individual 5-year-old Narragansett alfalfa plants under high fertility treatment.

employed with high-lime, high-potash stands.

Five years ago we were still concerned about keeping alfalfa stands "long enough to make it pay."

Since then, research has shown high fertility alfalfa to be so easily established and so productive in the seeding year the dairymen are beginning to use the crop in very short rotations with silage corn on the rock-free soils of our river valley and coastal farms.

So far, our research has shown that high fertility transforms alfalfa into the most easily managed forage on the farm.

For example:

1 High Mineral Nutrition Helps Extend The Range of Alfalfa-Growing Soil

Inadequate soil drainage has long limited alfalfa usage in Maine.

Would liberal fertilization and liming help extend alfalfa to soils of imperfect drainage? A field experiment was established in 1955 to find out.

Plots of the Narragansett variety were established on a long sloping field of Dixmont silt loam, ranging from moderately well to somewhat poorly drained with decreasing elevation.

High-lime check plots were located on a well-drained area of Bangor silt loam at the upper end of the same field. The experiment was conducted through five harvest years, 1956-1960. Two lime levels and several rates of annual phosphorus and potassium were studied.

Table 1 and Figure 1 show how effectively lime and potassium maintained productive alfalfa on this marginal soil.

High lime plots receiving 160 lbs. K_2O annually maintained excellent alfalfa stands even on somewhat poorly drained soil area.

This surprising tolerance of high fertility plants appeared related to their *extensive rooting habit,* in contrast to the low potash plants (Figure 2), and to lateral spreading of individual plants of the Narragansett variety as shown in Figure 3.

These results have been supported by observations on leading dairy farms over Maine. We have noted individual fields of marginal internal drainage where long-term stands of the Narragansett variety have been maintained, or have thickened following moderate winter injury.

In each case, soil tests have revealed lime levels of at least pH 6.2 and "high" levels of available potassium, obtained with liberal annual top-dressing of 0-15-30 and/or muriate of potash.

2 High Mineral Nutrition Helps Spread Out Lime Investment

Another factor retarding alfalfa adoption has been the low lime status of Maine's agricultural soils, since most topsoils range between pH 5.0 and 5.5 unless heavily limed.

Many of our dairy farms are located on fine-textured soils high in organic matter, requiring nearly ten tons limestone per acre to bring the plow layer to pH 6.5 or above.

In the mid-1950's, we were reluctant to recommend alfalfa usage until a field soil had been limed to minimum pH 6.5. In many cases, farmer interest in alfalfa ended abruptly when the soil test report

Figure 4—Second cutting of the second year on Dixmont soil. The superiority of alfalfa can be readily seen in these high potash plots, even at the lower lime rate of 2 tons (pH 5.8).

called for six tons of limestone or more per acre.

Was it possible to use more moderate rates at the outset of an alfalfa program? To what extent could high fertility compensate for moderate lime usage during the first rotation?

The long-term experiment of Dixmont silt loam (previously described) was initiated, in part, to study the persistence and productivity of alfalfa at extreme levels of lime and fertilizer potash.

A typical field, with a past history of restricted liming and fertilization, was selected on a dairy farm in central Maine in 1954. Legume-timothy seedings were established in the spring of 1955, comparing Narragansett alfalfa, Viking trefoil and Kenland red clover. Liberal fertilization (50 N, 200 P_2O_5, 200 K_2O) was used to insure stand establishment.

The initial and final lime status of the experimental plots is shown in Table 2. It should be noted that the 2-ton lime rate fell short of pH 6.0, although a moderate rise in available calcium resulted. Typically, this soil required about nine tons of finely ground limestone to bring the upper twelve inches to pH 6.5. We used seven tons at seeding in 1955 and topdressed two more in 1957.

Table 3 shows the soil potassium levels of this study. The initial level of available potassium was barely maintained by the annual 40-lb. K_2O rate in conjunction with 200 lbs. K_2O at seeding. The 320-lb. rate resulted in substantial increases in available potassium to a depth of twelve inches.

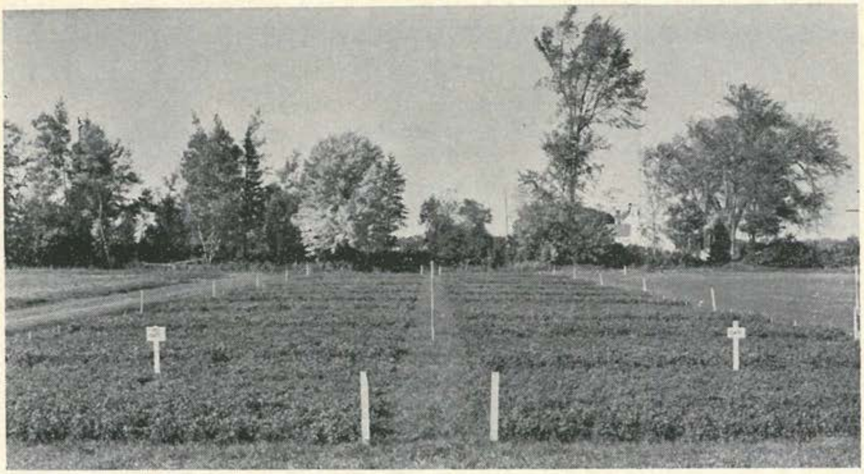


Figure 5—High fertility alfalfa in October of the seeding year (1962), following harvests in mid-July and early September. An oat companion crop had little residual effect on stands or yields after the July harvest. Small-plot differences in this photograph reflect continued fall growth of the DuPuits variety in contrast to the more hardy Narragansett.

The superiority of alfalfa on this soil, even with restricted liming, was clear-cut throughout the entire 5-year experiment.

Each year alfalfa yields exceeded those of the trefoil-timothy and red clover-timothy mixtures by at least one ton hay per acre. Actually, alfalfa's superiority was substantially greater than this since no third cut was practiced until the final year, resulting in a sacrifice of 15 to 20 inches regrowth each year. The other legume mixtures produced little regrowth after the second cut.

Figure 4 shows the surprising persistence and vigor of high potash alfalfa with restricted liming (pH 5.8). This view of the plots in August of the second year contrasts the virtually pure stands of alfalfa with the grass-dominated stands of red clover and trefoil. No nitrogen was applied after the seeding year to prevent a masking of the legume comparisons.

The substitution of potash for lime in this study was most clearly evidenced during the last two years, as the effects of seeding year fertilization became diminished. Yields with 2 tons lime were as great as with 9 tons, when 320 lbs. K_2O was supplied annually (Table 4). It is significant to note that high lime was able to compensate only partially for low potash.

It seems important to emphasize that our study of the potash-lime interaction has been limited to a soil derived from calcareous glacial till. Our granitic soils, with their more strongly acid subsoils, may require more complete liming of the topsoil before alfalfa can be successfully grown.

The partial substitution of potash for lime has had rather widespread application on Maine dairy farms. Many of our farmers are trying alfalfa for the first time, on soils

TABLE 1—YIELDS OF ALFALFA-TIMOTHY HAY IN FIFTH HARVEST YEAR, 1960

(Tons Per Acre, 10% moisture)

Soil Drainage	pH 5.8, 2 tons lime		pH 6.5, 9 tons lime	
	40 K_2O	160 K_2O	40 K_2O	160 K_2O
Somewhat poor (Dixmont-Monarda)	3.3	4.7	3.6	5.5
Moderately well (Dixmont)	4.1	4.7	4.4	5.3
Well (Bangor)	(no treatment)		5.1	6.0

with a lime requirement of six to eight tons (to reach pH 6.5).

Successful seedings are being obtained with the use of three or four tons disked into the surface soil along with liberal phosphorus and potash. Excellent stands are being maintained with the use of 200 to 250 lbs. K_2O annually.

These dairymen do not intend to continue indefinitely these moderate lime levels of approximately pH 6.0. During the next rotation they will use another three tons of lime prior to alfalfa seeding. In the meantime, liberal potash fertilization has permitted earlier adoption of alfalfa than we might have hoped five years ago.

3 High Mineral Nutrition Helps Insure Seeding Year

A third problem affecting the acceptance of alfalfa has been weak, weedy seedings. Farmers "fired up" to try alfalfa have soon cooled to the idea when faced with a field of stunted plants fighting for survival amidst grass and weeds.

At the University of Maine we are currently studying management factors related to alfalfa establishment and productivity in the seeding year. We have been literally amazed by the inherent seedling vigor of present-day alfalfa varieties when liberally supplied with fertilizer and lime. In our tests alfalfa has completely dominated

TABLE 2—LIME STATUS OF THE DIXMONT SOIL

Soil Horizon (inches)	Initial pH (1954)	Final pH (1960) 2 tons lime	Final pH (1960) 9 tons lime	Available Ca, lbs./acre Initial (1954)	Available Ca, lbs./acre Final (1960) 2 tons lime	Available Ca, lbs./acre Final (1960) 9 tons lime
0–6	5.3	5.7	6.6	480	1440	2660
6–12	5.6	5.8	6.4	670	1050	1510
12–24	5.7	5.8	6.0	410	430	820
24–36	5.9	5.8	5.9	570	510	550

TABLE 3—POTASH STATUS OF THE DIXMONT SOIL

Soil Horizon (inches)	Available K, lbs./acre Initial (1954)	Final (1960) 40 lbs. K_2O	320 lbs. K_2O
0–6	118	136	480
6–12	142	102	221
12–24	138	114	120

any associated perennial legume or grass. Likewise, it has tolerated severe competition from spring companion crops and weeds, recovering rapidly following their removal. Based on these tests and observations on leading dairy farms, we are convinced that inadequate mineral nutrition is the basic cause of most seeding failures of alfalfa in Maine.

