Better Crops
WITH PLANT FOOD

NUMBER 1—1974

25 CENTS

Beef Grower's DILEMMA

Page 3

Better Crops
WITH PLANT FOOD

Published Quarterly by
Potash Institute of North America
1649 Tullie Circle, N.E.
Atlanta, Georgia 30329

Santford Martin, Editor
Selma Bushman, Assistant Editor
Potash Institute of North America

VOL. LVIII 1/74

$1.00 per year, 25¢ Per Copy

Controlled circulation postage
paid at Washington, D.C.

CONTENTS

Beef Producer's DILEMMA

BOB C. DARST
STILLWATER, OKLAHOMA

A DILEMMA IS A CHOICE among equally undesirable alternatives, Webster says. Beef producers now face a dilemma.

Caught between the energy crisis and consumer outrage, the American cattleman confronts challenges he has never faced before.

The price and shortage of fertilizers are forcing producers to take a long look at their operations. Coupled with rising costs in all areas of production, the fertilizer situation seriously threatens the outlook for many cattlemen, big and small.

Most experts tell us the energy shortage is here to stay. That means continued high prices and periods of product shortage. The day is past when the fertilizer dealer can be called at a moment's notice and expected to deliver a cheap product . . . often on credit . . . immediately.

Most producers will survive the shortage by adjusting their operations to function as efficiently as possible under existing conditions.

They will correct deficiencies in their production practices to absorb some of the impact of high priced, often scarce fertilizer products. But many cannot continue to meet the increasingly difficult challenges. The answer to the dilemma—for them, at least—is to get out of the business.

Those who have the staying power can choose three alternatives:

1—Renovate current pastures to include legumes, easing the pinch of short nitrogen supplies.

2—Continue with present systems, seeking new ways to improve operational efficiencies.

3—Reduce fertilizer investments, which cuts back on grazing intensity.

ALTERNATIVE 1—Put legumes into grass pastures, easing the pinch of short nitrogen supplies.

Legumes fix nitrogen from the air, manufacturing an input vital to the grassland farmer. Without nitrogen, all other management genius can mean little. With short nitrogen supply and high prices, the farmer still faces a situation far from comfortable.

Legume-grass mixes have many

more advantages than grasses, all well documented. Legumes fix nitrogen to produce more and generally better quality forage. Legumes help stretch the grazing season.

Nitrogen fixed by legumes in a legume-grass pasture helps produce more forage than grass can produce with little or no nitrogen fertilizer. Alfalfa, for example, can fix as much nitrogen as 150-200 lbs of nitrogen applied to grass alone. Other legumes fix less amounts in their fixing capacities, but are still better than grass alone.

Legumes add quality to legume-grass forages. Animals generally consume more of them and digest them more rapidly than grass alone. Legumes give the animals more protein than grass. Some legumes may even contain unidentified growth factors that influence weight gain.

Legumes also help stretch the grazing season, reducing the need for high-priced supplemental feeding. They also reduce the incidence of grass tetany.

Growers who add legumes to their grass pastures must meet some high standards. Legumes require more intensive management, especially when compared to range-type and other pastures that carry only a light grazing load.

Many legumes are not permanent. This requires reseeding each year. Others remain in the stand for only two or three years. Only alfalfa, if properly managed, can be expected to remain for more than five years.

Legumes demand high fertility if they are to contribute efficiently. Eight tons of alfalfa will remove about 80 lbs of phosphate and 500 lbs of potash EACH YEAR. Six tons of clover-grass mixtures per acre will remove nearly 100 lbs of phosphate and more than 350 lbs of potash per year. Cattle droppings return some of this to the soil. But, at best, distribution is poor, usually around drinking and loafing areas.

Legumes must be grown on fertile soils to survive. In other words, they demand a combination of native soil fertility and added fertilizer to stay strong in a pasture mix. This requirement is less critical for many grasses.

Soil pH is an important factor when adding a legume to a grass pasture. Grasses will generally tolerate acidity and often will not show a great response to liming unless pH becomes quite low.

This is not true for legumes. They demand a pH in the range of 6.0-7.0 to grow efficiently. Many southern soils require moderate to high limestone additions to grow the best legumes.

Applying limestone for maximum efficiency on pastures presents a challenge. When the soil becomes acid, it is usually acid throughout the root zone. This means the neutralizing capacity of the limestone is limited by the degree of mixing obtained. It is harder to mix limestone in a sod than in a soil growing a row crop.

To establish and maintain a legume-grass pasture, the producer must commit himself to top management. Seeding of the legume must follow careful seedbed preparation, including adequate liming and fertilization. High quality, freshly inoculated seed is a must. Getting good seed could be as big a problem as getting nitrogen fertilizer in some cases.

Grazing must be controlled in the spring after seeding to keep the grass short until the legume can start growth. When the legume begins growing, cattle should be removed up to two and a half months to let the legume develop before grazing the pasture again.

In a nutshell, it takes careful management to add a legume to a grass pasture and MAINTAIN it in the mix. The legume requires favored treatment—and returns the favor with top quality feed.

ALTERNATIVE 2—Choose to continue with a sound fertilizer program, improving management efficiency in other areas.

Fertilizer at twice the price it was two years ago is still a bargain in 1974, **when management level is high enough.**

Consider a manager who spent $20.00 per acre in 1973 and produced 400 lbs of beef. Then, assume he has to spend $40.00 per acre in 1974 to purchase the same quantity of fertilizer as in 1973, still producing 400 lbs of beef per acre. How does his gross income above fertilizer cost compare for 40-, 45-, and 50-cent beef?

Year	Fertilizer Cost/A	Gross Income Above Fertilizer Cost 40-Cent	45-Cent	50-Cent
1973	$20.00	$140	$160	$180
1974	40.00	120	140	160

Although his fertilizer costs doubled in 1974 over 1973, going from 5 to 10 cents per pound of beef caused his gross income above fertilizer cost to drop only $20.00 per acre at each level of beef prices.

Now, suppose he decided to continue to spend only $20.00 per acre for fertilizer, even though he can buy only half the amount he purchased in 1973. It would not stretch the point to assume his production would drop to 300 lbs. of beef per acre.

How will his gross income above fertilizer cost compare to what it would have been if he had spent $40.00 for fertilizer, applying the same amount as in 1973?

Fertilizer Cost/A '74	Pounds Beef	Gross Income Above Fertilizer Cost 40-Cent	45-Cent	50-Cent
$40.00	400	$120	$140	$160
20.00	300	100	115	130

Can he afford to lose this additional income? He faces rising costs in other production areas over which he has little or no control. The extra income from proper fertilization **can** mean the difference between profit and loss in 1974.

His REAL loss comes from reduced production in 1975 and the years ahead. Mining the soil of plant nutrients will certainly affect later yields.

ALTERNATIVE 3—Cut back on the amount of fertilizer application. The decision to go this route, of course, will trigger a chain of events that will reduce profits from now on.

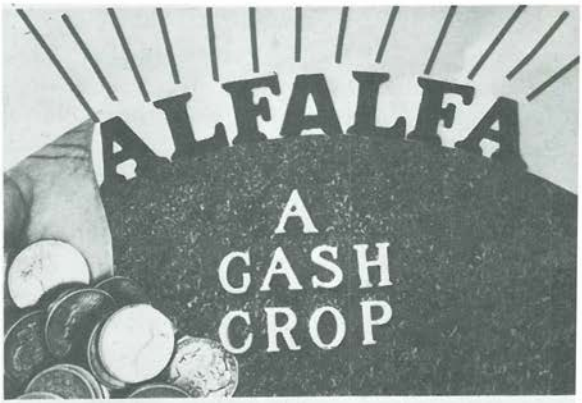
Reducing fertilizer applications will produce less forage per acre. If the grower has been utilizing what he grew in the past, he will have to reduce his herd size, acquire more land or increase winter and supplemental feeding costs—maybe all four. He will also have to depend on improving production efficiency in other areas just to stay even with what he has been doing.

This alternative is just a long, hard way of getting out of the beef production business. **The End**

IN THIS AND FUTURE ISSUES, our readers will find helpful articles on forage production . . . **and the role of legumes in this production.** Legumes have always been important for reasons too numerous to list here. But one of those reasons shines like a lighthouse in a storm of shortages today—legumes bring new life to a grass pasture or hay program limping from nitrogen shortages.

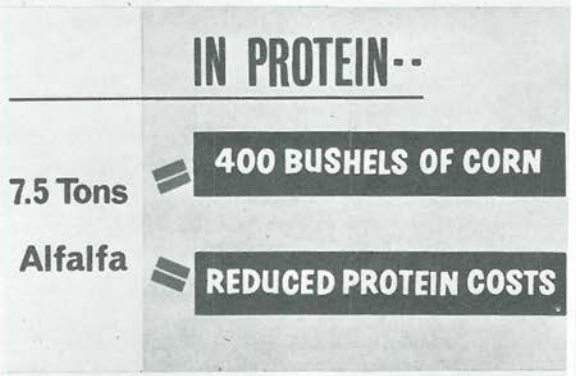
NEWLY REVISED SLIDE SET

SLIDE 1—Alfalfa can equal or surpass return from "cash" crops, IF you give it equal management. But too often we neglect forages. Alfalfa's cash crop potential comes from HIGH yields. Management steps are available to do the job. In humid regions, set yield goals for at least 6 tons. In deep, well-drained soils, aim for 8 to 10 tons per acre.

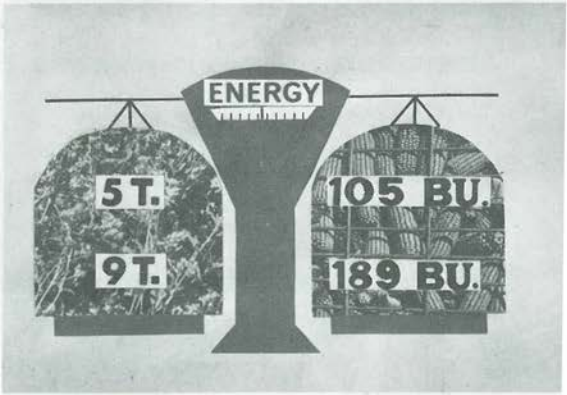


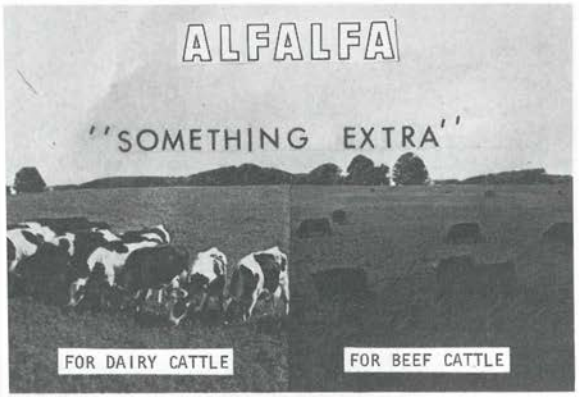
SLIDE 2—Animals love high quality alfalfa. The value of any animal feed depends on two things: (1) The AMOUNT the animal takes in. (2) The EFFICIENCY of its digestion. Alfalfa is full of non-fibrous, digestible nutrients. Alfalfa ranks high in animal feeds for three reasons: (1) Animals consume more of it. (2) They digest it faster. (3) And they convert it faster from *consumed energy to productive energy.* No other feed gives better nutrition to dairy, beef, horse, sheep, or poultry stock.

