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ARE FORAGE CROPS NEEDED IN CORN BELT AGRICULTURE?

W.M. Myers 1/

In dealing with this topic, it might be well for us to examine first why this question should be raised. Forage crops have traditionally been a part of our American Agriculture; they have been an important part of corn belt agriculture. Why, then, should we question whether they are now needed in corn belt farming? There are several reasons for this. At the risk of leaving out important ones, I shall mention some of these reasons.

The farm today is a complex business. For its successful operation, a high level of managerial skill is required. The farmer must be, at once, a specialist in crop varieties, crop production practices, fertilizers and fertilizer applications, weed, insect and plant disease control, field machinery operation and maintenance, crop preservation, livestock breeding, animal nutrition and animal disease control. On top of this, he must be a business man. He must know when and how to buy efficiently and when and how to market his farm products for maximum profits. Finally, he must keep complete records of all of his operations, not only to know how his business is progressing, but also so he can file his income tax return. I doubt whether the manager of a large factory has any more complex job than the successful farm operator. Yet the farmer does not have vice-presidents in charge of raw materials, plant operations, sales and each of the other phases of his business. Neither does he have a staff of bookkeepers, shop foreman and a secretary to keep his appointments straight.

Farming is becoming increasingly mechanized. This has come about because of the development and availability of machinery. But such mechanization has been necessary in our present American economy, where the cost of hand labor for anything that can be done by machine is prohibitive. Man has released himself from the drudgery and slavery of hand labor by mechanization. And fortunately, our farms are not an exception.

Because of the increased complexity of farm operations and increased mechanization, specialization becomes a desirable objective. And specialization includes reduction of the number of crops grown. Obviously, it takes less total information and less managerial skill to raise a single crop than two or more crops on the farm. Machinery overhead is almost staggering. Although many machines are useful for several or all crops, others, such as the corn picker, are specialized implements. Therefore, the producer of a single crop can mechanize his operations with less total outlay for machinery than can the producer of two or more crops.

The corn belt is admirably adapted, by virtue of its climate and soils, to production of the crop from which it derives its name. Corn is a highly productive crop. It is an easy crop to grow. Every farmer learned how to raise corn from his father, who in turn had learned it from his father. Because of the importance of and the great interest in corn, it has received more research attention than almost any other crop. And I doubt whether our farmers are using the findings of research as completely in the production of any other crop as they are in corn production.

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1/ Head of Agronomy and Plant Genetics. Minn. Agr. Exp. Sta. Talk given at Agriculture Conference, Purdue University, Jan. 2, 1957.

Support prices, too, have played their part in favoring the production of corn. With a good support price, there can be little danger of being wiped out financially by a sudden drop in market price due to over supply.

Finally, many farms no longer have livestock. The farmer is tired of being on duty 24 hours a day, 365 days a year. Like his city cousin, he wants a shorter work week and vacation time to go to Florida, California or Hawaii. And who can find fault with him for that? Yet unless he can hire help, he and his family are tied close to the farm by livestock. Without livestock, the farm must produce crops that are readily marketed from the farm for a good price. And in the corn belt, the best crop for that purpose is corn.

For all of these reasons, therefore, we are being asked whether forage crops are needed. We are being asked whether corn can be grown year after year on the whole farm. We are face to face with the problem that I am supposed to discuss with you today.

In my opinion, despite all of the reasons that can be advanced in favor of growing corn without forage crops, we still must have forage crops in our corn belt agriculture. I shall attempt to develop the reasons why I believe this is so.

We need forage crops as the basis of crop rotations for soil maintenance and improvement. Crop rotations based on forage crops have been proved in many experiments to be an effective and efficient means of maintaining and improving soil fertility and productivity. They have stood the test of many years of use on farms in this area. Yields of corn and other annual crops have been almost invariably higher in rotations involving perennial legumes or legumes and grassed than when grown without these perennial forage plants. Experiments in Ohio, Missouri and elsewhere have shown that soil organic matter is lost at the rate of approximately two percent per year when a corn crop is grown, and at the rate of about one percent per year under small grains. On the other hand, soil organic matter is maintained or increased under a productive sod crop.

As has been pointed out by numerous authorities, these rotation experiments were carried out at relatively low levels of fertilization. Today we have inexpensive nitrogen, and it has been suggested that the fertilizer nitrogen can be substituted economically for the nitrogen provided by the legume in the rotation. Following this reasoning further, it has been suggested that crops, like corn, can, on many soils, be grown continuously without depletion of the soil organic matter, since the corn stalks / nitrogen will provide the necessary raw materials for renewal of the organic matter that is broken down through natural processes, which are accentuated by the plowing and tillage necessary in corn production. Although I recognize the possible validity of these arguments, I should like to advance some words of caution. The idea of continuous corn production plus nitrogen fertilization has not yet stood the test of time on corn belt farms.