In one of our studies we set out to determine the feasibility of alfalfa-clover mixtures. Many of our dairymen have believed alfalfa could not tolerate the competition of red clover (or even ladino) in the seeding year.

In 1959, we studied DuPuits and Vernal alfalfa in mixtures with Dollard red clover or ladino clover sown at various rates. The experiment was sown in mid-May without a companion crop on a previously well-limed (pH 6.8) silt loam soil.

Prior to seeding, the soil was heavily fertilized with 800 lbs. borated 0-15-30 plus 600 pounds 8-16-16 per acre.

Table 5 shows the clear-cut superiority of alfalfa in this experiment. Ladino clover was completely dominated regardless of its seeding rate, and red clover ran a poor second to alfalfa even when sown at the unusually high rate of 12 lbs. per acre.

Another study, conducted in 1960, involved Narragansett alfalfa in mixtures with ladino clover or Mansfield trefoil. The superiority of alfalfa during midsummer drought was such that its yields

TABLE 4—YIELDS OF LEGUME-TIMOTHY MIXTURES DURING LAST TWO YEARS, 1959–60

(Tons Per Acre, 10% moisture)

Lime	Annual K_2O	Alfalfa-Timothy Actual	Alfalfa-Timothy Rel.	Trefoil-Timothy Actual	Trefoil-Timothy Rel.	Red Clover-Timothy Actual	Red Clover-Timothy Rel.
tons	lbs.	tons	%	tons	%	tons	%
2	40	6.8	100	4.2	100	3.6	100
2	320	9.6	141	6.4	152	4.6	128
9	40	7.8	115	4.7	112	4.1	114
9	320	9.7	143	6.4	152	5.5	153

TABLE 5—SEEDING YEAR YIELDS OF ALFALFA ALONE OR IN CLOVER MIXTURES

(Tons Per Acre, 10% moisture)

Seeding Mixture	Component yields in 2 cuts[1] Alfalfa	Clover
(pounds) Alfalfa (8)	1.87	——
Alfalfa (8) + Ladino (4)	1.78	0.17
Alfalfa (8) + Red Clover (4)	1.78	0.24
Alfalfa (8) + Red Clover (12)	1.55	0.49

[1] Averaged for DuPuits and Vernal.

were 22 times greater than ladino, 7 times greater than associated trefoil.

The ability of high-fertility alfalfa to recover from severe early-season competition was clearly illustrated by a test conducted during the 1962 season.

1 We imposed different intensities of competition through controlled rates of oats, herbicides, and nitrogen fertilization. Severe competition, totalling nearly two tons dry matter per acre, reduced alfalfa's first crop growth to less than one-third the ideally managed plots.

2 Following first harvest on July 16, we topdressed 500 lbs. of borated 0-15-30 per acre.

3 Alfalfa recovered rapidly on all plots and second cutting yields on September 5 were nearly identical for the competition plots and the plots maintained free from oats and most weeds. Hay yields of pure alfalfa in this second cutting averaged 1.0 tons for Narragansett and 1.4 tons for DuPuits.

Figure 5 shows the fall regrowth of this experiment.

With each passing year, we become more convinced that most alfalfa failures can be prevented by more liberal use of lime and fertilizer, phosphorus, potash, and boron.

Moreover, we can foresee the use of this amazing legume in short, intensive rotations with silage corn on certain easily-tilled soils of the state.

In Conclusion . . .

Nearly a decade of research and demonstration with high fertility alfalfa has completely changed our attitude, and the attitude of leading farmers, toward this legume.

No longer is it a crop to be reserved for a few fields ideally suited in drainage or depth.

No longer is it a crop on which

seeding failures must be accepted as "things not going just right." *Soil fertility can change all of this.*

Increasing adoption of alfalfa in New England is assured wherever the vital role of fertilizer in the growth of this amazing legume is properly appreciated.

THE END

Since 500 bushels of Irish potatoes remove from the soil 225 lbs. of nitrogen, 60 lbs. of phosphate, and 330 lbs. of potash, it is easy to understand the value of plant nutrition research on this important vegetable crop.

Over 100 California Tests Probe Potato Needs

. . . for Nitrogen

Phosphorus

Potassium

The Vice Chairman of the University of California Vegetable Crops Department, Oscar Lorenz, Reports to the California Fertilizer Association

DURING the past six years, we have conducted over 100 large well-replicated experiments with potatoes where we have tested from minimal to very high, or even excessive, levels of all of the major nutrients.

These studies were conducted in all of the potato producing areas in Southern California, including Kern and Tulare Counties, Santa Maria Valley, the Chino area of San Bernardino County, and the Hemet and Perris areas of Riverside County.

The program had three main objectives:

1 To further determine the crop response in yield and quality *to nitrogen, phosphorus, and potassium*. With nitrogen we were interested in determining how high the rate of application should be, or in many cases could be. With phosphorus and potassium we were interested in further delineating the exact areas where these nutrients are required and how much to apply.

2 To develop more information on plant analysis for assessing the nutrient level of the crop and then to relate these plant analyses to yields, nutrient content of the soil, and to fertilizer application.

3 To obtain information on soil analysis for phosphorus and potassium for determining whether or not the nutrients are deficient. Some excellent results were obtained and the information has already been published as California Agricultural Experiment Station Bulletin No. 781.

Furthermore, and even more important, this information is being widely used for growers, chemical laboratories, and the fertilizer industry.

WITH NITROGEN . . .

. . . it was found that the highest yields were usually associated with applications of about 200 lbs. per acre. On the heavier textured soils, 120 lbs. of nitrogen were sufficient, but in some of the lighter soils applications of 240 lbs. or more were required.

On the light soils where rates as high as 240 or even 300 lbs. per acre were required, better results were obtained from split applications than from a single application made at the time of planting.

In some soils it was possible to apply too much nitrogen and reduce the yield of U. S. No. 1 potatoes even though the total yield was not reduced.

Also, high nitrogen applications often produce potatoes of low specific gravity or dry weight.

A number of the nitrogen experiments included comparisons of sources of nitrogen, including ammonium sulfate, urea, and ammonium chloride.

In none of the tests were any of the sources better than ammonium sulfate.

In most tests ammonium sulfate was considerably better than urea, particularly so on the more alkaline soils.

WITH PHOSPHORUS . . .

. . . the many experiments in Southern California brought out the fact that there is definite need for phosphorus fertilization in all of the areas and in most fields in any one area.

Usually about 60 lbs. P_2O_5 per acre is sufficient, but in fields where phosphorus is quite low the application should be 120 lbs. or more of P_2O_5 per acre.

Soil analyses showed that if a soil contained less than 15 ppm of bicarbonate extractable phosphate-phosphorus, it was definitely deficient.

If a soil contained more than 25 ppm there was no increase in yield from adding phosphorus fertilizer.

WITH POTASSIUM . . .

. . . probably the most striking results were obtained with potassium fertilization, doubtless accounting for the great increase in the use of complete fertilizers with potatoes.

Benefits from potassium fertilization were obtained in a relatively large number of soils and in some it was found that severe potassium deficiency existed.

For example, in some soils in the Santa Maria Valley, plants without potassium died a month prematurely. In these fields potato yields were doubled by potassium fertilization.

In Kern County, we had for many years observed a purpling in the tops of the plants. This was associated with a peculiar rolling of the leaves and many times was attributed to some virus infection.

Analysis of petiole tissue from these plants showed that they were very low in potassium. In trials where we applied relatively high rates of potassium (at least 200 or 400 lbs. of K_2O per acre), we were able to eliminate these leaf symptoms.

A number of fertilizer experiments in that area showed good yield increases from potassium fertilization, especially on the lighter-textured soils.

Fields giving the greatest benefits from potash fertilization were those which had been cropped to potatoes and other high potassium-removing crops for the longest periods of time.

Plant analyses have given excellent

results with potatoes, and growers should make use of them. This research is being done by Drs. K. B. Tyler, F. H. Takatori, and O. D. McCoy.

CALIFORNIA FA NEWS

Railroad Supports Soil Testing

. . . Via Cigarette Ashes
Unwashed Pickle Jars
Empty Fertilizer Bag

PEOPLE went to the railroads for many years and still go—mostly with freight.

But in recent years the Illinois Central Railroad, part of whose system serves western Kentucky, has gone to the people.

The going has been personal—and technical. Working closely with county agents, the railroad is teaching the value of soil testing to the area's farmers.

Jim Pryor, IC employee who operates the two mobile, trailer labs used in demonstration work, is in charge of the project. He makes a slew of counties in Western Kentucky, plus others in neighboring Indiana and Illinois, promoting proper soil-testing techniques.

"We don't actually test farmers' soils," he said recently. "We just show them how important a soil test is, how the technicians do it in their laboratories, and why the county agent (through whom most samples are forwarded) has to abide by some strict rules in sampling."