SLIDE 3—Alfalfa is a great source of protein. Look at what a 7.5 ton yield produces: 2,600 lbs crude protein per acre or the amount in 400 bushels of corn. Figure what this protein would cost you on today's market.



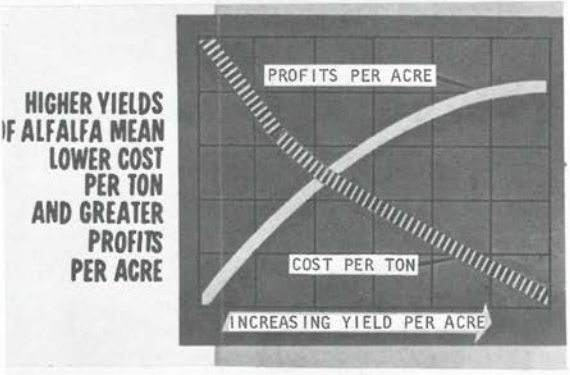
SLIDE 4—Available energy can run short in high forage rations. Yet THE NET ENERGY in just 5 tons alfalfa equals 105 bushels corn or 12.5 tons corn silage. The NET ENERGY in 9 tons alfalfa equals 189 bushels corn or 22.5 tons corn silage. Corn energy material is more fibrous, less efficiently used. And we can now grow 5 to 9 tons of alfalfa just as easily as 105 or 189 bushels of corn.



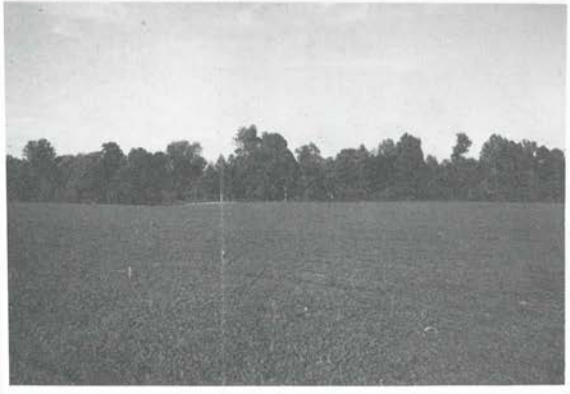


SLIDE 5—Animals fed alfalfa seem to perform with "something extra." More feed consumption. Greater weight gain. More milk production. Alfalfa smells good. It has high carotene, basis for Vitamin A. It has high inorganic nutrients. And it seems to boost hormone and microbial activity in ruminants. Do these factors give alfalfa the "something extra"? We don't know. But we do know livestock men report great results from alfalfa.

SLIDE 6—High-yield alfalfa BUILDS the soil for later crops. Roots go 10 feet or more. Top growth and roots contain valuable nutrients and organic matter. Alfalfa is a legume fixing up to 300 lbs nitrogen per acre. All this gives later crops a better soil, some nitrogen supply, higher organic matter. **BUT REMEMBER:** Poorly fertilized and managed alfalfa can rapidly deplete your soils of phosphorus and potassium. They must be replaced for later crops.



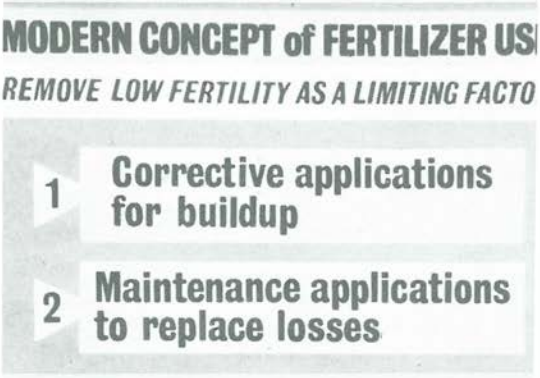
SLIDE 7—Why seek high yields? Rising yields do three things: (1) Reduce unit costs. (2) Increase production efficiency. (3) Increase profit potentials. **REMEMBER:** Efficiency increases alfalfa yields just as it does corn, soybeans, and other cash crops.



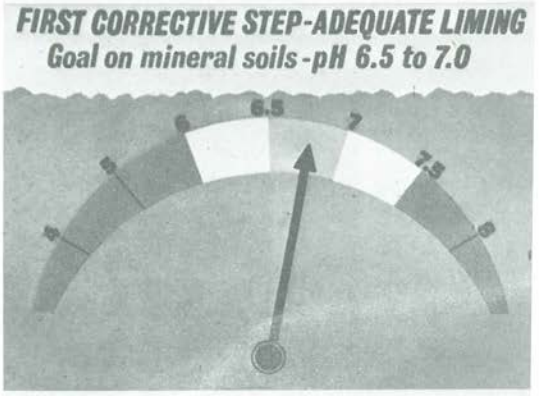
SLIDE 8—The first hurdle to top production is a good stand. Establish it right . . . for a deep-rooting system . . . for strong early growth . . . for uniform field cover to keep weeds and insects down. Such a stand can take intensive management demanded by top yields.

SLIDE 9—Deep, well-drained soils produce the best yields. The great feed potential in quality alfalfa recommend it for the best land. Many livestock farmers now get their best animal and crop production from alfalfa-corn silage or alfalfa-sorghum silage rotation.

SLIDE 10—Intensive alfalfa management demands HIGH fertility. This means high enough phosphorus and potassium rates to insure high soil test levels. Plowdown the P and K to get the nutrients in deep, moist soil. To meet boron and sulphur problems, make first annual application before seeding.



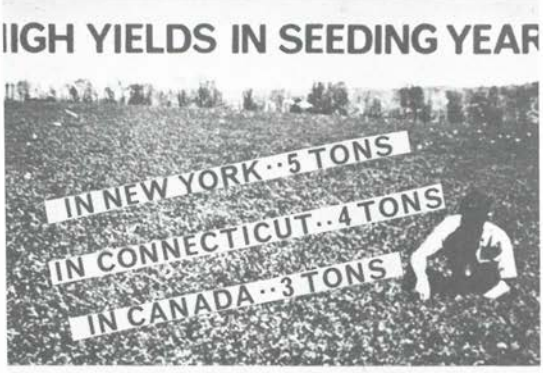
SLIDE 11—Test the soil to determine lime needs. Keep pH above 6.5 for the life of the stand. Always try to apply the lime 6 months to one year AHEAD of the seeding. If you can't lime this far ahead of seeding, then apply 200-500 lbs of finely ground limestone in addition to regular application and work it into the soil before seeding.



SLIDE 12—Develop a firm seedbed free of clods . . . to insure uniform seeding depth and close contact of seed with soil and moisture. Successful growers who bandseed often use 1:3:1 fertilizer ratio IN ADDITION to the broadcast treatment they plowed down. Young alfalfa roots need phosphorus AT ALL TIMES. Seed recommended rates as early as the soil can be fitted in spring. Late summer seedings are also good. Always inoculate seed.

SLIDE 13—Use the best varieties for your area . . . improved and certified. Some are more resistant to certain insects and diseases than others. Recently some varieties have been bred for higher yields . . . getting over 9 tons per acre the first haying year . . . just as good the second year.

SLIDE 14—Be sure to control weeds in new stands. Such problems as severe mustard invasion can wipe out profitable stands. Grassy or broadleaf weeds compete for nutrients, light, and space. Use recommended chemicals right.

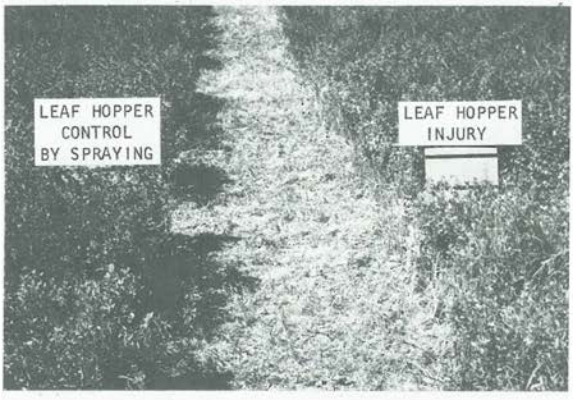


SLIDE 15—You can harvest spring seeding in the seeding year . . . a possible 3 to 5 tons the seeding year. When recommended varieties are well fertilized, they can recover and store food reserves for rapid start next growing season.

SLIDE 16—Harvest 60-65 days after spring seeding when weather cooperates. Make first cut at first blooms . . . succeeding cuts at trace of blooms. Never cut 30 days before average first frost. **REMEMBER:** Apply in late summer or early fall 10 lbs P_2O_5 and 50 lbs K_2O for each ton you harvested the seeding year.

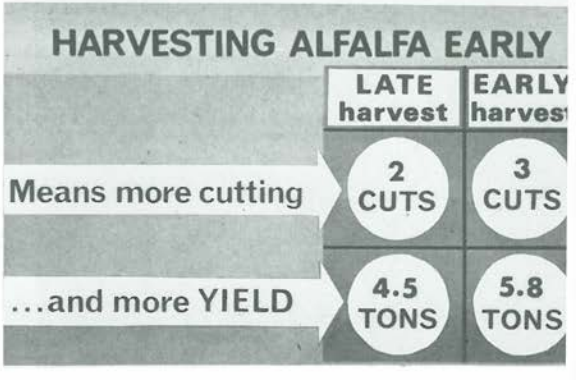
SLIDE 17—Control insects AT ALL TIMES in alfalfa. Many kinds of insects steal profits by reducing yields and quality. In recent years, the alfalfa weevil has been a real headache. Chemical controls can prevent injury. Parasitic wasps and tolerant varieties can reduce economic injury. Apply recommended controls at first damage sign.

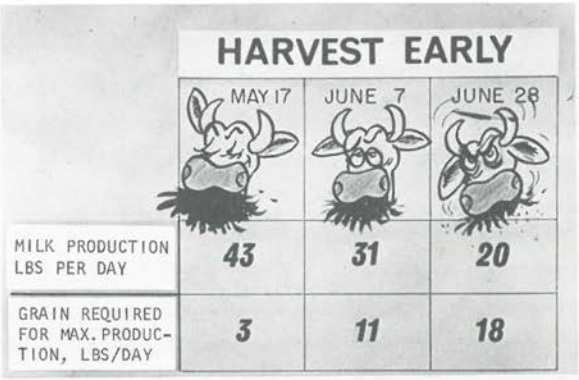
SLIDE 18—Don't overlook or blame damage on nutrient hunger or drought. The potato leaf hopper, for example, can hurt the plant's yield, quality, and ability to store reserve food supplies for regrowth.



SLIDE 19—Begin first cut as buds start developing . . . before flowers appear. Two factors—higher fertility rates and better varieties—have outmoded the idea that first cutting must go to bloom to hold the stand. Make succeeding cuts at full bud or at trace of bloom.