Furthermore, only a limited part of our corn belt soils are so favored by topography that there is little danger from erosion. On the contrary, erosion is a real hazard on a large part of our most productive land. And it has been well established that the perennial sod crops are our most effective tool for erosion control. Under the perennial forage crops, the soil is protected throughout the entire year from the beating action of rain drops and the soil-moving action of running water. Under corn and other annual and tilled crops, the soil is exposed for long periods, frequently when the hazards of severe rain storms are greatest.

Every erosion experiment with which I am familiar has shown that soil losses under corn and other tilled crops are several to many times greater than under forage crops grown for hay, silage or pasture. Furthermore, the amount of soil loss increases with increasing length of time after the sod crop in the rotation. Soil losses of corn after corn are higher than on corn after hay or pasture.

Byron Shaw, Administrator of the Agricultural Research Service said, a few years ago, that no farming system adapted to American agriculture had yet been found whereby soil organic matter can be maintained or improved except crop rotations based on forage grasses and legumes. I believe this statement still holds for the majority of our farms. Furthermore, I believe it can be extended to include control of soil losses by erosion as well as maintenance of organic matter.

Forage crops are needed for livestock feed. We are still a meat-eating and milk-drinking people. We must still raise livestock unless we are content to adopt the cereal diet of the Orientals. And I am sure that none of us is prepared to do that. In spite of the fact that many farmers are getting out of livestock, our total numbers of cattle and other livestock remain high. Other farmers are increasing their herds to more economical and profitable sized units. Forages are important as feed for these livestock for several reasons.

The forages are high quality feed. Almost everyone damns them by calling them "roughages," placing them in the same class as corn stalks and oat straw. Yet the forages can be as high in feeding value as what we now call "concentrates." Based on the feeding standards accepted in this country, four to five pounds of alfalfa hay contain as many digestible nutrients as three pounds of corn, and three to four pounds of dry matter from pasture contain as many nutrients as three pounds of corn. In protein, two to four pounds of alfalfa equals one pound of cottonseed cake or four to eight pounds of corn. I have only recently returned from five weeks in New Zealand. There they told me that our American feed standards were either all wrong or based on very poor forage. In New Zealand, digestibility trials show pasture herbage to be equal to concentrates in percent of digestible nutrients, while good hay and grass silage are only slightly lower, that is 65 to 70 percent compared with 75 percent. As a matter of fact, we have a few results in this country that support the findings of the New Zealanders. In Georgia, pasture herbage with 75 percent digestibility, which is equal to corn, has been reported. In a feeding trial with dairy heifers in Minnesota, early cut hay was shown to be worth \$47 per ton in terms of gain, compared with \$50 per ton for grain concentrate. We should stop calling good forage "roughage."

Meat and milk can be produced on forage. Cattle and sheep are ruminants. They have the capacity to utilize the feed nutrients in forage. Many dairy cows can attain maximum milk production on high quality forage without any concentrates. In a New Jersey experiment, cows produced 8,000 to 10,000 pounds of milk per year on forage alone. This was 82 percent of the production of the comparable herd fed concentrates in a 1:3 ratio. Another herd in the experiment which was fed at the 1:6 ratio produced 95 percent as much as the herd fed 1:3.

In New Zealand, I saw a Jersey herd composed of 65 cows. These 65 cows plus 24 replacement heifers are carried on 65 acres, all of which are in grass. No feed is purchased. The cows and their replacements have never been fed any concentrates. The herd average exceeds 360 pounds of butter fat per year. There are many herds in New Zealand that are producing an average of 350 to more than 400 pounds of fat per year without any concentrates.

Incidentally, one of our American dairy nutrition specialists, when we heard of these kinds of results, said, "I don't believe it." I wonder how much of our present day feeding programs is determined by people who don't believe that better methods can be found. One further example, just to prove that New Zealanders do not have everything. You have no doubt read in the January issue of "Farm Journal" of the New Hampshire farmer whose herd of 31 Holsteins is averaging between 11,000 and 12,000 pounds of milk on a 1:20 feed ratio.