Main idea, of course, is to teach farmers that soil testing pays. Pays because it shows them what the soil actually needs in the way of nutrients —and keeps the farmer from spending good money on fertilizer the soil may not need.

Pryor says that working with county agents puts him in contact with several thousand persons a year. He is prepared to go "any place any time in our territory, to get the message over and give the county agent a hand."

Like any good showman, Pryor uses several gimmicks to get attention. One involves use of cigarette ash—an apparently innocuous item.

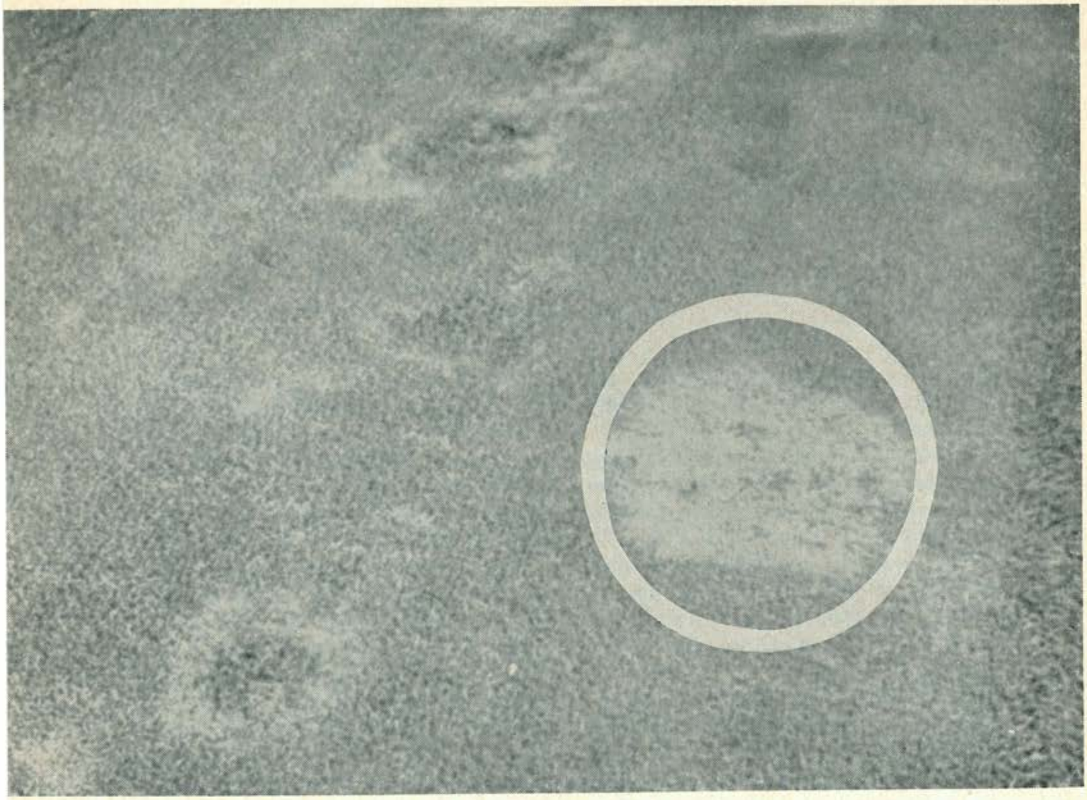
He shows a soil sample which tests out to a blue color. But, he points out, if the farmer is smoking a cigarette (or cigar) while taking the earth sample, he may goober up the whole works. A pinch of tobacco ash in the blue-colored solution in the test tube turned the solution a bright red. This red color normally would mean an entirely different fertilizer treatment (or liming treatment) than the blue-colored test. The farmers got the point.

Another gimmick is to point out why a fertilizer sack should NOT be used as a soil sample container. Remnants of the fertilizer will throw the test off completely, making it appear (from the adulterated sample) that the land is amply supplied with nutrients.

The unwashed pickle jar (with its high acid residue) is another culprit. This makes the soil sample test out to something usually entirely different from what the land actually needs, Pryor says.

The message the mobile lab is getting over through the country agents apparently is taking. The day Pryor and Ridley held their demonstration in Beaver Dam was a rainy, blustery, cold day. But from 25 to 50 farmers stopped and listened intently during the two hours Pryor and Ridley were repeating their demonstration work.

—Kentucky News



Ophiobolus patch disease, shown on this putting green, is an increasing problem in the northwest.

A vigorous, healthy turf will respond to management and resist disease attacks. For the average northwest conditions, a fertilizer with about a 3-1-2 ratio of NPK will help give this health and vigor if the level is kept high enough and no serious deficiencies were apparent initially.

Let's Take Another Look At Potassium For Turfgrass

By Roy L. Goss, Washington State University
Western Washington Experiment Station
Puyallup, Washington

TURFGRASSES are rapidly becoming the number one crop in the United States.

In Washington alone there are over 900,000 homes producing more than 60,000 acres of lawns. The installation cost of these lawns exceed $261,-000,000.

Golf courses, parks, cemeteries, schools, roadsides, and other turfed areas compose another large and valuable area. With current urban growth and turfed recreational areas increasing, turfgrasses will probably become our number one crop in the future.

To understand the management of highly specialized turfgrasses we must consider a few fundamental facts:

1 Turf is considered a very permanent crop. Major changes in soil physical properties and nutritive levels cannot be made as simply, rapidly, and as inexpensively as with annual field crops. Complete turf renovation is often more costly than initial establishment costs.

2 We must remember that most turfgrass soils are highly artificial. Some contain as much as 90% coarse sand, while others are very similar to our agricultural soils. Golf course putting greens and tees, play and athletic fields, and lawns planned for heavy play and high rainfall areas, must be constructed from soils high in sand and low in silt and clay if they are to respond to use and management.

3 The third consideration is how will the turfed area be used and to what degree of perfection do we want to maintain it. The trend during the last few years has been toward greater usage of fertilizer on turfgrasses because neater appearing areas are desired.

What Are Our Fertilizer Balances?

The fastest, best guide to proper plant nutrition is the soil test. The reaction and appearance of the plant is also important but sometimes too late a guide to correct a deficiency in time to help the crop.

With turf, if we wait until it shows a deficiency symptom for potassium, phosphorus, or calcium, the lacking element cannot be applied to the root zone as easily as with annual crops. So, it is important to know what our fertility level is *before* planting a permanent turfgrass.

Table I gives us an idea of what our fertility balances are in some turfgrass areas.

TABLE I.—FERTILITY STATUS OF SOME GOLF COURSE PUTTING GREENS

No. of Samples	Phosphorus Deficiency No.	Phosphorus Deficiency %	Potassium Deficiency No.	Potassium Deficiency %
227	11	4.8	108	48

Putting greens are the story here, since these represent recent tabulations of soil tests from well managed golf courses.

Potassium was being used in the fertilizer programs, but obviously not enough. The same general trend is true for all other turf soil tests.

These results indicate that (1) insufficient amounts of the formulated fertilizer were not applied or (2) the fertilizers were not properly formulated to meet the crop needs.

These potassium deficiencies must be corrected slowly in order to avoid injury to the grass.

How Much Potassium Does Your Turfgrass Use?

Table II shows some results from a turfgrass fertilizer experiment in progress at the Western Washington Experiment Station.

TABLE II.—COMPARISON OF SOIL POTASSIUM* LEVELS AFTER 3 YEARS OF CLIPPING REMOVAL

N–K–P Treatments lbs./a./yr.	Initial K_2O lbs./a.	Present K_2O lbs./a.	Lbs. K_2O applied per acre in 3 yrs.	Relative net use K_2O lbs./a.
1. 870–0–0	500+**	184	0	316+
2. 870–174–0	500+	149	0	351+
3. 870–174–348	500+	329	1044	1215+
4. 522–0–0	500+	183	0	317+
5. 522–174–0	500+	175	0	325+
6. 522–174–348	500+	330	1044	1214+
7. 261–0–0	500+	217	0	283+
8. 261–174–0	500+	220	0	280+
9. 261–174–348	500+	348	1044	1196+

* Extractable with Morgan's solution
** 500# /a.—Highest standard used by W.S.U. Lab.

These data do not consider certain variables, such as possible leaching, fixation, and the release of non-exchangeable potassium in the soil. But, obviously large amounts of potassium have disappeared from these plot soils.

The nitrogen rates were 20, 12, and 6 lbs. per 1000 sq. ft. per season. Phosphorus (P_2O_5) was applied at 4#/1000 sq. ft. per season, and potassium (K_2O) was applied at 4 and 8#/1000 sq. ft./season.

All nitrogen was applied as urea and potassium was applied as muriate of potash. They were dissolved and sprayed on the plots at regular intervals to make up the annual total. Phosphorus was applied as treble superphosphate separately.

As nitrogen rates increase, potassium usage also increases. Compare treatments 1, 2, 4, and 5 with 7 and 8. In spite of what was thought to be adequate K_2O applications, all plots showed a *net loss of potassium* over the three year period. These facts agree with several other investigators who have reported briefly on turfgrass fertilizer requirements.

Just how high we would have to go with our potassium applications to show a net gain is not known for putting green turf. But preliminary results on lawn turf fertilizer plots (in Table III)) show some net gains have been made, especially when available nitrogen and K_2O were applied equally at 8 lbs. per 1000 sq. ft. (348#/a.) per season.