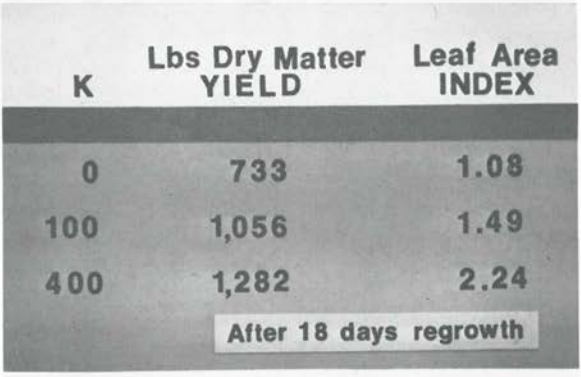
SLIDE 20—Harvest early to get an extra-cut bonus. In studies where all plots have been treated alike—except for harvesting first cut EARLY in one plot—the early harvest plot got THREE cuts instead of two, 5.8 tons instead of 4.5. Harvesting first crop early gives second crop longer good growing weather.



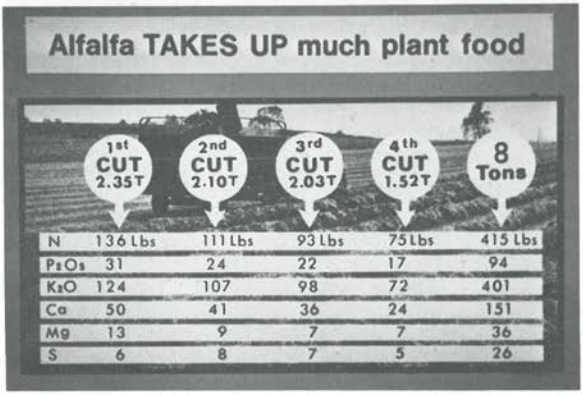


SLIDE 21—Early-cut alfalfa contains more nutrients, protein, and carotene. This means much to milk production and grain demands. Here we see milk production decline 54%—from 43 down to 20 lbs a day—as digestibility and animal intake drop so much between May 17 and June 28. Cows getting late-cut alfalfa require 18 lbs grain per day—6 times those on early-cut alfalfa—to maintain top milk production.

SLIDE 22—Well-fertilized, early-cut alfalfa regrows fast. Much faster than less vigorous alfalfa. The horizontal strip across the center of this field received low phosphorus and potassium rates. The strips on both sides got 100 lbs P_2O_5 and 300 lbs K_2O per acre EACH YEAR. Such regrowth can be harvested 3 to 7 days earlier than less intensively managed alfalfa. Early harvest and fertilization insure EXTRA cut, HIGHER yield.

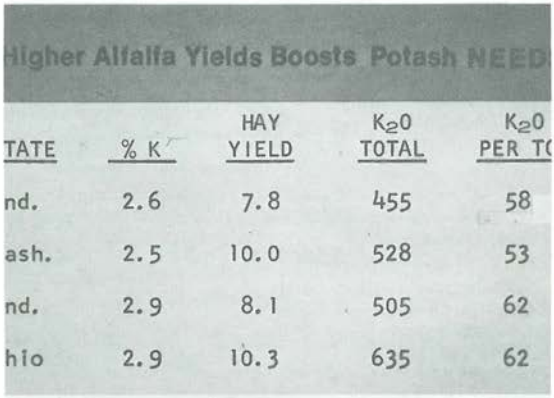


SLIDE 23—Potassium is a big key to faster regrowth. Virginia increased alfalfa regrowth—both dry matter and leaf area index (LAI)—by increasing potassium rates. In just 18 days growth, the high-K rate more than doubled leaf development and almost doubled dry matter. These differences continued to harvest. Faster regrowth covers the ground quicker, intercepts more light, and insures more leafiness, a quality factor.



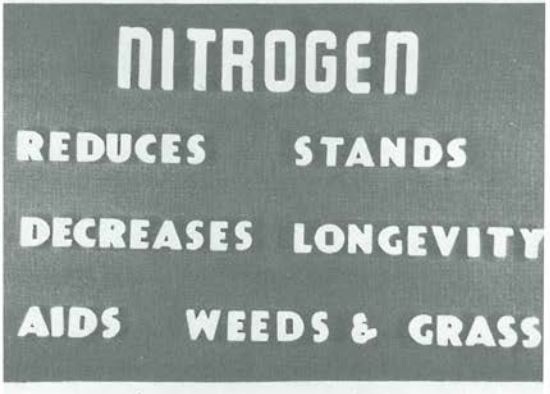
SLIDE 24—Alfalfa absorbs much plant food in 8 tons. Each year for 5 years this crop received 100 lbs P_2O_5 and 300 lbs K_2O per acre from fertilizer and 125 lbs K_2O from soil release. This 8 tons removed 94 lbs P_2O_5 and 401 lbs K_2O. The greatest amount went out in the first cut . . . BUT look at that fourth cut, over a ton and a half! Such a program demands yearly fertilizer for 3 reasons: (1) To maintain TOP yields. (2) To insure healthy, sturdy plants for a 4-cut system. (3) To resist winter rigors.

SLIDE 25—Even greater potash needs show up in other tests . . . where high yields and intensive management remove from 400 to over 600 lbs K_2O per acre. The higher the yield the more potassium (percent) you'll find in the plant. Harvest EARLY and MAINTAIN succeeding harvest schedules. That's the KEY to success. Test your soils and plants for fertility. Keep your K level above 2.5% in first cut . . . never below 2.25% in following harvests.

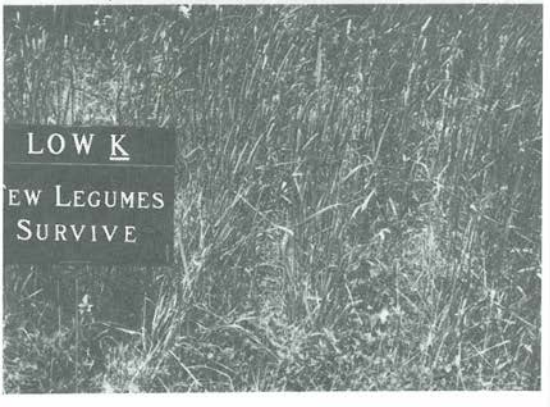


SLIDE 26—The 0-1-2 and 0-1-3 ratios won't serve a high yield system. Six to 8-ton yields demand about 0-100-400 per acre YEARLY. More than 8 tons demand about 0-120-500 annual top-dressing. If you can't get fertilizer mixtures with these quantities you can supplement with potassium chloride or potassium sulphate. Apply all fertilizer at once or in split applications. The crop likes two feedings . . . after *first cut* and after *late summer or early fall harvest.*

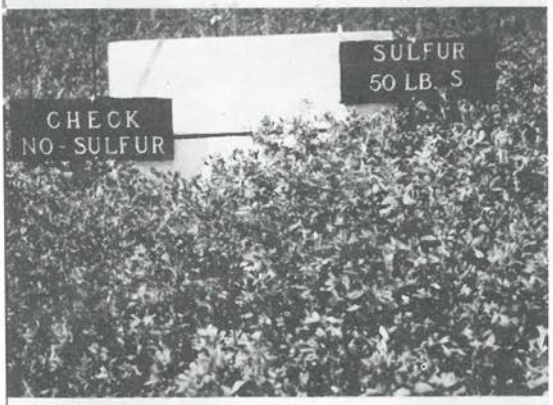
SLIDE 27—Nitrogen fertilizer doesn't benefit yields or quality of an established alfalfa stand. Using N fertilizer on well nodulated alfalfa reduces stand, shortens life, and aids weed and grass invasion, research has shown.



SLIDE 28—Don't let potassium hunger thin out your alfalfa stand. It can happen fast. Plants hungry for K cannot restore food reserves in the roots . . . to regrow rapidly and to stand summer droughts and winter rigors.



SLIDE 29—Alfalfa responds well to boron. Even on soils where other crops get ample B, alfalfa might need 3 to 5 lbs B per acre. Boron starvation shows "yellow top" and stunted growth. Short internodes make the plant top look bunched up. Don't let hunger appear. If your area has a history of boron needs, be sure to include it in your fertilizer program.



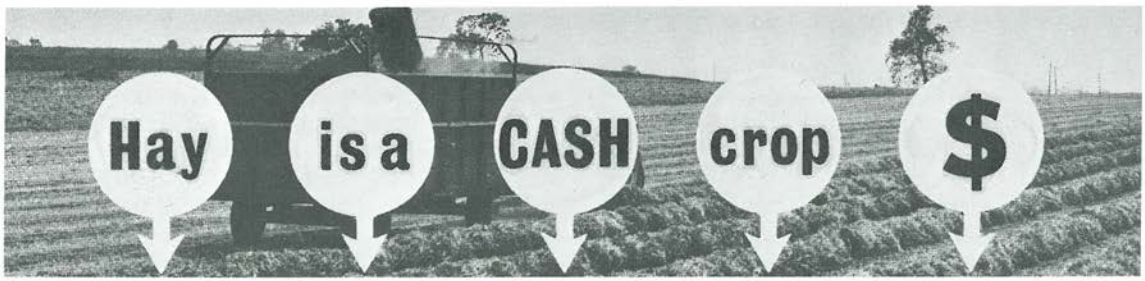
SLIDE 30—Don't let sulphur hunger cramp your yields and quality. Many areas report responses to S . . . as this alfalfa did to 50 lbs of S. Sulphur builds plant proteins. When added to S-deficient soils, it will boost the percent protein in the plant. Modern high yields, less sulphur in fertilizer, and cleaner atmosphere have increased recent needs for this vital element.

SLIDE 31—The KEY to top-quality, high-yield alfalfa is harvest MANAGEMENT. Each LATE harvest sacrifices yield and quality. Digestibility declined 0.3% *each day* harvesting was delayed beyond best harvest time, in Michigan tests.

SLIDE 32—Weather is always a problem to hay in humid regions. When hay is rained on, turned, and rained on again, you lose leaves, quality, and yields.

SLIDE 33—You can lick the problem with a haylage or low moisture silage system . . . especially with FIRST HARVEST. What about field, harvest, and storage losses? **Haylage or wilted silage** suffers 10 to 20% losses. **Barn or field cured hay** suffers 25 to 35% losses. Haylage requires only one-third field drying time of field-cured hay. Haylage also takes less handling, less labor, and preserves more leaves for quality.

This slide set—ALFALFA, A CASH CROP—contains a total of 35 color slides (35mm). You can order the full set by convenient coupon on the back cover.



DR. JOHN E. BAYLOR
EXTENSION AGRONOMIST
THE PENNSYLVANIA STATE UNIVERSITY

HAY IS BIG BUSINESS in the U.S. today. Last year American farmers produced 131 million tons of hay valued at about 2¼ billion dollars. Hay was harvested from 63 million acres.

Historically most of our hay has been fed on farms where it was produced. But this practice is changing. Today some 15 to 20 percent of the hay produced in the U.S. is sold off the farm. In 1970, for example, 18 states sold nearly 20 million tons of hay—exceeding $1 billion dollars in value. In four states—Arizona, California, New Mexico and Washington—over 40 percent of the hay produced is actually sold.

During the 1960's, hay sales increased by 30 percent. So far in the 70's it is evident that the increase in hay sales during this decade could more than double the increase of the 60's.

MARKETS ARE CHANGING. Why this hay marketing explosion? One thing, of course, is that farming patterns are changing. Dairymen in many parts of the country are becoming more specialized. They prefer to grow cows and let other specialists grow feed.

But other hay markets are developing, too. Horse numbers are increasing every year—both race horses and pleasure horses. These animals consume the highest quality hay available—and nearly all of it must be purchased.