Beef, too, can be produced and fattened to good or choice market grade on forage. This is being done today at a few experiment stations and by many farmers. At the present time, grass-fed beef takes a discount on the market compared with fatter corn-fed beef. I wonder, however, how long that will continue. There is increasing buyer resistance to fat meat. We hear much emphasis on meat-type hogs. There is the evidence incriminating animal fat as a major cause of diseases of the heart and circulatory system. I have watched with interest the beef prices in our local meat market. For some time, they have handled both choice and good grade, the latter being advertised as economy grade. At first, there was a substantial difference in price, but for months the prices have been coming closer to the same. Last Saturday, I noticed for the first time that the best cuts--sirloin, T-bone and porterhouse--were the same price in the two grades. Buyers were originally attracted to the economy grade by lower price. Finding it equal to the choice grade in tenderness and flavor and superior to it in percent of edible meat, they have continued to come back for it. Now demand is having its effect on price. When this goes as far as I think it can and will, we will not only be able to produce beef on grasses but we will want beef produced on grass.

Meat and milk can be produced at less cost from forage than from concentrates. This is because feed nutrients in forage are less costly than feed nutrients in concentrates. There is a Michigan experiment, for example, which showed that feed costs of milk production could be reduced 20 to 25 percent by making better use of high quality forage and by reducing the proportion of nutrients obtained from concentrates. Those last pounds of milk, forced from the cow by heavy concentrate feeding, may be pretty expensive. Our dairy cows are fed an average of 1500 pounds of concentrates per year. They get only about 66 percent of their feed nutrients from forage. Dutch farmers have done considerably better. Their cows are fed an average of 450 pounds of concentrates per year. They derive 90 percent of their feed from forage. And New Zealand farmers have gone all of the way. As far as I could determine, no dairy cow, except experimental animals, in New Zealand has ever had a bite of grain.

Beef also can be produced more economically on grass than on grain. Experiments in Illinois, Missouri, Iowa, Minnesota and other places show that the cost per pound of grain is only one-third to one-half as great on pasture as it is in the feed-lot on grain.

Forage crops are high producing crops. This is contrary to popular opinion. Almost everyone knows that forage crops are low producing crops and that diverting acres from corn or other grain crops to forage will result in lower total production. Yet this need not be so, and I doubt whether it very often is. We usually forget the value in terms of feed nutrients of the forage crops. Using our American feed standards (and remember that the New Zealand research workers believe that they are too low so far as forage is concerned), we find that a ton of alfalfa hay has as many feed nutrients as 22 bushels of corn.

Therefore it would require an 88-bushel corn crop to equal a four-ton hay crop or a 110-bushel corn to equal a five-ton hay crop. I have not attempted to make a comparison for Indiana, but the census data suggest that our southern Minnesota farmers are right now producing essentially as many nutrients with their alfalfa as with their corn crops. And this is in spite of the fact that major emphasis, including such things as management, fertilization, place in the rotation, etc., is given to corn, whereas alfalfa must take care of itself.

If one considers protein production rather than total nutrients, the advantage in favor of forage is even greater. A ton of alfalfa hay contains as much protein as 50 bushels of corn. A five-ton hay crop would equal a 250-bushel corn crop in protein production.

In this connection, it is worthwhile to refer again to the place of legumes in the rotation. Some authorities, in comparing the cost of legume nitrogen with fertilizer nitrogen, have over-looked or ignored completely the feed producing capacity of the legume. If the legume-grass crop produces, as it can, as much feed per acre as the grain crop it replaces, the 100 pounds of nitrogen per acre it produces in addition is not merely cheap nitrogen, it is free nitrogen.

Let us assume, however, that in spite of the reasons I have advanced for growing forages in the corn belt, it is still desirable to raise only corn. In fact, this may well be the case on some farms. But if it is desirable on some farms, it also may be desirable on many or most farms. Then we would be raising corn on almost all of the tillable acres of the corn belt. Bear in mind that I am not suggesting that we should do this or ever will, I am merely suggesting the possibility for sake of argument. If this happened, what would we do with all of the corn? We are already producing substantially more corn than we are using. All of our corn belt acres in corn would very greatly increase the surplus. This means either a complete break in market price, or it means government support of corn prices. And with price support must inevitably go acreage control. In other words, farmers could not be permitted to put all of their land in corn. They would be forced, by acreage restrictions on corn, to grow other crops. And this brings us back where we started--to a diversified cropping program including forage crops.

But you may say, "who said anything about growing all corn?" We merely asked whether forage crops were necessary. The answer, of course, is that I suggested the "all corn" idea. But back of every suggestion of monocrop culture in the corn belt is the thinking that one crop would be corn. And why not, because corn is a remarkable crop? But if you do not like corn, take any other cash crop--soybeans, oats, wheat, barley--and you end up the same place we did with corn, which is surpluses that lead through the steps of price depression, support prices, acreage control and back to diversification including forage crops.

And so we can close by repeating that forage crops are needed in corn belt agriculture for the following reasons:

1. To maintain and improve soil fertility and productivity.
2. To control erosion.
3. As the basis of livestock feeding programs.
4. To provide diversified cropping.

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