Again, these data do not take into consideration the variables of fixation, leaching, and release of non-exchangable potassium.

What About Fertilizer Balance For Turfgrasses?

Results at this time indicate that balances are important to turfgrasses

TABLE III.—RELATIVE USE OF POTASSIUM BY LAWN TURF WHEN VARIABLE RATES OF N-P-K ARE USED

N–P–K Treatments	Initial K_2O	Present K_2O	Lbs. K_2O applied per acre in 3 yrs.	Relative net use K_2O lbs./a.
1. 348–0–0	479	180	0	299
2. 348–174–0	466	145	0	321
3. 348–174–174	419	289	522	652
4. 348–174–348	415	438	1044	1021
5. 348–0–174	414	386	522	550
6. 348–0–348	414	481	1044	977
7. 174–0–0	428	180	0	248
8. 174–174–0	414	180	0	234
9. 174–174–174	449	381	522	590

but not in the same proportion as for most field crops. For example, only small applications of phosphorus are necessary to maintain a good healthy turf, but considerably more potassium is required to maintain quality.

Plots with high potassium levels have better color and growth characteristics than those with low levels when observed in the field. Nitrogen levels influence the uptake of potassium by turfgrasses. The higher the nitrogen level, the more potash is removed.

In computing phosphorus use, it was found that potassium influenced the levels considerably. When potassium was applied, larger amounts of phosphorus were taken up. Likewise, phosphorus influences potassium uptake, but to a much smaller degree.

What About Disease?

Nutrition plays a major role in disease development. In cooperative disease control experiments with Dr. C. J. Gould of this station, we have definitely established the fact that Fusarium patch disease is stimulated by heavy applications of nitrogen. It was further observed that organic forms stimulated greater infection than inorganic.

Ophiobolus patch disease, an increasing problem in the northwest, is similar in its response as Fusarium patch when considering nitrogen. Other examples of disease and nutrition interrelationships can be found.

Just how much these diseases are being affected by potassium, phosphorus, or combinations of these nutrients still remains to be seen. As we approach the critical levels, both high and low, it appears that the picture is changing somewhat and more can be said in the near future.

A vigorous, healthy turf will respond to management and resist disease attacks. Hence, for the average conditions of the northwest, a fertilizer with about a 3-1-2 ratio of nitrogen, phosphorus, and potassium, will give this health and vigor if the level is kept high enough and no serious deficiencies were apparent initially.

THE END

Pastures Beat Drought

. . . with lime and fertilizer help

DESPITE the severe drought in his area last year, Georgia farmer J. M. Hardy was able to carry 100 dairy cattle on 100 acres of permanent pasture, according to Turner County Agent Robert Miles.

Mr. Hardy's summer grazing consists of 60 acres of Coastal Bermuda and 40 acres of Bahia grass. He supplements this with 10 acres of millet to stimulate milk production.

This pasture was fertilized according to soil test with 500 pounds of 5-10-15 mixed fertilizer and 50 pounds of nitrogen per acre. Mr. Hardy had planned to top dress with an additional 50 pounds of nitrogen but left it off because of the drought.

"I used to think fertilizer would burn up a crop," Mr. Hardy said, "but now I know fertilizer will actually keep the crop from burning up."

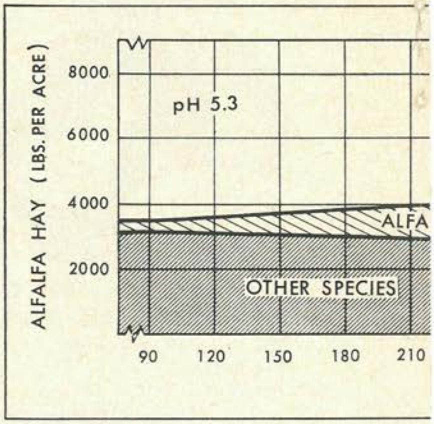
For winter grazing, this farmer plants 35 acres of rye and 75 acres of oats. Both crops are fertilized according to soil test. In addition he plants 26 acres of Borre sweet lupine to fill in between the winter and summer pastures.

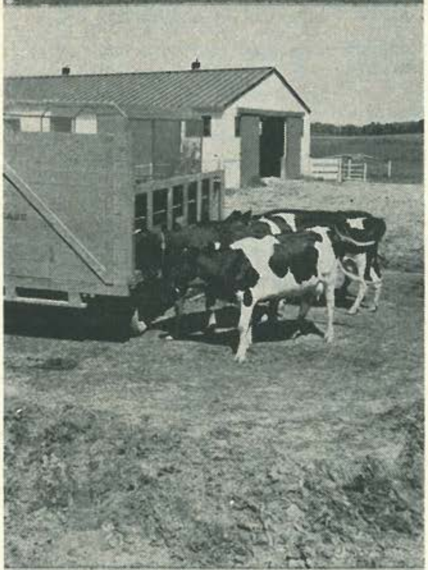
The pastures are limed every three to four years according to soil test reports and this liming program makes for greater fertilizer efficiency, says J. R. Johnson, head of the Extension Service agronomy department at the University of Georgia.

Mr. Hardy's pasture demonstration was one of 25 in the state last year.

—Georgia Extension News

While intensive grazing is vital when grazing alfalfa . . .



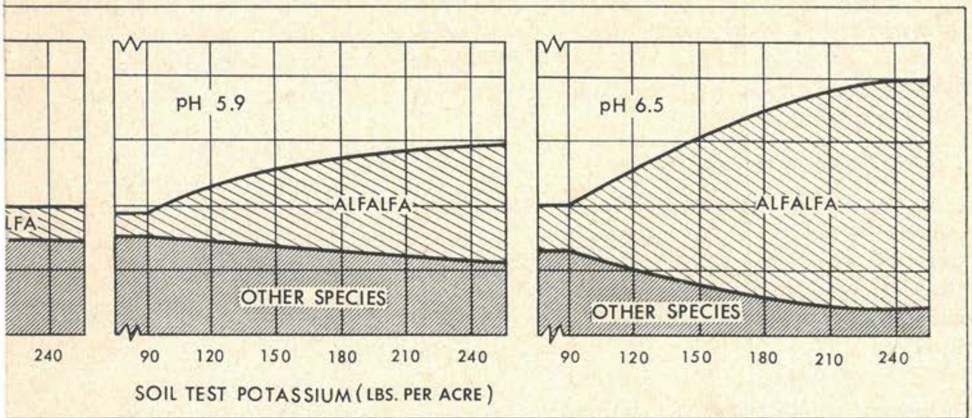


. . . a concrete slab is necessary in a green feeding operation.

. . . A Key to Efficient Milk Production

. . . as well as a tractor forage harvester and self-feeding or self-unloading wagon.

Relationship between annual yields of alfalfa hay and soil tests for potassium and pH on withee silt loam soil in North-Central Wisconsin



QUALITY ALFALFA-MANAGEMENT

By H. J. Larsen, C. C. Olsen, R. F. Johannes

University of Wisconsin

PROFITABLE milk production demands a complete forage and dairy herd management program. Any missing link in the chain of good soil and crop management—including correct cutting and storing methods and proper feeding practices—reduces efficiency and profits.

Native grasses and clovers have lost their economic advantage in our present day dairy enterprise.

Such plants as bluegrass, red top, quackgrass, and white clover are well adapted to native soil conditions but as productive, quality forage they can't compete with alfalfa.

Alfalfa has many desirable attributes—high yield, high protein content, good palatability, long life, rapid recovery after cutting, drought and heat tolerance, no summer dormancy, and ability to tolerate extremes in winter temperatures.

No other forage can bring all these needed qualities to a forage program—a *quality* forage program.

Only twenty years ago, this "Queen" of forages was not thought adaptable to north-central Wisconsin silt loam soils (Almena-Freer-Withee association). These soils usually lack sufficient internal and/or surface drainage and are naturally very acid and very low in available potassium.

Soil conditions are now adjusted to fit the needs of the alfalfa crop by insuring (1) *good surface drainage*, (2) *pH 6.5 or above*, and (3) *more than 250 pounds of exchangeable potassium per acre.*

To Remove Excess Water

In some areas, waterlogged soils caused by high water tables or seepage zones can be drained by tiling or deep ditching. But in many cases, excess moisture is a surface problem.

On long slopes, water may accumulate at the base of these slopes or in field depressions, saturating the soil for long periods. When these surface drainage problems are aggravated by imperfectly drained subsoil, as in north-central Wisconsin, the problem is serious. But it can be corrected by land forming.

Land Forming Techniques

Land forming combines three practices: (1) sod waterways, (2) drainage channels, (3) land smoothing.

Outlet ditches or waterways are constructed as "V" ditches large enough to carry the drainage water from the feeder channels and remove collected water from the field. Shallow feeder channels or "eave troughs" are constructed on the contour 150 to 300 feet apart and empty into the outlet ditches.

Channels are 6 to 8 inches deep, 10 to 12 feet wide, with bottom slopes or gradients of 0.5 to 1.0 per cent. No sharp or unneeded ridges to interfere with normal field operations are permitted.

These cross-slope channels collect runoff water from the field and deliver it to the sod waterway. This practice prevents water accumulation at the bottom of the field slope. Smoothing the land between channels with a land plane eliminates field depressions and prevents water impounding between the channels.