And don't ignore the export market for hay. This generally requires a special hay

package. But in the future it is one to be reckoned with and a challenge that many big hay producers in the west are already meeting.

Newer methods of marketing hay have made hay selling easier, too. Hay dealers or brokers are still major suppliers. But more and more hay is being marketed through cooperative associations, hay auctions, or similar groups. Last winter in Pennsylvania, for example, in Lancaster county alone an estimated 1,200 to 1,400 tons of hay moved weekly through two hay auctions, just one of our hay marketing outlets.

HAY, HOW DO YOU PRICE IT? Historically most hay was sold and bought using the ancient art of bartering. The dealer possessed the art of matching hay quality, based on his own judgment of course, with consumer preference. A price was agreed on and the hay was sold.

Hopefully this practice is changing, too. The National Hay Marketing Task Force of the American Forage and Grassland Council agrees that one of the fundamental hay marketing problems today is one of determining price by some realistic measure of its feeding value. Agreeing on this realistic measure may not be easy but we think it can be done.

Several states, mainly in the west, have already taken the lead selling hay on the basis of **quality as determined by analyses.** Analytical methods currently available are reasonably satisfactory for alfalfa but less well suited for grasses or mixed hays. Nevertheless, states farther east including Wisconsin and Indiana are already setting up pilot programs to include hay testing as a part of their marketing program.

Not all of the problems are solved, of course. Such things as method and cost, sampling technique, time involved and setting up a pricing structure are still obstacles. But there is general agreement that if hay is to keep pace with the changing agricultural needs many of our traditional selling arts must be replaced by developments of modern science.

A PROFITABLE CROP TO GROW. At today's feed prices, hay, especially alfalfa, is a profitable crop to grow, too. How profitable is illustrated in the following table comparing total and marginal values of several crops grown in Pennsylvania.

		PER ACRE	
	YIELD	Total Value	Marginal[1] Value
Corn Silage	18 T	$187	$133
Alfalfa	4 T	210	178
Clover-Grass	2.5 T	88	62
Corn, Ear	100 bu	159	95
Soybeans	30 bu	136	98
Soybeans	35 bu	159	119

[1] Marginal value is total value minus the variable cash expenses of production, harvesting and processing. Labor and storage costs are assumed to be fixed costs.

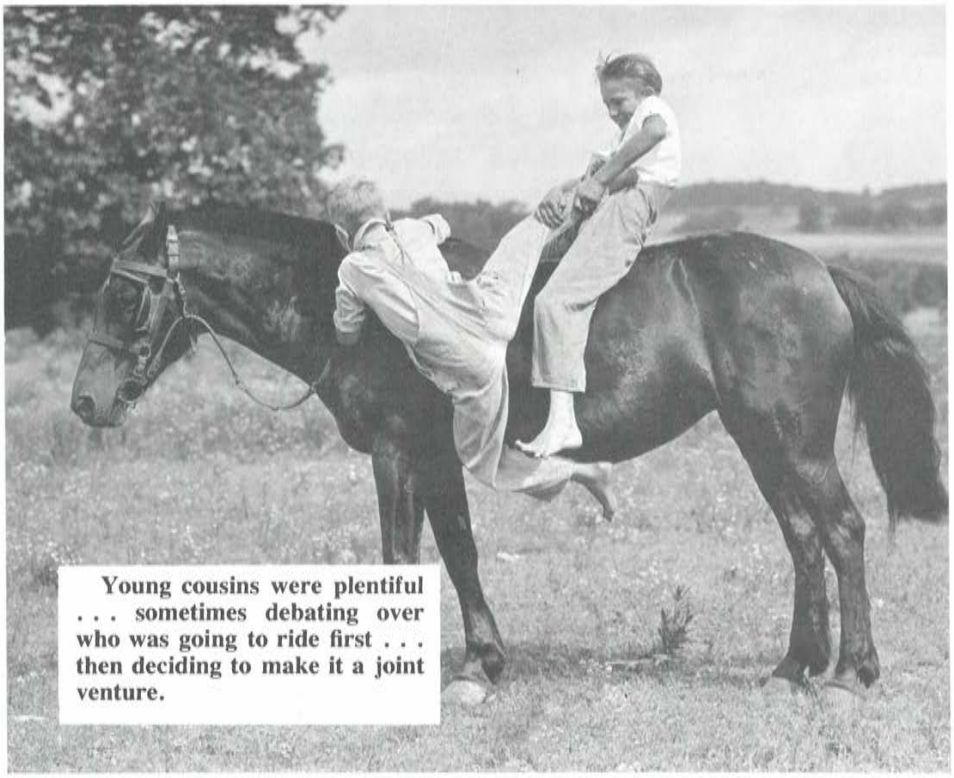
These values are based on comparable yields under moderate management with corn priced at $1.50 a bushel and soybean meal at $8.00/cwt.—a mid-position point between prices of the past decade and recent high prices. As indicated assuming comparable yields and the price relations used, **alfalfa hay has a greater potential cash value than either corn or soybeans.**

The problem, of course, is that too often farmers still treat hay as a **second cousin.** If hay is to be grown profitably as a cash crop, it must be given the same attention as other cash crops grown on the farm. That means **top management** from choice of variety to storage, with emphasis on adequate lime, phosphorus and potash, a good insect control program and a harvesting program geared to high yields, high quality, and stand persistence.

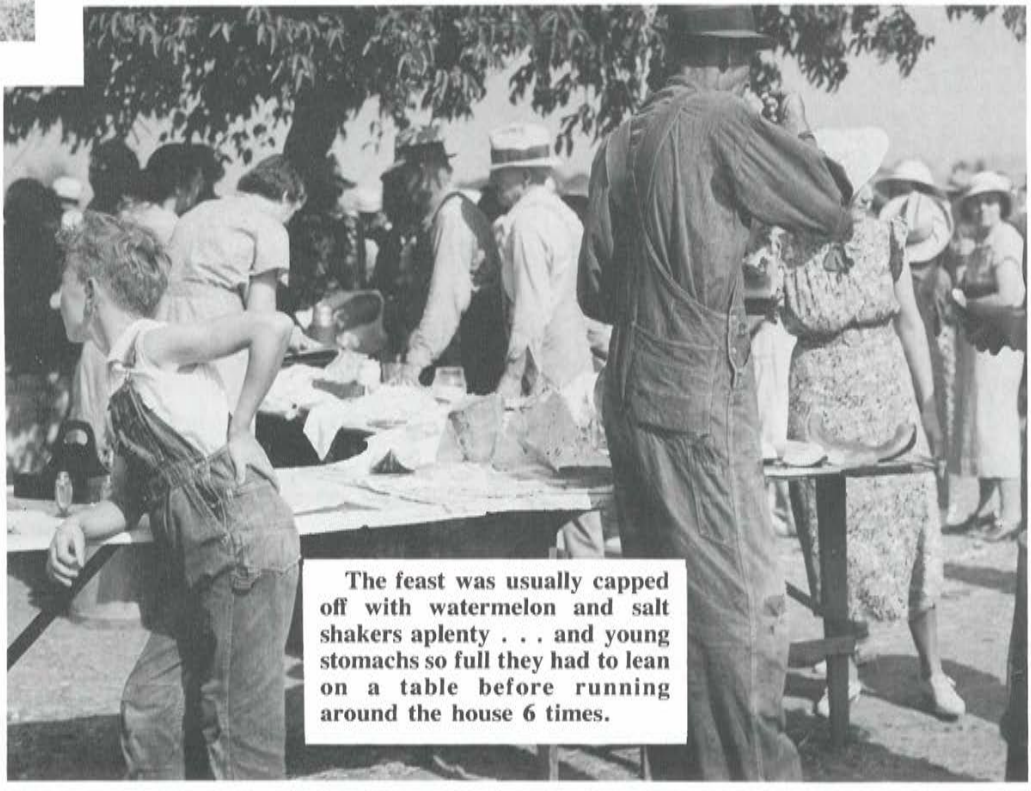
Better Crops has featured many stories stressing the importance of good management practices. Varieties, mixtures, fertility needs and insect problems vary from area to area. But the facts are clear—with attention to hay marketing details, the future of hay as a cash crop is brighter than ever. **The End**

The family has always been important to the people BETTER CROPS readers have served. These 9 "chips off the old block" were blessed with a REAL MAN for a father . . . a farmer who needed them as much as they needed him in 1928.

Sometimes these families renewed their ties in gatherings called reunions. The featured event was dinner . . . glorifying every taste bud God gave man. A feast of unforgettable dishes created by women too loving to seek liberation from their ancient gift of managing men.

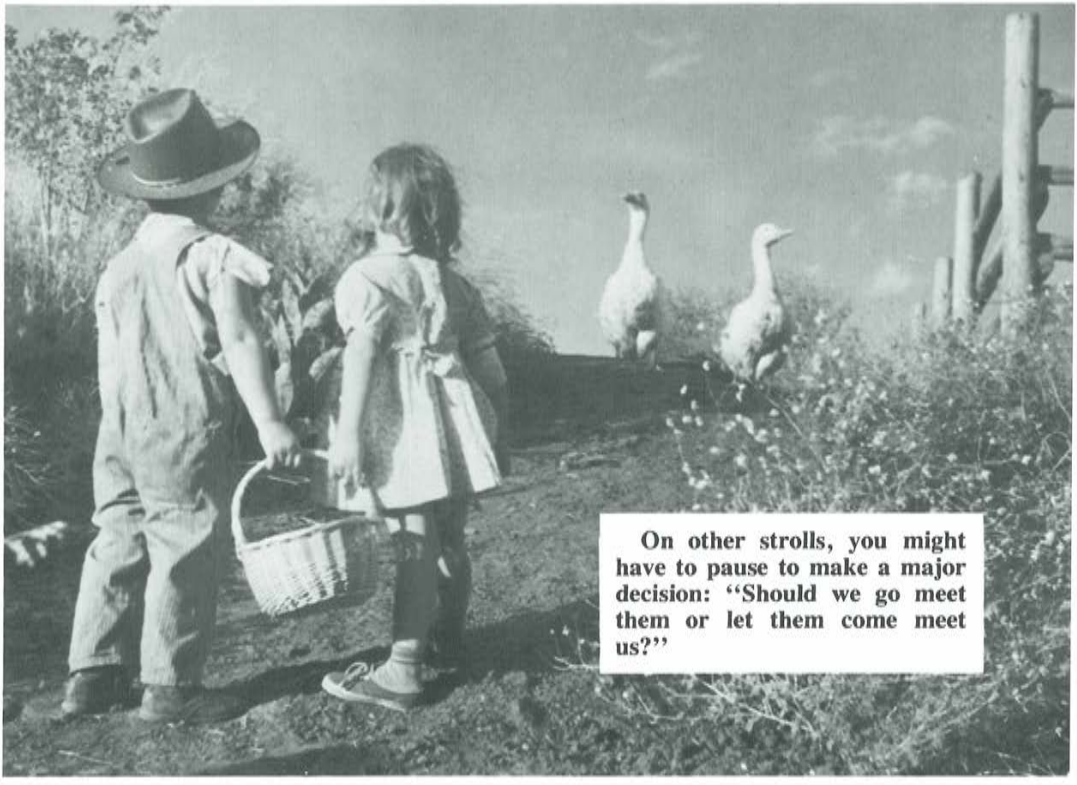


Young cousins were plentiful . . . sometimes debating over who was going to ride first . . . then deciding to make it a joint venture.

