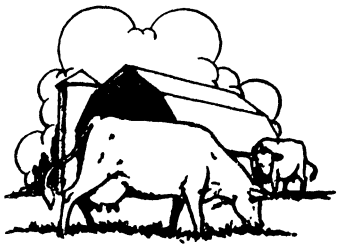

MINNESOTA farm business NOTES

NO. 371 ST. PAUL CAMPUS, UNIVERSITY OF MINNESOTA MAY 31, 1956

Does More Forage Give Greater Profits?

J. R. Schmidt and S. A. Engene

More hay and pasture in the crop rotation does not always give greater profits. In fact, preliminary results from some of our research indicate that it may reduce profits on many farms.

The full effect of a change in the crop rotation must be measured by considering the entire farm organization. The farm is a unit, and a study of one part by itself may give misleading results. Also, since the effect of forage crops on profits depends upon other parts of the farm business, their profitability will vary from farm to farm.

The relation of forage acreage (hay and pasture) to farm organization and profits can best be studied by looking at a single farm. Since no real farm can have more than one amount of forage at a time it is necessary to use a hypothetical farm.

Farm records of members of the Southeast and Southwest Minnesota Farm Management Services provide a reasonable basis for estimating the probable effects of specified changes.

A Hypothetical Farm

Let us take a 160 acre southern Minnesota farm, with 144 acres tillable. The remaining 16 acres are roads, farmstead, and waste land. This is a fairly level farm, where erosion is not a serious problem. In addition to the labor of the operator, members of the family work about two hours a day.

To study the effect of changes in the amount of forage, let us consider three different crop rotations for this farm. (See table 1.) The first rotation, with 20 per cent of the land or one field in five in forage, leaves the hay and pasture crop down for only one year. The next one, with 40 per cent in forage, leaves the hay and pasture crop down for two years. The 60 per cent rotation leaves them down for three years.

Table 1. Rotations and Crop Yields, with Varying Proportions of Land in Forage

20 per cent rotation		40 per cent rotation		60 per cent rotation	
Corn	54*	Corn	56*	Corn	54*
Soybeans	20*	Corn	42*	Oats	55*
Corn	46*	Oats	50*	Hay	2.2†
Oats	45*	Hay	2.2†	Hay	2.2†
Hay	2.2†	Hay	2.2†	Hay	1.7†

* Bushels.

† Tons of hay or hay equivalent of silage or pasture.

The probable crop yields for these rotations are shown in the table. They are based on the 1947-51 average yields of the farm management services. Consequently, they reflect the average quality of land and the amount of fertilizer used on these farms. Agronomy and soils men at the University of Minnesota have estimated the differences in yield that would develop between these rotations.

Table 1 shows the yields after one complete cycle of the rotation. By continuing the fertilizing practices that the farmers have used in the past, yields would slowly fall over the years. They would fall somewhat more rapidly with the 20 per cent rotation than with the 60 per cent.

Improved fertilizing practices could raise these yields. In this case, the response would be greater with the 60 per cent rotation than for the 20 per cent. On land subject to erosion the rotations with the most forage crops will be most effective in maintaining yields.

Comparing the Three Rotations

For a comparison of the three rotations we will use the yields given in the table. They represent typical practices on level land. This gives a clear-cut starting point. The reader can then make adjustments to other conditions.

Now let us take these rotations and find the best way of using the crops produced with each.

The crops could be sold, or they could be fed. To simplify the analysis we have considered only the three most common enterprises of southern Minnesota—dairy cattle, hogs, and poultry. The quantity of feed required, the production, and the costs and returns per unit are based on the average of the farm management services. These are shown in table 2.