To Adjust Soil Fertility

Soil tests are used to determine the lime and fertilizer needs.

Typical pH readings for these north-central Wisconsin soils range from 5.0 to 5.4 and organic matter readings from 35 to 45 tons per acre (3.5 to 4.5%).

So, these soils require from 7 to 11 tons of Wisconsin Grade A limestone per acre. The limestone is well mixed with the plow layer to raise the pH to 6.5.

Typical available potassium readings range from 70 to 110 pounds per acre and phosphorus readings (Bray P_1 test) from 25 to 40 pounds per acre. *Common corrective fertilizer recommendations are 600 pounds of 0-10-40 or 700 pounds of 0-10-30 per acre.*

Boron appears to be another essential element short on these soils. Unless a soil test shows more than 2.0 pounds per acre available boron, a borated fertilizer is topdressed the first hay year. This supplies the boron needed for the five year rotation used by most dairymen.

To Maintain Soil Fertility

Alfalfa stands *must be topdressed annually* with a high potash fertilizer to replace the potash removed in the forage and thus insure continued high yields.

A maintenance fertilizer application equivalent to 350 pounds 0-10-40 per acre replaces the phosphorus and potassium removed in 4 tons of alfalfa.

To Choose Right Variety

The plant breeder has done much to fit the alfalfa plant to our environment. It would be unwise to ignore the greater winter hardiness and disease resistance of some of the newer alfalfa varieties, such as Vernal.

To insure success in growing alfalfa, a good seedbed is prepared, the seed is inocculated and placed deep enough to obtain moisture but shallow enough to allow emergence.

The companion crop, usually oats, is controlled so as not to compete too severely with the seedlings for light and moisture.

To Cut and Graze For Quality

Once productive alfalfa stands have been obtained, the next questions are: (1) when to harvest for the highest feed value, (2) how to keep this high nutritive value *after* harvest.

For quality forage, the pasturing dairyman should *not permit grazing past early bloom.* When green feeding, he should *not harvest past half-bloom.* When making hay or silage, he should *not harvest past one-tenth bloom.*

For example, in north-central Wisconsin, cuttings should be taken about June 5th, July 15th, August 25th.

Control Waste In Pasturing . . .

When pasturing forage, waste can amount to 35 per cent if the forage is in the bud stage. Waste from pasturing is rarely less than 15 per cent.

It comes from fouling by dung and urine, trampling, and/or selective grazing by the cattle.

Rotational grazing must be used to prevent excessive waste and an intensive daily ration system is best.

. . . In Green Feeding

Green feeding allows the dairyman to escape many losses connected with pasturing, but he still must cut the forage at all stages of maturity, reducing quality and dry matter production per acre.

Even so, losses of forage while feeding green-chop in dry lot rarely exceed 5 per cent.

. . . In Stored Feeding

Stored feeding of hay or silage offers the opportunity to cut forage at the right time. Due to weather effects, field curing rarely makes the quality desired.

If quality alfalfa hay is to be made consistently, artificial drying is necessary. High quality forage can be made in the form of wilted silage (60-65% moisture) or low moisture silage (45-55% moisture).

Some losses occur in making stored forage, both in storage and when feeding. Even so, under proper management these losses are much less than pasturing. When using stored forage, additional tonnage of high quality dry matter per acre can also be produced since harvesting can be done at the proper stage for maximum TDN production per acre.

Figure 1 shows that little is

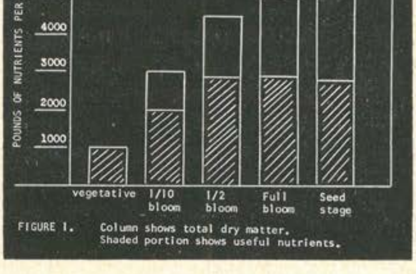


FIGURE 1. Column shows total dry matter. Shaded portion shows useful nutrients.

gained in TDN or protein by waiting beyond the early bloom stage.

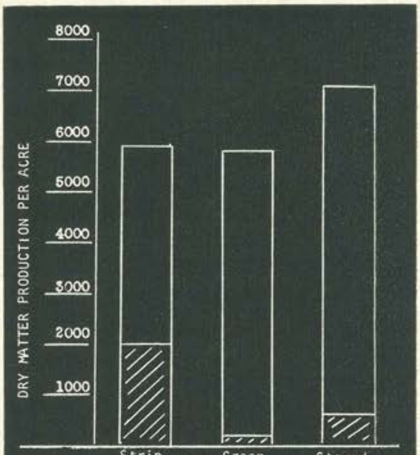


FIGURE 2. Column shows total dry matter. Shaded portion shows loss by cows.

Figure 2 shows the relative dry matter loss for the three basic systems of summer feeding.

Milk per Acre

Milk production per acre can be the final measure of good cattle management, forage quality, fertility program, soil environment, crop and system of harvesting.

High milk production levels are possible at a very low cost when quality alfalfa provides the protein and a major portion of the TDN and home grown grains provide the balance. Since at least 50% of milk production cost is feed cost, a sound forage program is important to the net income of the dairyman.

Figure 3 shows that stored feeding will produce more milk per acre than other systems of summer feeding.

Conclusions

1 Use land forming, liming, and fertilization to adapt the soil to fit alfalfa requirements.

2 Plant adapted varieties and use good seedbed and seeding practices to insure stand establishment.

3 Harvest, when useful nutrients are at their peak—bud to early bloom.

4 Control waste by grazing with intensified pasture systems.

5 Preserve forage as artificially dried hay, wilted or low moisture silage.

6 Topdress annually with high potash grade fertilizer.

7 Feed as stored forage for the most milk per acre.

THE END

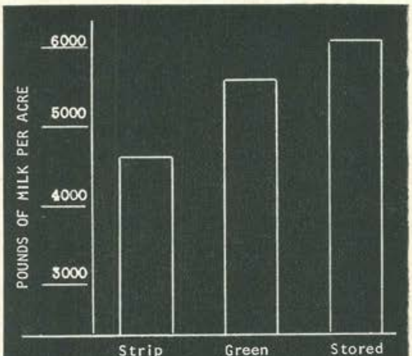


FIGURE 3. Columns show relative amount of milk per acre from three systems of summer feeding.

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AMOUNT

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. . . that fertilization can increase yield per inch of water used, whether rainfall or irrigation.

. . . that plant roots feeding in subsoil usually have access to half the potassium found in the surface soil.

. . . that improved fertility on claypan soils pays off in spite of critical periods of drouth or floods.

. . . that potassium increases the water-holding capacity of plant tissues.

. . . that few enterprises give as much return for time spent as soil sampling for available nutrient tests.

. . . that water use efficiency can be measured in terms of crop yield per unit of water used by the crops, lost by evaporation, and wasted during irrigation.

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

A Texas rancher had some boots made, and they turned out to be too tight. The bootmaker insisted on stretching them.

"Not on your life!" exclaimed the rancher. "Every morning when I get out of bed, I got to corral some cows that busted out in the night and mend fences they tore down. All day long, I watch my ranch blow away in the dust. After supper, I listen to the radio tell about the high price of feed and the low price of beef; and all the time my wife is nagging me to move to the city. Man, when I get ready for bed and pull off these tight boots, that's the only pleasure I get all day!"

A little boy strayed away from his father at the fair grounds and cried to a policeman that he was lost.

"What's your father like?" asked the cop.

"Women!" came the prompt reply.

"Who introduced you to your wife?"

"We met; that's all. I don't blame anybody for it."

"Mother, am I descended from monkeys?"

"I don't know, dear. I never knew your father's people."

A kiss is something that brings two people so close together they can't see anything wrong with each other.

Young Harry: "Father, what's the difference between a gun and a machine gun?

Dad: "There is a big difference. It is just as if I spoke, and then your mother spoke."

She: "I consider, John, that sheep are the most stupid creatures living."

He (absent-mindedly): "Yes, my lamb."

An expert is a person who knows all the answers—if you ask the right question.

Beauregard, on trial for killing his wife when he found her in the arms of her lover, was acquitted with a verdict of justifiable homicide. As he started to leave the court room a free man, the judge stopped him.

"Just a point of curiosity, suh," the judge asked. "Why did you shoot your wife instead of her lover?"

Said Beauregard, stroking his moustache: "Suh, it seemed like a better idea to shoot the woman once, than a different man each week."

UNFERTILIZED

FERTILIZED

To insure adequate growth and frost resistance in northern climates, lupines often require phosphorus and potash. Here late-sown lupines froze and died from frosts—left half of beds—while fertilized plants still make good growth.

In this case, potash was responsible for improved frost resistance.

LEGUMES and LIME: European Forestry Aids

By J. H. Stoeckeler
Lake States Forest Experiment Station
U. S. Department of Agriculture

and

L. C. Walker
University
of Georgia

LEGUMES and lime, alone or together, have been used for decades in Europe for improving tree growth on impoverished upland mineral soils.

They are used extensively in Germany, and to a considerable degree in Austria, Denmark, Finland, Sweden, Czechoslovakia, and Poland.