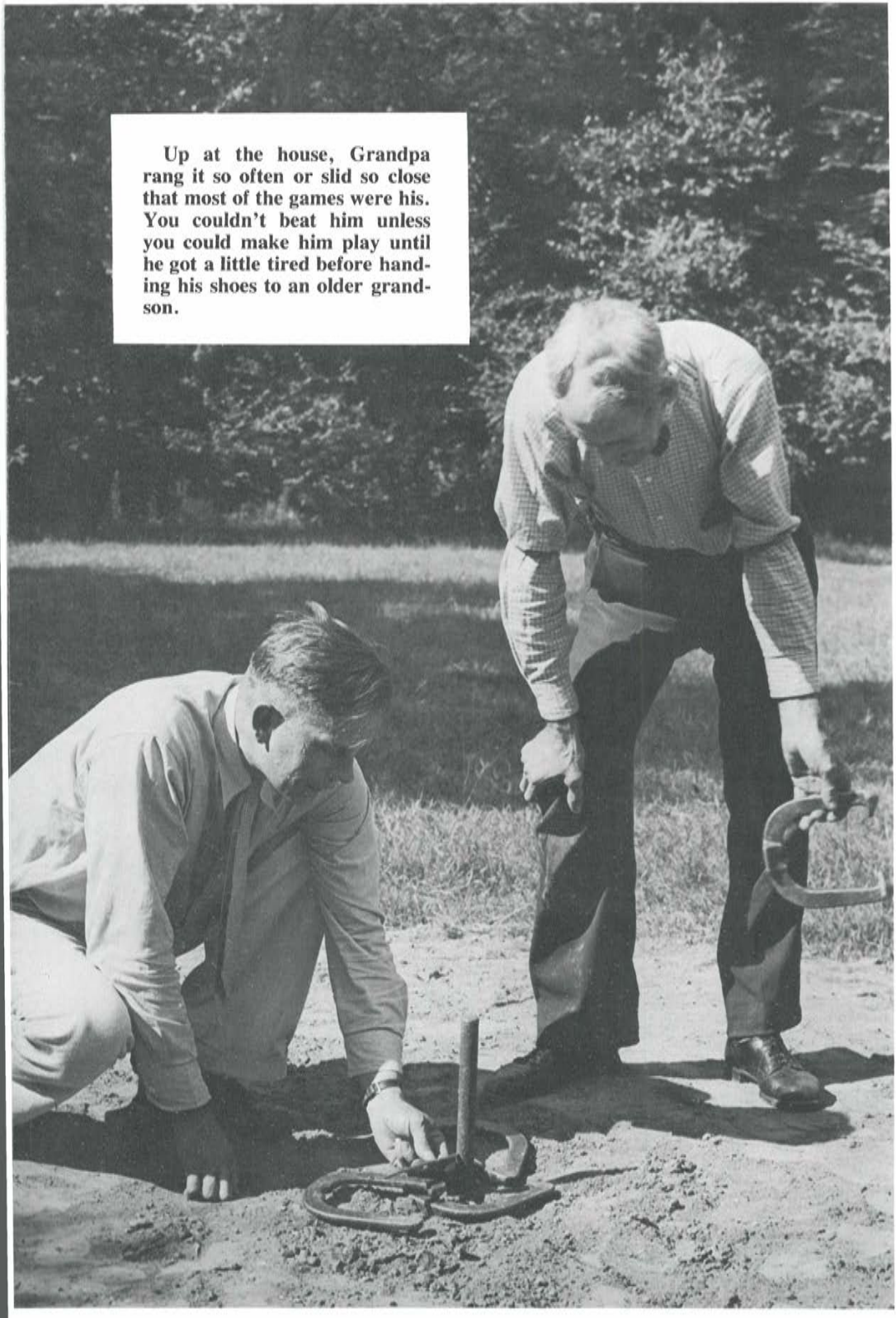


The feast was usually capped off with watermelon and salt shakers aplenty . . . and young stomachs so full they had to lean on a table before running around the house 6 times.

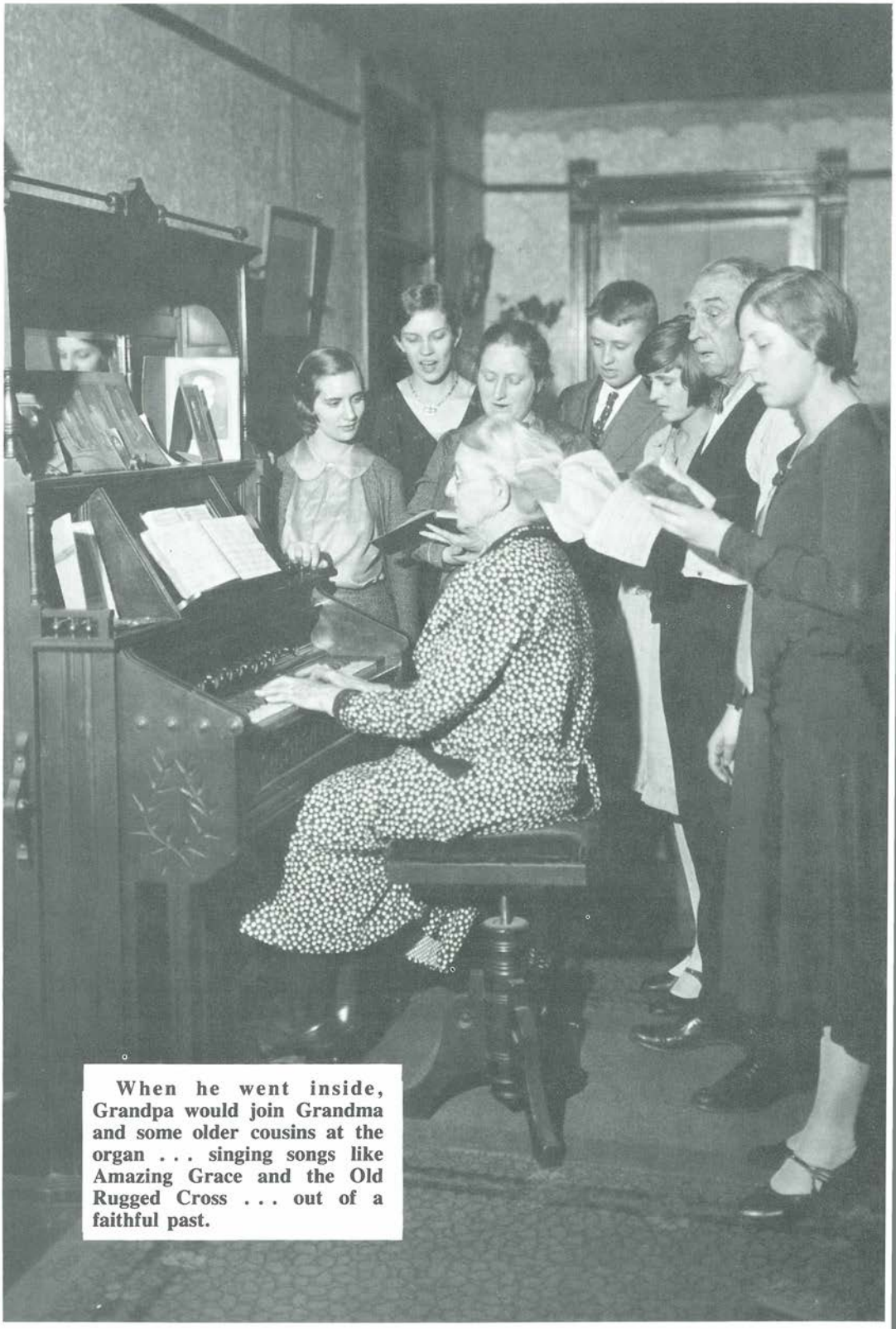
No reunion was complete without a stroll down the lane . . . with your favorite cousin . . . to explore the creek with Grandpa's "Old Bob" who seemed to know where all the minnows were.



On other strolls, you might have to pause to make a major decision: "Should we go meet them or let them come meet us?"



Up at the house, Grandpa rang it so often or slid so close that most of the games were his. You couldn't beat him unless you could make him play until he got a little tired before handing his shoes to an older grandson.



When he went inside, Grandpa would join Grandma and some older cousins at the organ . . . singing songs like Amazing Grace and the Old Rugged Cross . . . out of a faithful past.

Hope Springs ETERNAL

WRITERS OF BOOKS can be divided into two broad classes, writers of gloom and writers of hope.

The prophets of gloom probably make more money from their books than the prophets of hope. The gloom takes all sorts of forms—political, biological, cultural, and particularly economic.

It is refreshing to occasionally find something to stack up against the prevalent flood of gloomy thought.

One such instance was a very significant event in Wales. South Wales is suffering perilously from unemployment. The coal industry, on which it depends, is in a deplorable state. Some men have not had work for years. **Yet, in spite of these grim conditions, large numbers of the humble folk of South Wales spent a week in singing.**

Reports show that South Wales can now claim its pre-war position as a center of brilliant choral singing. Most of the contestants were amateurs.

The area of Wales is small, yet in one choral contest alone it was able to recruit ten choirs of over a hundred male voices in each choir to sing Shubert's "Song of the Spirits."

A group of over a thousand men in a festival of song amidst the worst economic conditions is surely a tribute to courage and the finer things of life, showing that the real character of a people is rooted deep in its soil and its history, quite independent of economic conditions, bad as they may be.

The report continues to state that there was an enormous house to heat the ten choirs and very often the prolonged expressions of enthusiasm were as much a source of embarrassment as a pleasure to the competitors.

About the same time an initial group of ten thousand unemployed miners was shipped overseas to help in the harvests as the only possible way of giving them work.

This is just a significant note for the world's writers of gloom who are so anxious to tell us of the terrible things that are going to happen to our present civilization, unless we sign on their particular dotted line.

BETTER CROPS, 1928

Ambitions Much Like Humans

SOIL IS A LIVING THING subject to change. It has **Youth** and **Old Age,** a process of development and a process of decay.

To tell how old a soil is, look at its face. A soil's face is its profile. We used to think soil was an inert body, the final product, as it were, of long processes of soil-making. But due to recent investigations of soil science, ideas are changing.

What processes modify soils? According to Dr. A. G. McCall, Chief of the Soil Investigation Unit of the United States Department of Agriculture, environment is the all-important factor in developing the characteristics of soils and in determining whether they shall be good or bad, fertile or unproductive.

Dr. McCall pointed out to members of the Agricultural Historical Society that the chief stumbling block to our knowledge of soils and to the development of soil science has been the persistent assumption of scientists that soils were chiefly the product of heredity.

Continuing, Dr. McCall said: **"In the light of progressive scientific discoveries we find it impossible to believe that the 'death' of a soil is necessarily anything more than a stage of coma or suspended animation. Soil surveys are studies of the relationships of soil environment in which their evolution has occurred. Our faith in science is so profound that we**

believe in the possibility of resuscitating even a dead soil and who knows but that in the near future we may be able to treat dead soils and start them on a brand-new evolutionary course from youth to old age?"

Thus, soils have many ambitions in common with human nature.