(Continued on page 2)

Table 2. Rations and Production for Livestock

Item	Dairy cows*		Hogs	Chickens†
	Heavy grain	Light grain		
	per cow		per cwt.	per hen
Corn, pounds	1,830	570	346	50
Oats, pounds	1,130	365	110	45
Commercial feed, pounds	480	155	44	54
Hay, pounds	6,550	7,800	.....	.....
Grass silage, pounds	8,950	8,950	.....	.....
Pasture, acres	1.4	1.4	.....	.....
Gross return	$339	$275	$19.00	$6.50
Cash costs	$136	$126	$ 4.08	$3.99
Net to feed and labor	$203	$149	$14.92	$2.51

* Includes cow and her share of young stock.

† Includes hen and her share of replacement chicks.

(Continued from page 1)

One other possibility was allowed. We assumed that this farmer could feed a light grain ration to the dairy cows, with more forage but lower production per cow.

Prices used here are the average prices received by members of the farm management services from 1947 to 1951. For dairy products, this is a blend of grade A and grade B milk prices; the average is closest to grade B. The prices used were: $3.40 for 3.5 per cent milk, $19.00 for hogs, and $.37 for eggs. The relationship of these prices to each other was about normal during this period.

Our problem at this point, then, is this: What combination of livestock and sales of crops will give the maximum profit for each of the three rotations?

To calculate this we assumed (a) the farmer will adjust his organization to what he and his family can do—that is, he will hire no labor; (b) there is no market for surplus hay and pasture; (c) the farmer is unwilling to buy farm-grown grains except in exchange for his soybeans; (d) the farmer has sufficient capital for buildings, machinery, and operating expenses.

The most profitable combination of enterprises for each rotation under these assumptions is given in table 3.

Table 3. Optimum Enterprise Combinations for a 160 Acre Farm, with Operator and Family Labor

Item	20 per cent rotation	40 per cent rotation	60 per cent rotation
Number dairy cows*	4.3	12.4	15.4
Cwt. hogs produced	592	436	280
Tons forage unused	.....	.....	32
Hours labor used			
Cows	623	1,796	2,244
Hogs	1,155	849	546
Crops	677	530	340
Total	2,455	3,175	3,130
Return to land, labor	$7,309	$6,547	$5,205

* Dairy cows with a light grain ration.

Let us examine these organizations more closely. Start with the one with the least forage. The most profitable organization would have only four dairy cows and primary emphasis would be upon hog production. The farmer would produce 592 cwt. or about 240 hogs. He would use all the forage for hog pasture and dairy feed. The cows would be fed a low grain ration, with most of the grain going to hogs.

The farmer would work about 2,455 hours with crops and livestock in addition to 1,000 hours for farm shopping, maintenance work, etc. The total labor requirement with this organization is only about 80 per cent that of the typical southern Minnesota farmer.

Would it be more profitable to use up all the available labor by raising more cows and fewer hogs? This could be done within the feed supply by feeding a heavy grain ration to the cows with corn silage as a supplement to hay and pasture. Hogs, however, give a higher return for the grain. Therefore, it is more profitable to leave the labor unused.

When more of the land is used for forage more dairy cows will be kept and fewer hogs raised. With the 40 per cent rotation, the farmer will have to work about an average length day to produce the crops and take care of the livestock he can raise. By shifting to a 60 per cent rotation, he will have feed for still more cows.

If, however, he works only an average day at average efficiency he can handle only about 15 cows and will have unused forage. This is shown in the table. There is enough feed available to keep 19 cows. This, however, means either working more hours per day or working more efficiently.

How would the earnings of this farm differ with these rotations? The net return to land and labor for each rotation is given in the last line of table 3. This is the amount left to pay the farmer and his family for their labor, to pay taxes and general overhead on the farm, and to pay interest on the investment.

On this farm the earnings would be greatest with the 20 per cent rotation. The earnings would be $2,100 more than with the 60 per cent rotation, and the family would have only 80 per cent as much work to do. If, with the 60 per cent rotation, he added cows to use up all of the forage, earnings still would be $1,500 below the 20 per cent rotation.