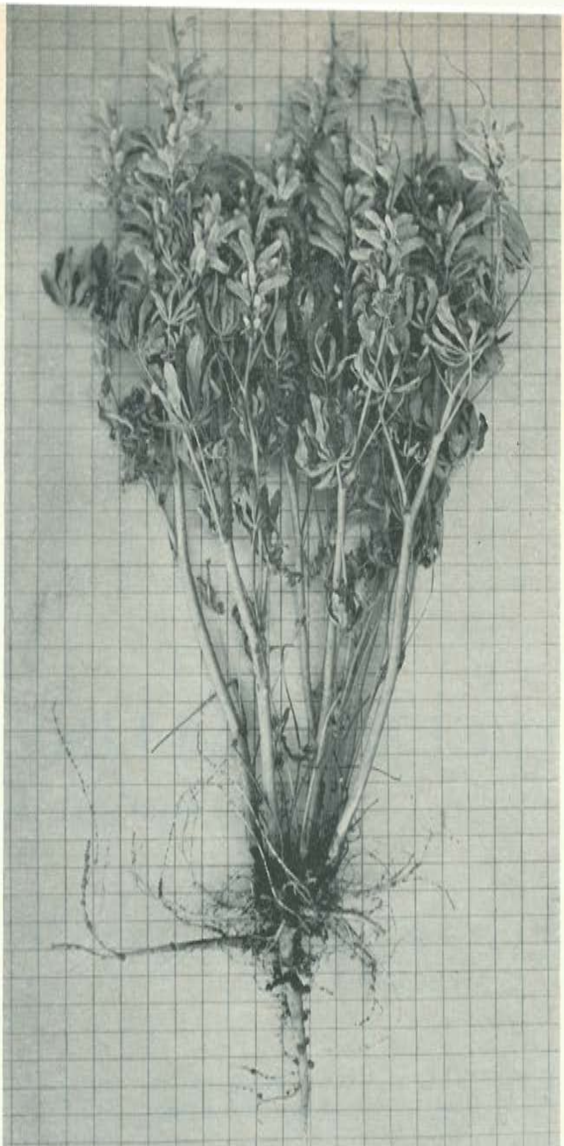
In spite of the expense in getting a good stand, legumes are important because they provide a long-lasting (20 to 25 years) supply of nitrogen for sandy soils or other sites where the influence of commercial forms of nitrogen fertilizers may last only 6 to 10 years, as observed by C. O. Tamm of the Swedish Forest Experiment Station. Perennial lupine is the principal legume employed.

Other cover crops showing promise in supplying nitrogen to forest trees include vetches, seradella, yellow clover, Swedish clover, and white clover.

Lime is used in spruce stands where a thick layer of raw humus exists and where legumes are grown for forest soil improvement.

Legumes

The poor performance of humus-impoverished forest soil results from the discriminatory use of com-



This third-year perennial lupine is in the pod stage. Note nodules on roots. Background consists of one-inch squares. Tree growth response to the presence of perennial lupines is increased two to fourfold when accompanied by lime or by potash, phosphate, and lime, according to German tests. Beneficial effects last many years. Norway spruce plots so treated and measured 25 years later showed volume increases of 220 to 380 percent over check plots on the Lüneburg Heath.

pounds important for nitrogen mobilization in the soil. The residual humus is relatively high in ash-rich humic acids and other resistant substances which, in humid climates, lose much nitrogen.

By cultivating nitrogen-fixing legumes, for which favorable conditions can be created by fertilization, serious growth deficiencies can be corrected in a short time.

As humus is restored and enriched, tree growth is improved. However, fertilization may need to be continued in another form after the legumes disappear.

Perennial Lupines

Perennial lupines are used extensively in Germany, especially in Bavaria and Prussia, for supplying nitrogen to young forest plantations.

They are important in diluvial sands, sandy heathland, and other low nutrient-retaining soils where much nitrogen from commercial fertilizer may be leached out before the stand canopy closes.

Once a well-ramified root system develops and a sizable crown is established, leaching losses are greatly reduced.

In Practice:

1 Perennial lupines are seeded between the rows of trees in plantations 2 or 3 years old, when trees are no longer in danger of being overtopped by the lupine. Persisting for 3 to 10 years or until excluded by tree shade, the legume supplies nitrogen for the plantation and leaves a "reserve" of the element available after stand closure in the several tons of organic matter produced.

2 Elsewhere, the ground is thoroughly plowed and disked—and often lime, potash, and phosphate are worked into the soil.

3 Thereafter, the lupine, properly inoculated with bacteria, is seeded in the spring and plowed under while in the flower stage during midsummer of the next year. By then, plants are about 3 feet high.

4 Total nitrogen in well-developed stands of lupine under central European conditions may range from 107 to 134 pounds per acre.

5 A pH of 5 or higher is required for favorable growth, according to the late A. Nemec of Czechoslovakia.

LPK Aid Tree Response

Tree growth response to the presence of perennial lupines, as noted by Professor Wiedemann of Germany, is increased two to fourfold when accompanied by lime, or by potash, phosphate, and lime. Beneficial effects last 20 or more years. Norway spruce plots so treated and measured 25 years later showed volume increases of 220 to 380 percent over check plots on the Lüneburg Heath according to Forester Seibt of Germany.

Growth increase was much less when complete commercial fertilizer (N,P,K, Ca) was used but no lupines planted. For example, Japanese larch showed over 50 percent increment increase, while Scotch pine growth was least (22 to 49 percent greater than check plots) among many species tested.

Professor Wittich of the Forestry School at Hann.-Münden recently noted that raw humus in a moist, cold, subalpine forest limed and seeded with perennial lupine had 856 pounds of earthworms per acre, while untreated areas had none. In a 12-year period, practically the entire limed raw humus layer has passed through earthworms to form a favorable soil structure.

Lime

Liming of forests, extensively done in Germany, is considered very important in improving acid raw humus.

Tangible Benefits

Large quantities of nutrients are locked up in the thick layer of undecomposed organic matter characterized by this humus type. Liming greatly accelerates biological activity that breaks down litter and encourages its incorporation with the mineral soil.

The treatment (1) improves soil structure, (2) encourages growth of soil floras, (3) provides an essential element, (4) facilitates absorption of other nutrients.

Thirty years research by Hassenkamp in northwest Germany have stimulated interest in this method of site improvement.

Liming in 15 trials, reported by Mitscherlich in 1959 in Germany, showed a 12.5 percent increase in annual ring width in measurements taken 6 years after treatment.

In another series, also involving nitrogen, the increase was 23.4 percent.

However, optimum results (32 percent) were achieved when lime was supplemented by nitrogen and phosphorus in stands of spruce, pine, and fir averaging 82 years old. Even stands over 100 years of age gave good response.

Researcher Schairer of the Forest Experiment Station at Stuttgart suggests that liming gives a growth response for Norway spruce, if the soil pH is under 5.

Professor P. Viro of the Forest Research Institute in Finland has found that liming improved tree growth 37 percent in podsolized soils low in basic minerals, first treated in 1911 with 1,800 pounds per acre of ground limestone. Larch was especially responsive.

Not Always Beneficial

In some trials, of course, liming has shown no beneficial effect on tree growth and, in some cases, negative effect.

One of the older experiments in Denmark, installed on Norway spruce in 1904 by P. E. Müller and reported some 5 decades later by Paludan and Rafn, showed no favorable influence. Of trees removed in thinning the limed plots, from 11 to 14 percent had butt rot caused by *Fomes annosus* compared with only 5 percent of those removed from untreated plots.

Overliming may also cause an unfavorable Ca:K ratio resulting in sickly European larch, Douglas-fir, and Sitka spruce seedlings, observed in nurseries by Dr. Themlitz of the Forest Soils Research Institute at Hann.-Münden.

Source and Application Notes

Dolomite is regarded as an excellent source of lime because magnesium, often deficient for conifers, is also supplied.

Lime is distributed by rotary methods or by blowers, the latter now most commonly used. It is generally in the form of $CaCO_3$, but may be $Ca(OH)_2$, though the hydroxide tends to become lumpy and lose its efficiency.

Applications generally, where needed, are ½ ton CaO per acre for pines, 1 ton for spruce stands, and 1½ tons for hardwoods. It must not be used when wet.

Applications of burned lime at rates of 10 to 15 tons per hectare effectively control sphagnum moss where natural reproduction is desirable and where the brown podzolic soils are covered with a thick mat of raw humus and moss which precludes seedling establishment.

North American Possibilities

Leguminous cover crops on tree planting sites (old fields, eroded land, and severely burned areas) warrants additional testing in North America.

Old Fields

The most feasible sites appear to be impoverished agricultural lands where one can (1) prepare an adequate seedbed by plowing and disking, (2) seed the cover crop, (3) add phosphorus and/or potash, (4) supply lime, if the soil is strongly acid.

Eroded Land

Areas eroded by water or wind (such as sandblows) and strip-mined spoil banks are other sites, warranting extensive trials.

Severely Burned Areas

Where severe or repeated burning has consumed much of the surface organic matter, legumes may provide a necessary source of nitrogen for planted or direct-seeded trees.

Recent burns with the mineral soil still exposed might be suitable for aircraft seeding of legumes without further site preparation.

On steep, rocky, stumpy, or debris-littered older burns, it may be difficult (1) to hold down ground preparation costs before legume seeding and (2) to control later competition between the legume and small tree seedlings. Spotwise or band seeding of legumes could minimize the latter.