BETTER CROPS, 1931

"A Rather Strange IDEA . . ."

IT IS NOT VERY long ago that certain leaders in the fertilizer and dairy fields advocated what seemed the rather strange idea of fertilizing the old and long-neglected pasture.

The amazing thing is how rapidly and intensely the idea has taken hold. From many parts of the Northeast there come reports that farmers are buying fertilizers for their pastures. In Maine for instance, the 5-8-7, the 10-16-14, and the 10-16-20 are being recommended and used for this purpose.

The idea has spread all the way to the Pacific Coast, north to Canada, and to many parts of the South. In the State of Washington the fertilizer trade is furnishing fertilizer materials for 20 one-acre intensive pasture management demonstrations in cooperation with and to be supervised by the State authorities. This project is to be carried on for three years.

In Canada experimental and demonstrational work with pastures has been carried on by the Provincial authorities of Ontario, Quebec, and the Maritime Provinces. The weather in eastern Canada last spring is reported to have been not very favorable for this season's results, but it is hoped that sufficient success will be achieved to further demonstrate the value of fertilizers used in this way.

AS OVER-PRODUCTION looms more and more as the overwhelming problem, the cost of production, whether it be of any particular crop or of milk and meat, becomes of increasing importance, for as prices fall it is more than ever essential to produce at **a low cost per unit.**

From this point of view there is a great field of study and practical application in producing cheap feed at the right time from pastures all over the country. Nature, unaided by man, has carried the job of feeding her livestock for many months of the year. Fortunately nature is to be relied upon and every spring produces feed for our farm stock.

But if the farmer is to successfully compete in the economic stress of the present time, it will pay him to assist nature in extending the pasture season later into the summer when normally there is not much growth available. In fertilizing pastures it is not only the increase in feed that counts but the increase value of that feed in additional protein content and the availability for a longer feeding period.

Probably there is no other project on the dairy and stock farm that offers such profitable possibilities today as the right use of the right fertilizers in producing more feed on the farm.

BETTER CROPS, 1931

The Source Of LIFE

WE HAVE HEARD many preachments on the importance of maintaining the fertility of our soils. But few have appealed like the six paragraphs quoted below from an address delivered by Clarence Ousley, former Assistant Secretary of Agriculture of the United States:

"I always contemplate the earth with reverence. I like the phrase 'Mother Earth'—the source of all our sustenance, the storehouse of all our supplies, our raiment, our shelter, the pathway of our feet, the final resting place of our worn

bodies.

"And of all its elements and attributes, the soil seems to be most appealing and vital, and I cannot but regard its depletion as vandalism and sacrilege. The good God gave us but one soil, and He gave it for the use of His children to the end of time. We are but His trustees in the occupancy and preservation of the estate of all posterity.

"If we despoil it, if we fail to maintain it, if we leave it less fruitful than we received it, we are unfaithful trusteees, and I feel that in the sight of God we are as culpable as if we robbed the estate of orphan children of whom we were made guardians by decree of court.

"Spiritual or emotional considerations aside, the first rule of all sound business enterprises is to maintain the physical plant. Allowance for depreciation and for replacing wear and tear is the first charge against profits—it cannot be spent or dissipated without inviting bankruptcy.

"The soil is the farmer's laboratory plant, and it must be maintained. There was a time when increasing population called for a large volume of supplies, and when the greater demand enhanced land values more than soil depletion depressed them. But we are nearer a state of equilibrium between population and supplies. We now have overproduction of nearly every product and in nearly every agricultural country.

"Henceforth, the first requisite of profitable agriculture is increased acre yield to reduce unit cost, and the first element of that requirement is soil fertility."

Figure the amount of plant food removed by annual harvests and lost by useless erosion or leaching and balance this against the amounts restored by legumes, manures, and commercial fertilizers.

Are we faithful to the trust placed in us by an allwise Creator—simply to leave our soils as good as we found them? Are we "sinning" against this trust? Must we sooner or later pay the penalty, if we are not already paying it?

BETTER CROPS, 1930

The Key To Real PEACE

"SOIL IS THAT THIN film between the earth and sky that supports all living things," says Dr. Charles E. Kellogg of the U.S. Department of Agriculture.

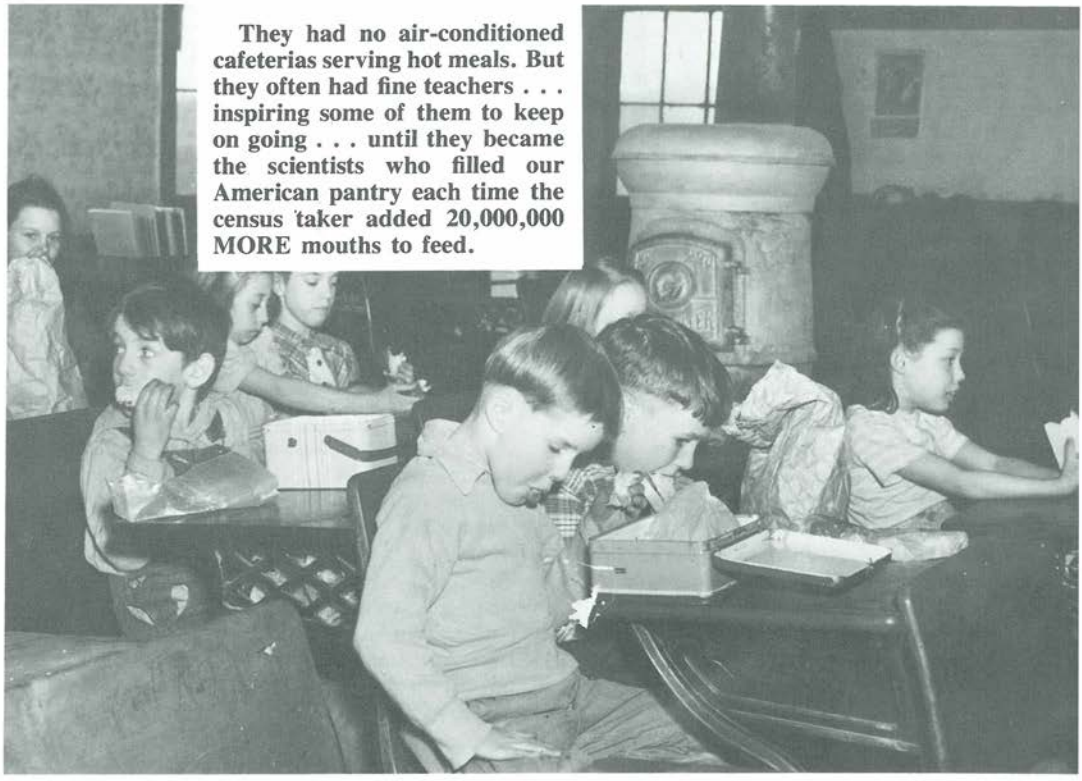
"Beneath lie the sterile rocks, above it are the air and sunshine. From it all plants and animals, and man himself, draw their nourishment, either directly or indirectly from other things that live in soil. To it their dead bodies return. There is no life without soil, and no soil without life; they have evolved together.

"Even though we call this an industrial age, far more than half the people in the world live by tilling the soil. They produce food, fiber, and many other things for themselves and for the rest of us.

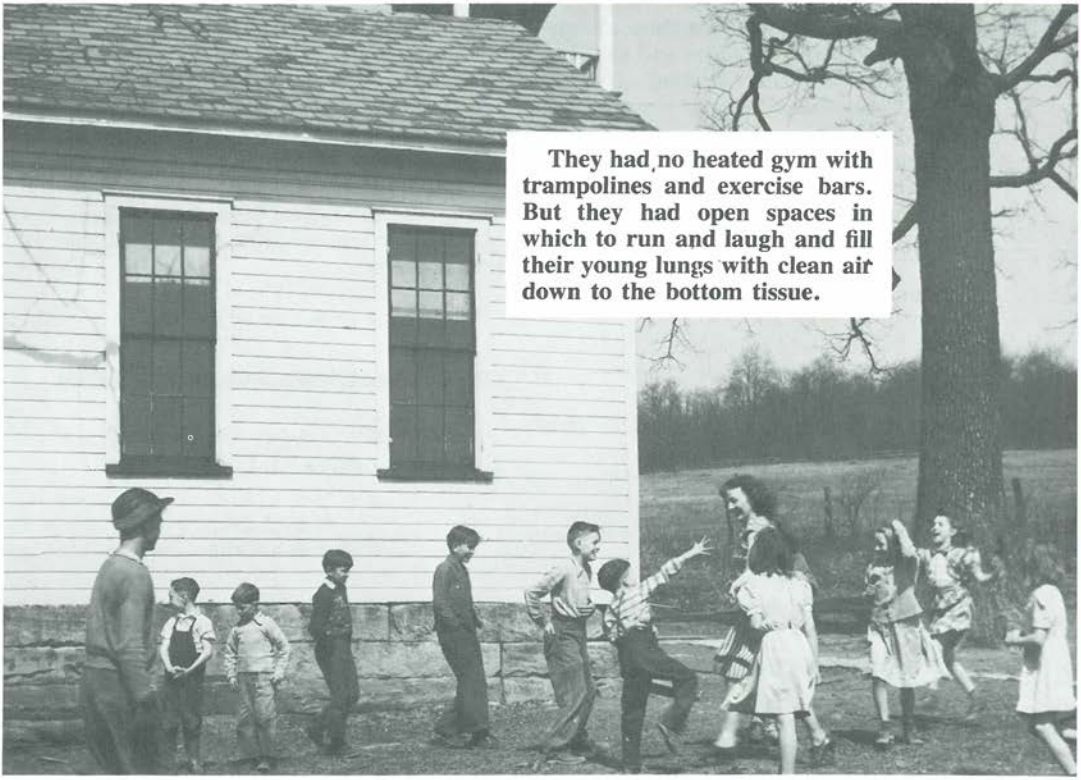
"Some work efficiently and live well; other barely exist. A few try to cultivate soils that are unsuitable for use by any known methods. Many more could produce abundantly on their soil if they only knew what to do and had the means and skill to follow proper practices.

"Enough soil exists for all to have abundance. But we shall have **neither peace nor abundance** until we learn more about the thousands of different kinds of soils, precisely where they are, and how to use them for good production."