The unpalatable bitter or alkaloid varieties of cover crops may warrant preference where it is desirable to avoid attracting deer, elk, rabbits, or livestock. If the palatable sweet strains are used in such areas, the crop may be badly trampled or the trees severely browsed.

Conclusion

European experience with leguminous cover crops as a source of nitrogen for forest trees shows that at least 1 or 2 decades must elapse before a realistic technical and economic appraisal of their benefit is forthcoming.

The long-range outlook for forest nutrition in North America is that commercial fertilizers will probably be the most economical source of nitrogen for the majority of sites requiring that element—but, as in Europe, legumes may have an auxiliary role for specific situations.

Because of its ability to increase

nitrification that hastens breakdown and incorporation of organic matter with the mineral soil, liming is practiced in the raw humus sites of Germany. Its usefulness on this continent deserves testing in similar more humus types and other moist acid soils, including swampy lands.

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THE END

HANG ON TO YOUR HATS!

Corn Yields are going up!

Three practices combine to produce dramatic corn yield increases

The Milberg Brothers of south-central Illinois are typical of the new breed of corn farmer. He's the corn grower who is getting increasingly serious about lowering his costs of producing a bushel of corn. And he is *doing it* by raising yields per acre to heights undreamed of until now.

Members of this new group of corn farmers all make about the same point: "We can consistently grow a whale of a lot more corn per acre than we were growing a few years ago."

The success of these farmers has been so widespread—and consistent—that it is safe to say that almost all corn raisers can start from their present yield levels and take a significant step-up in yields per acre.

Three practices are basic to producing this dramatic increase: 1) Planting new high capacity Funk's G-Hybrids*; 2) increasing planting rates to fully utilize the potential of these hybrids, the soil and available moisture; and, 3) applying additional fertilizer to feed this higher plant population.

Generally, farmers take two or more seasons to reach these higher yield levels. Where moisture is adequate and soils are normal, most corn farmers can increase their yields 20, 30, even 50 percent over what is considered a "good" yield for their area.

Not all hybrids have this extra CAPACITY TO PRODUCE. The first step is to select a high capacity Funk's G-Hybrid. For more detailed information on this three-step corn growing program, just write to Funk Bros. Seed Co., Bloomington, Illinois.

FUNK'S G HYBRID ®

THE PRODUCERS OF FUNK'S G-HYBRIDS

*Funk's G-Hybrid is the registered trademark of Funk Bros. Seed Co., Bloomington, Illinois.

Up Your STANDS With Right PLANTING

YOU might have been better off if your corn planter had worn out years ago. Some planters last too long.

George Hawkins, agronomist at Virginia Polytechnic Institute, says when farmers planted only 8,000 to 10,000 stalks per acre and applied only 100 to 150 pounds of fertilizer per acre in the row, the old corn planters did a satisfactory job.

But, in many cases, corn planters being used today can't plant any more than 8,000 to 10,000 kernels per acre. Since about 20 percent of the kernels won't produce stalks, this planting rate will give a stand far below that needed for profitable corn production.

Hawkins says results of research throughout the corn growing areas of the United States indicate that the best stand levels will vary between 14,000 and 20,000 stalks per acre, depending on conditions.

For the light deep sandy soils and soils with a thick sandy surface layer where water holding capacity is low, stands in the 14,000 and 15,000 stalks per acre range will be near optimum. For the medium and heavy textured soils with good water holding capacity, stands of 15,000 to 20,000 stalks per acre will be better.

However, these heavier stands won't result in more profitable corn production if all other production practices are not improved along with increasing the stand.

When you apply fertilizer with the corn planter at the time of planting, concern yourself with two things: (1) how much is being applied, (2) where the planter is placing the fertilizer. Almost all of the old corn planters, and some of the new ones, place the fertilizer in contact or close to the seed.

If fertilizer is being placed this way, don't use more than 25 to 30 pounds of nitrogen plus potassium per acre. This means you can use only 100 to 150 pounds per acre of a fertilizer such as 5-10-10 or 10-10-10 without running into the chance of salt injury to germinating seeds.

If you plant corn with a planter that puts fertilizer in contact or close to the seed, and you want to use more than 100 to 150 pounds per acre, you should plow under or broadcast and disk in the rest of the fertilizer.

New corn planters now on the market have fertilizer attachments which make it possible to place the fertilizer in a band to one side and at seed level or slightly below.

When fertilizer is placed in this manner, considerably higher rates can be used without danger to the germinating seeds.

However, Hawkins says that even though fertilizer attachments on the new corn planters make it possible to place high rates of fertilizer in bands near the row, it is doubtful that all the fertilizer should be applied in this way.

If a row fertilizer is used, it is still advisable to either plow under or broadcast and disk in most of a total heavy application.

—**VPI EXTENSION NEWS**

Allow for Fast Planting Speeds

At fast planting speeds, most corn planters do not drop as many viable kernels as the planter settings indicate. For example, at only 5 to 6 miles per hour, unplanted or cracked seeds may cause a 10 to 15 percent stand reduction below the planter setting. This is in addition to losses from insects, diseases, or mechanical injury. The farmer seeking a final goal stand of 16,000 to 18,000 stalks should set corn planter for desired stand plus 10 percent for mortality.

How to Check Corn Stands Quickly

To estimate thousands of stalks per acre:

(1) Measure or step off length of row equal to 1/1000 Acre, as shown in the table below.

(2) Count number of stalks and multiply by 1000. Check several sections of row and take average.

Row Width (inches)	Length of Row for 1/1000 A. (Feet and Inches)
28″	18'–8″
36″	14'–6″
38″	13'–9″
40″	13'–1″
42″	12'–5″

An example, for 40-inch rows, measure 13'-1″ or step off about 4 paces. Count back. If you have 18 stalks, that means a population of 18,000 per acre, a good goal.

Easy to Estimate Corn Yields

To estimate corn yields, harvest 1/70 acre units. Weight of corn in pounds equals bushels of corn per acre (70 lbs. @ 15.5% moisture).

Row Width inches	Row 1/70 acre, harvest length of row shown below: Feet
28″	267'
36″	207'
38″	197'
40″	187'
42″	178'

Adjustments for Moisture Differences should be made to 70 lbs./Bu. equivalent. Sample 20 or more ears from each lot. If kernel moisture is above 20%, cob moisture may be higher. Adjusting only for kernel moisture will give too high yield estimates. So, take both shelling percentage and kernel moisture, and convert to shelled corn basis.

Is It Worth It?

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Whether flushing quail from a patch of bicolor lespedeza or fertilizing fish ponds to insure more fish per acre, the results are the same:

More profits for the farmer.

Farmers Develop New Crop: RECREATION

By T. S. Buie
Columbia, South Carolina

GONE is the day when a man can pick up his gun, drop a handful of shells in his pocket, whistle for his dog, and set out to kill a deer, a dozen birds, or even a lone rabbit.

In many places, there are too many people for game of any kind to be that plentiful. But in areas where land and water resources are adequately developed and managed, game and fish abound.

Hunters and fishermen no longer expect to have access to well-stocked game areas and fish ponds for free. They know that to produce birds, small game or fish in adequate quantities costs money.

And they are willing to pay the price to hunt where they get good shots or to fish where the fish begin biting as soon as the hook is dropped in the water.

That brings us to the owner of the land—*the farmer*. Many of them are finding that one way to get "bigger" farms, or at least to get greater returns from the same acres, is to develop income-producing recreation right at home. This can be done through proper planning and action.

With technical assistance from their soil conservation districts, farmers develop conservation farm plans for the entire farm—fields, pastures, and woodlots, often considering—wild life needs and possibilities.

Field-woodland borders, open spaces in woods, hedge and fence rows, and low-lying areas suitable for farm ponds are areas most frequently developed for wild life.

Other owners are expanding this idea by planting entire fields to provide food and cover for various forms of wild life. Or they are building a number of ponds to furnish sport for many fishermen.

Income from Fishing and Hunting

Many farmers are capitalizing on the increased interest in recreation, selling hunting and fishing rights on surplus or idle acres.

More people engaged in industry with shorter working hours are increasing recreation demands. There is no over-production of this crop. Nor is there any problem of marketing. The purchaser goes to the farm, pays his fee, and does his own harvesting.

Many of the old rice fields along the South Carolina coastal marshes have been converted into duck ponds. Quail hunting is featured on upland farms and hundreds of farm ponds dot the state.

To develop a 100-acre marshland for ducks without cost to the owner requires some figuring. But H. N. and H. A. Black of Charleston County did it. They gave 6-year hunting rights to a group of sportsmen in return for building the necessary dikes and water control gates as specified by Soil Conservation Service technicians.

At the end of the "free" period the sportsmen have "first refusal" for continuing the lease on terms satisfactory to both parties.

"Put and Take" Shooting

Many people, such as doctors and lawyers. want to hunt but do not have the time to roam the woods and fields all day. Yet, they hate to go home with an empty bag after a 2-hour hunt.

A specialized type of shooting known as "Put and Take" meets this need. On such preserves the sportsman may shoot at—if not kill—quail, chukkers, pheasants, and mallards. Hunters are willing to pay a good price for this type of hunting where success is almost sure to be attained.

As the number of preserves increases, the hunting pressure on the natural wild life population will decline.

Deer hunting is a very popular sport but the opportunity to "try for a buck" often is limited. W. A. Graham of Yonges Island has a partial solution. He leases the hunting rights on a large plantation and, in turn, conducts public hunts weekly during the open season. The charge is $5.00 per hunter.

Everyone benefits, for the income from the lease helps pay the taxes on the property; hunters have their sports, and Mr. Graham hunts with his friends without much out of pocket expense.

Some land owners are deriving more than cash from their recreational developments.

For example, brick manufacturer Joe Patrick of Ninety-Six says, "It's uncanny the way my bricks become more acceptable to architects and contractors after they have had a good duck hunt in my duck fields."

When a land owner gets along in years he may decide, like Henry Hazel of Saluda, that he does not want to work as much as he has in the past. The farm, or a part of it, may be leased for another purpose.

Mr. Hazel did just that. He leased 65 acres of farm land to the Oakwood Beagle Club which fenced in the area. It contains woods, cultivated fields, and a small pond near the center of the tract.

Twenty For A Dollar

Sometimes it pays better to use low-lying, poorly drained land, as is, rather than try to develop it for crops or even pasture. This is especially true now that we have a surplus of productive land.

Soil conservation district cooperators in South Carolina have built some 25,000 farm ponds. Most of these are small, but even the smallest pond can—and usually does—provide wholesome recreation for the family. Many fish-stocked ponds provide additional farm income.

Twenty for a dollar. That is the rate J. Otey Hutto of Harleyville charges. One dollar entitles the fisherman to catch 20 fish of any size or species.

And if they are biting and the zealous fisherman wants to keep on, all he has to do is pay another dollar for an additional score of bream or bass.

Sportsmen often like the unusual. They want something a bit different. The Thames Brothers of Awendaw met this demand by developing a fresh water lake in an area where such fishing is rare.

They operate an almost full time business through sale of fishing rights, boat rentals, and clean picnicking facilities on a well-developed, highly fertilized fresh pond a few miles from the ocean.

Market for Fish Bait

Fishing is a popular sport. Many fertilized and well-stocked ponds along with the large man-made lakes on major streams encourage a lot of people to fish who were unwilling to sit quietly on the bank of a stream and wait patiently for the "cork to bob".

But no one wants to dig bait or seine for minnows. They are too eager to begin the serious task of fishing. They'd rather buy the bait.

So, many farmers have developed a good business from sale of bait raised on the farm.

Near the Clark Hill Reservoir on the Savannah River, Milton Bladen derives a sizeable income from low value land by raising and selling minnows to fishmen who come from far and near to fish.

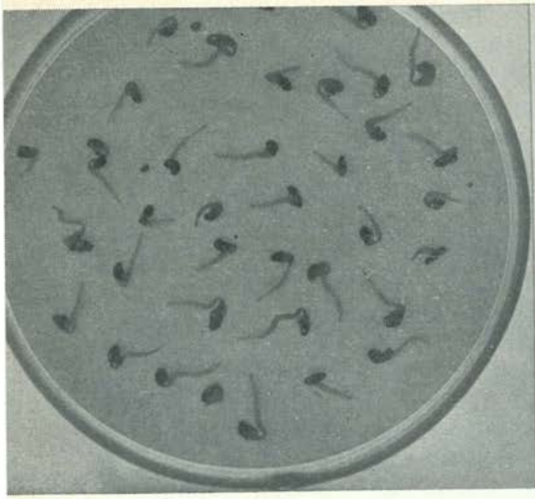
Using the technical services available to him as a cooperator with the McCormick Soil Conservation District, he constructed 10 ponds for producing minnows wholesale.

He fertilizes the ponds just as he would a pasture—but more often—and feeds the fish daily like he would chickens or cattle. Two harvests are made each year—summer and fall. The minnows are then held in retaining pools until sold.

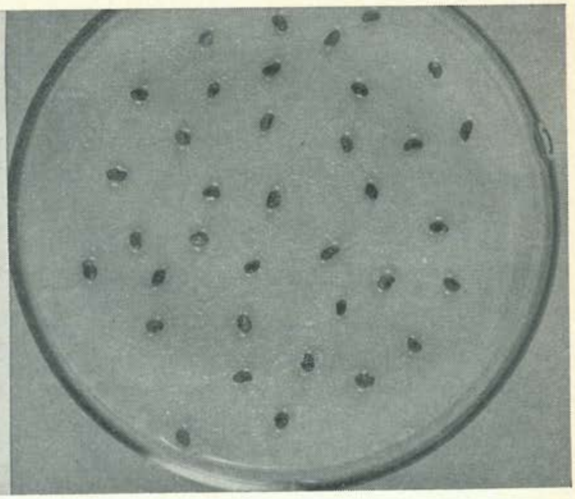
Fishing—Swimming—Skiing

For 500 people to visit a single farm in a week is unusual, perhaps. Yet that number fish, swim, or water-ski—each for a fee, of course—every week during the summer on the series of ponds that W. C. White developed on his Piedmont farm near Chester.

White was one of the first farmers in the Palmetto State to practice the use of excess land for income-producing recreation. **THE END**



YELLOW SEED



RED SEED

Dark alfalfa seed (RED) failed to germinate when placed on moist filter paper . . .

. . . and light colored seed (YELLOW) germinated readily

. . . as Florida scientists track down legume seed culprit.

SEED COLOR:
Indicator of Viability In Alfalfa and Clovers

By J. Francis Cooper

Gainesville
Florida

ONE CAUSE of low germination and poor seedling development in alfalfa and white, crimson and Ladino clover, which has plagued growers for years, has been found.

The culprit has been tracked down as a chemical inhibitor that occurs naturally in seed.

This discovery in the long effort to improve forage and pasture legumes was made by Drs. S. H. West and H. C. Harris at the Florida Agricultural Experiment Station.

Dr. West is assigned to Gainesville by the U. S. Department of Agriculture.

The chemical inhibitor or villain, as yet unidentified is found in red and dark brown seed, while yellow seed germinate more readily.

The investigators noted a difference in seed color, particularly in lots that had been held over for a year but occasionally in first-year seed.

It occurred to them that this color difference might give a clue to poor germination. They separated the darker seed from the lighter ones and placed both on moist filter paper for a germination test.

They expected the dark seed to germinate, but to their surprise the yellow proved to be the viable ones.

Only a small percentage of the dark seed germinated and root and stem measurements four days later showed the seedlings to be smaller than those from olive-yellow seed.

Drs. West and Harris have found that dark Peruvian alfalfa seed germinated 54 percent when fresh but only 3 per cent after two years storage. Yellow seed of this alfalfa showed no change in germinating ability.

With crimson clover, two years storage cut the germination percentage of red seed from 41 to 0 and the rate for yellow seed from 55 to 6 percent.

The agronomists found *one important exception* to the pattern of poor germination and weak seedling development from dark seed:

They reasoned that seed in the field awaiting harvest are often soaked by rain or dew, stimulating early germination. Drying stops the process. When these seed are harvested and stored, they gradually turn dark and lose viability.

So the scientists soaked and dried some samples of yellow alfalfa seed four times before attempting to germinate them. One-third of these seed turned red, one-third remained yellow, and one-third were between dark and light colors.

When these soaked-and-dried seed were germinated, the red and intermediate ones actually did a little better than the ones remaining yellow. But none had a very high percentage. This possibly explains the common experience farmers have of harvesting non-viable seed.

There now remains no doubt a chemical inhibitor is present. Water extracts from red and yellow alfalfa seed showed chemical differences.

Extracts from dark seed showed more magnesium, calcium, potassium, nitrogen, amino-acids and nucleotides (building blocks involved in plant metabolism) than extracts from yellow seed.

Using other techniques, Drs. West and Harris detected a chemical fraction in water extracts from dark seed not present in yellow seed extracts. Testing light absorption traits they learned this fraction contains at least three chemical components.

Another proof of the inhibitor came through germination tests on filter paper. After incubating red seed on moist filter paper for three days, they tried to germinate yellow seed on the same paper. They were unsuccessful.

Such failure indicated the inhibitor had been leached from the nonviable seed while it was being incubated on the filter paper.

THE END

Is It Worth Your Time?

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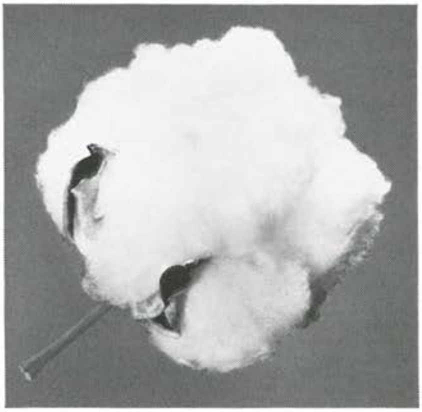

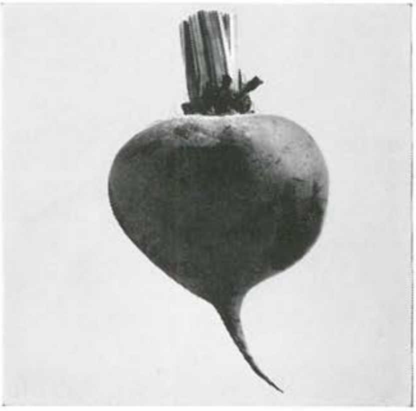

USEFUL

or

USELESS?

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Better Crops WITH PLANT FOOD

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