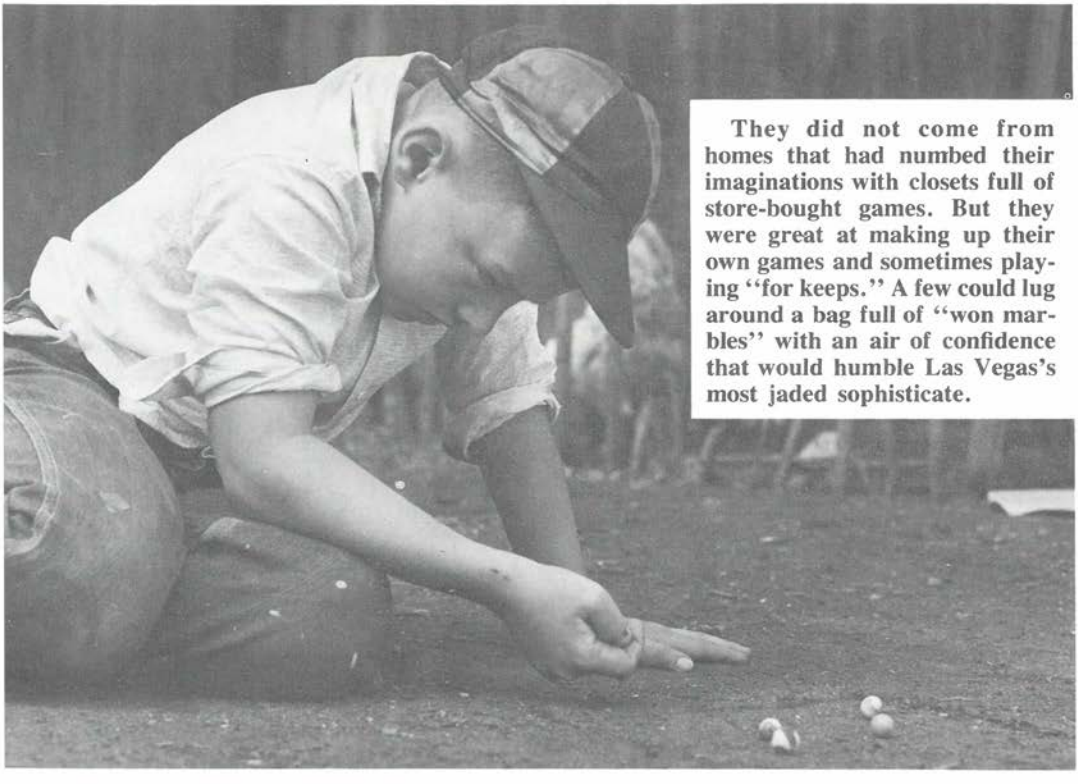
BETTER CROPS, 1953



They had no air-conditioned cafeterias serving hot meals. But they often had fine teachers . . . inspiring some of them to keep on going . . . until they became the scientists who filled our American pantry each time the census taker added 20,000,000 MORE mouths to feed.



They had no heated gym with trampolines and exercise bars. But they had open spaces in which to run and laugh and fill their young lungs with clean air down to the bottom tissue.



They did not come from homes that had numbed their imaginations with closets full of store-bought games. But they were great at making up their own games and sometimes playing "for keeps." A few could lug around a bag full of "won marbles" with an air of confidence that would humble Las Vegas's most jaded sophisticate.

NOSTALGIA IS A BIG HIT

THIS MAGAZINE'S PICTORIAL SERIES on our farming heritage is creating much interest. These prints were purchased over the past 50 years from early free lancers who submitted regularly to BETTER CROPS. We are writing the legends in 1974 to symbolize the world this journal has served since 1923.

Picture credits in this issue are: J. C. Allen : Page 16 bottom, page 17 top, page 20 full. International Newsreel Corporation: Page 16 top. J. W. McManigal: Page 17 bottom, page 25 top. J. H. Vondell: Page 19 full. Samuel D. Myslis: Page 18 bottom. H. Armstrong Roberts: Page 18 top. Eva Luoma: Page 24 top and bottom.

After our first pictorial series appeared, we received a new book in late April. It is called **FARM TOWN, A Memoir of the 1930's.** It features the best pictures of famed Kansas photographer, J. W. McManigal, edited with text and additional pictures by famed Pennsylvania photographer, Grant Heilman. It portrays farmlife during America's "hard times" decade so vividly, so honestly that every reader can remember or learn with pride. It is 96 pages, 10¾ x 8¾ size. It costs $7.95 paperback: $12.95 hardbound. Stephen Press, Box 1000, Brattleboro, Vt. 05301.

R. B. LOCKMAN
Washington Court House, Ohio

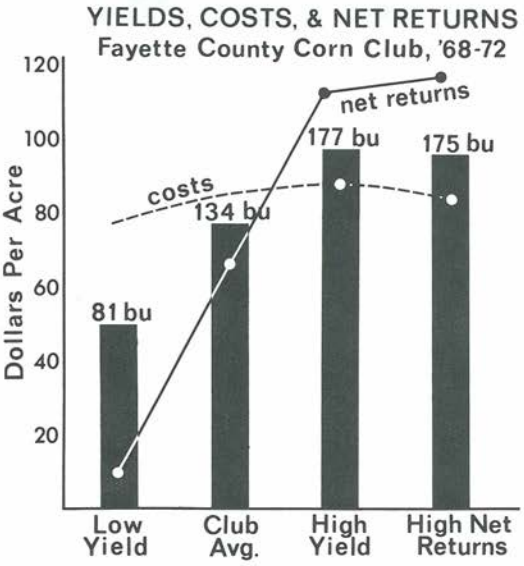


FIGURE 1

Aiming For 200-BUSHEL Corn Crops

THE OHIO CORN CLUB'S annual corn growing contest in Fayette County awards growers for **highest yield** and for **highest net return.**

As part of the qualifications, growers must submit a soil and plant sample taken at green silk stage. Other facts are collected on the entire crop management program. Standard values are set on all costs.

The program has been supervised by the county agents and the club's committee for over 8 years. The farmer selects and stakes his 5-acre plot area by mid-summer—but only one acre is mechanically picked and measured for final yield.

Over the years the club has collected 284 sets of rather complete data, showing what above-average growers do to get good corn.

Figure 1 gives some ABC's of this work:

A—Actual corn yields depend on the season and the program—yet, the club averaged 16 to 48% better yields than the state average even in the worst years, and there were some bad ones. Top yields during the best years exceeded 200 bu. per acre, more than twice the state average.

B—Farmers with highest yields and/or highest profits usually invest more money in their corn. They spend more for pesticides, fertilizers, other inputs. The ones with **most profit** tend to do a better job with the larger investments since their costs equaled or ran a little lower than the ones with highest yields. In other words, GOOD MANAGEMENT is the key to success. Soil and plant tests help one select the best investments to make.

C—Corn yields and profits are closely related. Farmers growing less than about 80 bushels had a net loss. The club's average profits never dropped below $47 per acre even in years of severe drouth or Southern Corn Leaf Blight (SCLB). Top growers averaging from 147 to 201 bushels showed from $78 to $145 per acre net. Good management paid dividends.

Now let's see what was behind these yields, costs, and profits:

NUTRIENT STRESSES. With the above-average farmers, soil tests were generally good but not consistently different from the low-yield farmers. Yet, farmers getting top yields tended to use more fertilizers along with other practices.

Plant tests showed almost all the farmers had some degree of nutrient stress (low or deficient levels) in their corn—often more with "high" yields, less under highest yields. What nutrients are causing high-yield growers the most trouble? Potassium number 1, phosphorus number 2.

Table 1 shows how often P-K stresses showed up most years. The next most frequent stresses were B, Zn, Mn, and Cu, but they varied from year to year indicating weather influence. The club farmers generally met the crop's N needs, as indicated by relatively few N stresses and above-

TABLE 1—Percent Of Earleaf Samples Showing Stress In A Given Nutrient 1966-1973

Year	Avg. Yield (bu/A)	Type Year	Nutrient[1] N	P	K	Mg	B	Cu	Mn	Zn
1966	116	Dry	15	30	48	0	41	4	15	4
1967	116	V. Dry	12	31	66	0	20	6	29	3
1968	124	Good	28	28	34	0	17	0	7	3
1969	148	Good	12	58	9	0	100[2]	12	0	55
1970	119	SCLB-wet	0	41	2	33	0	22	0	6
1971	146	Good	12	24	64	0	3	15	18	27
1972	135	Cool	5	32	24	0	0	5	27	20
1973	131	V. wet	30	12	43	5	22	51	43	54
8-year average (284 samples)			**13**	**32**	**35**	**8**	**23**	**16**	**18**	**22**
			——%——				——ppm——			
Critical Values Used[3]			2.8	.25	1.8	.20	5	5	20	20

[1]No iron stress (<30 ppm) and 1 Ca stress (<.20) was observed in 8 years.
[2]Boron levels run low in almost all corn samples in 1969 from areas east of Mississippi River—reason unknown.
[3]Any analysis below the critical values is considered to be under "stress" to the plant; i.e., either low or deficient.

average yields. Ca and Mg were rarely a problem on soils testing good in Ca and Mg.

Yields declined in the two dry years, 1966 and 1967, when K stress ran higher than average—48% of the K samples in 1966, 66% in 1967. N and P stresses were average.

Higher than average Zn stress showed up in the high yield years, 1969 and 1971. Zn stress ran proportional with yield for the 8-year period. P stress also ran high in 1969 when the club averaged 148 bushels per acre. This higher P and Zn stress during high-yield years proves again the limiting factor theory—that P and Zn started to become limiting factors once other limiting factors were corrected. The plant uptake could not keep pace with extra growth under otherwise favorable conditions.

In contrast with Zn, high yields came under less K stress in all years except 1971 and the Southern Corn Leaf Blight year, 1970. Frequent K stresses in 1971—64%—may have kept the already high club average yield from being even higher than it was. In 1971, two farmers with good K levels—either high K rates or high soil K tests—exceeded 200 bushels per acre, as shown in **Table 2.**

Table 1 shows how often Cu stresses showed up in the wet years, 1970 and 1973. The very wet 1973 season also showed abnormally frequent stresses of N, K, Mn, and Zn stresses in corn.

In summary:

1—Growers who shot for higher yields still ran short on P and K in the plant most years.

2—B, Zn, and Mn stresses were common, but varied according to season. Cu also seemed to be a problem in wetter years.

3—Better farmers did a better job of providing N but could still run short

TABLE 2—Corn Club Crop Production Statistics - 1971

	Yield Groups			
	"Low" (less than 125 bu/A)	Club Avg.	"High" (over 174 bu/A)	"Winners" (over 200 bu/A)
No. in Group	5	33	5	2
Avg. Yield (bu/A)	95.9	134.4	183.8	200.7
Costs Invested ($/A)	87	93	90	87
Net Return ($/A)	9	53	96	114
Avg. Planting Date	May 1	Apr. 29	Apr. 26	May 12
Plant Population (1000)	21.0	22.1	22.4	20.0
N-P_2O_5-K_2O(lb./A added)	186-73-51	174-93-106	178-85-163	176-59-119
Soil Tests (mid-summer): (Avg.)				
pH	6.7	6.6	6.6	6.2
P (lb/A)	131	69	65	67
K "	317	289	295	315
% K Saturation	(1-7%)	(1.8%)	(2.1%)	(2.2%)
Ca (100 lb/A)	62	54	45	44
Mg (lb/A)	1290	1165	930	1068
OM (%)	4.7	4.4	4.0	4.2
Plant Analysis-earleaf at green silk stage: (Avg.)				
N%	2.9	3.1	3.1	3.2
P%	.29	.27	.27	.27
K%	1.4[2]	1.6[2]	1.8	2.2
N/K ratio	2.2[3]	2.0	1.8	1.4
Ca%	1.00	.86	.73	.68
Mg%	.48	.45	.39	.36
B ppm	11	12	8	7
Cu ppm	11	9	7	10
Fe ppm	119	143	156	90
Mn ppm	36	37	37	28
Zn ppm	24	25	26	28

[1]Winners = highest yield individual and highest net return individual.
[2]Less than 1.8% K = low.
[3]1.5 N/K ratio optimum, if ratio is greater than 2.0 or less than 1.0 = poor balance.

some years, depending on season.

4—These generalizations can be applied on Fayette County Brookston, Crosby, Celina, and Miami soils . . . common in much of the eastern corn belt. So, this thinking could be applied with caution to corn in other areas.

SOIL FERTILITY LEVELS AND FERTILIZER APPLICATIONS. When we label 60 lb P and 300 lb K soil tests GOOD, **Table 3** shows that the average soil P levels were near minimum and soil K levels were often less than minimum. When we look at average plant analysis, **Table 4** shows that P and K were the only ele-

TABLE 3— Club Average Soil Test and Fertilizer Applications (1967-'73)

	Soil Test	Fertilizer Application
pH	6.6	—
P	66 lb/A	89 lb. P_2O_5/A
K	292 lb/A	109 lb. K_2O/A
Ca	5580 lb/A	—
Mg	1220 lb/A	—
OM	4.3%	147 lb. N/A

ments to show low average values on some years.

AVERAGE vs. BEST COMPARISONS, 1971-1972. To understand what is working, we must study individual results or at least smaller groups within the club. **Table 2** shows what takes place with 1971 data.

The high 1971 yields put much pressure on nutrient supplies. The higher-yield farmers apparently got their winning yields more through better nutrient balance than simply higher fertilizer rates. All farmers used about the same N rates. But the high-yield farmers used more K_2O than low-yield farmers on soils testing about the same K for each group.

The high-yield farmers seemed to come closer to a 3-1-2 ratio application which produced the better N/K ratios in their plants, as shown in **Table 2.** 1.5 is considered optimum. Both N and K levels were higher and near optimum value—3.0 to 3.5% N and 2.0 to 2.5% K.

The lower-yield farmers had few problems with micronutrients, while the higher-yield farmers that were really pushing were beginning to stress Cu, Mn, and Zn rather frequently. But the 1971 winners managed to avoid micronutrient stresses.

Similar data for 1972 show much the same story in a year when heat units were considered a yield limiter. Yields, costs, and profits of the five highest yield groups were compared with the five lowest yield groups of farmers. In 1972, 14% more in total investments helped produce a 44% increase in yield and a 96% increase in profit. The high-yield group in 1972 used 40% more N, 19% more P, and 48% more K . . . planted 17 days earlier with an 8% higher population than the low-yield group.

Successful corn growing for top yields and profits takes TOTAL management. Nutrient levels and balance are a BIG step in this management. **The End.**

Acknowledgements are given to John Gruber, County Ext. Agent; Phil Grover, former County Ext. Agent; and Karl Harper, former Agronomist of AGRICO Chemical Co., all of Wash. C.H., Ohio, for collecting and tabling data in this report.

TABLE 4—Club Average Earleaf Analysis

Year	N	P	K	Ca	Mg	B	Cu	Fe	Mn	Zn	Al	Yield Avg	Type Year
	%					ppm							
1967	3.1	.27	1.6*	.68	.43	13	11	144	36	36	47	116	Dry
1968	2.9	.34	1.9	.89	.45	20	14	165	70	35	50	124	
1969	3.2	.26	2.2	.85	.36	—*1	6	76	49	22	28	148	
1970	3.2	.24*	1.8	.85	.46	10	8	108	29	26	46	119	SCLB-Wet
1971	3.1	.27	1.6*	.86	.45	12	9	143	37	25	92	146	
1972	3.2	.27	1.9	.83	.45	12	9	196	34	26	55	135	Cool
1973	3.0	.30	1.9	.63	.36	6	5	157	26	20	93	131	Wet-Cool
Avg.	**3.1**	**.28**	**1.8**	**.80**	**.43**	**12**	**9**	**141**	**40**	**27**	**58**	**131**	

*Average for club below critical value.

*1Boron values all extremely low in 1969 east of Mississippi River not reported, but usually were in area of <5 ppm B.

A Simple Slogan . . .

THE BIG SEDAN belched smoke just below a bumper sticker that made you forget the pollution.

The sticker said, "Out of gas? Burn an ecologist. Let the bastards freeze in the dark."

I stared at that sticker, then at the prosperous driver. I wondered if he was cut out of the same cloth as the "executive" who grabs at two phones while giving a widely respected visitor half-attention before buzzing a vice president to shuttle the visitor along. The VP is embarrassed by the treatment of a much-honored professional. He wonders how long free enterprise can survive such arrogance . . . but he says nothing in order to keep up his mortgage payments.

The bumper sticker was right . . . to be concerned over what some ecologists are doing to man's efforts to produce enough energy in reasonable harmony with nature. I wondered if anyone has ever documented the many ways nature has tried to destroy man and what man did each time to survive her attacks.

Then—the THOUGHT hit me: What an arrogant way to put it . . . **burn an ecologist . . . let the bastards freeze.** As arrogant as little long-haired Cause Group politicians spreading sarcastic innuendoes before Congressional committees.

No wonder today's problems seem bigger than they may really be. Arrogance is like a loud mouth. It intimidates . . . slices and cuts and accuses . . . and NEVER admits a mistake, never shows repentant sorrow for any failings or guilts. And it's not limited to any one group or species.

What causes arrogance? Prosperity can do it to men. Power in little hands can do it to men. Education without character can do it. Religion without righteousness can do it. Profit without sweat can really do it to men.

Is there a remedy for such bumper stickers . . . such arrogance . . . such slicing without heart or much mentality. Don't ask me. I'm as arrogant as they come. But when the fever hits me real bad, I'm lucky to have a quiet corner to go remember a humble influence in my life.

She likes to come around sunset . . . this country grandmother . . . out of the mist of the past, walking slowly up the lane . . . through tall whispering pines from the barn by the pasture gate . . . swinging her bucket of evening milk in rhythm with her hum . . . a tall, stalwart woman in a long dress down to her hightop shoes . . . with the lines of time written deeply in her face . . . and the fibers of character flowing from eyes that had smiled through many burdens and griefs in the days before there was a specialist for every problem.

There was much muscle in her humility. The kind of muscle that would help the arrogant executive, the arrogant labor leader and professor and preacher and doctor and politician and editor . . . if we could acquire it.

I know, because I saw her humility at work in her oldest son . . . during the Great Depression . . . when millions wore cardboard in their shoes to school and sat beside cheap little radios to hear a warm voice assure us, "All we have to fear is fear itself."

I sat on a sideporch step whittling and listening to her son talk to an older gentleman known to many as Mr. Chairman . . . from a place called Congress . . . far off across the Potomac in Washington, D.C.

The older man had stopped by our city suburb to get some views from a kindred spirit. They had both been raised on farms . . . one at the foot of the mountains, the other on top of them in meadows magnificent to behold.

They talked about the fear and despair in many people . . . millions of people. Not fear of losing comforts, but fear of losing basics—food, clothing, some kind of roof, a little winter warmth, not to mention pride. When they spoke of fear, I knew it had to be a big threat because they were strong men who had plowed through deep snows to rabbit "gums" in the cold winter mornings of their youth.

On his journey from a foothills farm to build a couple of city newspapers, the country grandmother's son had not become super conscious of lapel styles or man-made titles. He had not caught the disease called "image-itus"—an aching urge to project whatever "image" will make us appear successful or important or even righteous, whether we are or not—a malady

most contagious when humans get too bunched up.

The editor had escaped this disease. This may explain the warm rapport between the two men, since the old statesman from atop the mountain was exposed to so much Potomac imagery and name dropping . . . so many power-starved or power-drunk creatures living beyond their mental or material means and sometimes both.

The two men talked into the twilight until my whittling became precarious. On reflection 40 years later, it all seemed to boil down to 3 concerns:

1—The "big gap" between what a farmer got for a pound of his crop and what a large company got for the same pound in many cellophane packages. (Better organization by farmers has narrowed that gap in recent years, in some cases. But 40 years ago there was a strange gap . . . where some men buying the farmer's crop allegedly reaped 5-figure salaries . . . even in the Great Depression . . . while the farmer struggled to keep title to his land and shoes on his children.)

2—The "eternal hope" that nothing would ever commercialize the family character out of farming . . . or weaken the farm family's capacity to build strong leaders. (An idealistic view, no doubt. Technology has increased efficiency and decreased the need for family unity and operation.)

3—The "repulsive idea" that temporary government programs (quotas, subsidies, etc.) might be less evil than bankruptcy on a market drowning in its own stews of contradictory rumors, chaotic reversals, and human greed. (It was a desperate feeling, for both men knew government regulation would be no more temporary than a new tax is ever temporary.)

I was too young to understand the economics and politics of it all. But I could understand the tones coming out of the two men. These tones told even a whittling youngster that these were kind men, thinking men, not given to arrogant curses and pompous platitudes . . . not inclined to call their fellowmen "bums" because they had failed or "enemies" because they opposed them.

There was no pride of power in the old statesman, though he apparently had lots of it. No pride of influence in the country grandmother's son, the editor. Just human groping in a desperate time by two earthy men, free of arrogance. Men who LISTENED to each other, fully, courteously, with much benefit.

They were great listeners . . . humble at heart. This humility met many citizen groups that came to the editor every election year urging him to run for governor or senator and always going home convinced an honest press was more important to them than a new politician.

As the older man got up to leave, he said he would be talking with a man he called Franklin the next week . . . for any ideas that had come in. Answers did come . . . many months and tribulations later . . . from all over the land.

Farmers began to get better income . . . but often propped up by government subsidies . . . and always like a roller coaster, up and down, up and down . . . while other folks seemed to move steadily upward in their wages and salaries.

It has been a long time since the two hill men went to see what makes the stars shine. But they would have felt at home when Secretary Butz recently took four slices of bread from a loaf to show what the farmer STILL gets.

Through nearly 50 years of editorializing, the editor believed the health of free enterprise depends on the farmer. Every depression begins when the farmer loses money and ends when the farmer makes money. Harvard might not teach this, but history teaches it—probably because the farmer produces the one commodity we MUST have.

We can survive the barest dwelling, clothing, transportation, and communication, if we have to. But we must have a certain amount of food each day. And the farmer must get a fair return for that food or he will lose his incentive and then his business. When he loses his business, the free enterprise system will collapse because it is based on property and production and men who know how to make the soil and the animal yield their best.

Today's sophisticated economists might call such thinking the product of a "simplistic mind." He was simple . . . the country grandmother's son . . . as simple as a slogan hanging on the wall of a friend who prepared his body for burial after he had left on the Great Adventure.

The slogan simply said, "We believe business principles should conform to the teachings of Christ." So did he—because he was early taught so.

SEND ME:

ALFALFA Slide Set: 10-day loan_____; Purchase $8.00___
(35 color slides) date

$____Payment enclosed
____Bill me

Name _____ Address _____

City_____ State_____ Zip Code _____

Organization _____

Potash Institute of North America, 1649 Tullie Circle, N.E., Atlanta, Georgia 30329

ALFALFA, A CASH CROP--Newly revised slide set now available. This set of 35 color slides featuring principles that apply in most sections of the country, tells WHY alfalfa is STILL Queen of Forages. (See pages 6-14) The set is available on 10-day loan or purchase at $8.00 per set. Use easy-order coupon above.

Better Crops
WITH PLANT FOOD

Controlled circulation postage paid at Washington, D. C.

Potash Institute of North America
1649 Tullie Circle, N.E., Atlanta, Ga. 30329