The earnings shown in table 2 are based on 1947-51 prices. If profits from the 60 per cent rotation were to equal profits from the 20 per cent rotation, dairy product prices would have to rise by at least 21 per cent. That is, with hogs at $19.00, milk prices would have to increase from $3.40 to $4.10. Or conversely, with milk prices remaining at $3.40, hog prices would have to drop from $19.00 to $13.85.

The high forage rotation is likely to be the most profitable on erodible land. This would be the case if the yields with the 20 per cent rotation dropped to four-fifths of the yields with the high forage rotation. This difference in yields can be expected on many Minnesota farms.

On some farms, forage yields are higher relative to grain yields than is the case here. This may be due to differences in soils, in climate, or in abilities of the farmer. These farmers may find that the high forage rotation is most profitable.

Similarly, both the organization and the most profitable rotation would be altered if the relative efficiency of the livestock enterprises were changed. For example, a very efficient dairyman who does poorly with hogs would concentrate on dairy production and cut down on the number of hogs raised.

Improvements in methods of producing, harvesting, and using forages will also change this comparison of rotations. This relationship is fairly complex since costs of machinery, buildings, and labor will also change. The research in this part of the problem is not yet complete.

When comparing rotations, the farmer must also consider the amount of risk associated with each organization. He may consider the specialized hog program with the 20 per cent rotation to be too risky because of the ups and downs of the hog price cycle. Consequently, he may prefer the 40 per cent rotation even though the net returns are lower than those expected with the 20 per cent rotation.

Obviously, many factors are involved when determining the best rotation. This research has shown that more forages will increase profits under some circumstances, but often will decrease profits.

It is necessary that each farmer analyze his own situation before he makes a decision. Many farmers are making such an analysis with the help of their county agent in the Farm and Home Development Program. This analysis will help them make a sound decision on the profitability of forage on their farms.

MINNESOTA

farm business

NOTES

Prepared by the Department of Agricultural Economics and Agricultural Extension Service.

Published by the University of Minnesota Agricultural Extension Service, Institute of Agriculture, St. Paul 1, Minnesota.

FARM ADJUSTMENTS TO FORAGES

John R. Schmidt and Prudence Nicolson

The preceding article showed that putting more forage in the rotation is likely to reduce earnings on many farms. The change in earnings, of course, will vary with conditions on the farm.

These conclusions were obtained by estimating the probable organization and earnings with different rotations. In other words, the comparisons were for a hypothetical farm. This was necessary in order that all conditions would be uniform except those arising from changes in the rotations.

Are these results reasonable? It is desirable to check these conclusions against actual farm experience insofar as possible. Two separate research studies provide some information that is useful for this.

In the first of these studies we asked all members of the Southeast and Southwest Minnesota Farm Management Services these questions: (1) What changes would you make in your farm organization if, for some reason, you had to cut the proportion of forages in your crop rotation to 20 per cent? (2) What changes would you make if you had 60 per cent in forage? We asked them to make these estimates for their present farms, considering only changes in rotations.

Our questionnaire was answered by 132 farmers. Of these, 113 gave the crop acres and livestock numbers they would have with 20 per cent of the land in forage. The averages for these men are given in the "low forage system" column in table 1. Estimates for the 60 per cent or "high forage system" were given by 115 men. These are only estimates given by the farmers. Few, if any, took time to calculate the exact changes they would make.

Table 1. Farmers' Estimates of Organizations with Varying Amounts of Forage

Item	Low forage system	High forage system
Number of replies	113	115
Total tillable acres	206	210
Hay and pasture	41	126
Corn	92	56
Soybeans	23	3
Small grains	42	25
Flax	4	.....
Canning crops	4	.....
Livestock numbers		
Dairy cows	9	20
Beef cows	3	11
Feeder cattle	24	42
Hog litters	28	16
Hens	203	174
Ewes	13	26

These estimates compare very closely with the budgets presented in the first article. With the low forage system they would raise less soybeans and put in more corn. With the high forage system they would have less grain but more corn.

Considering that these men made quick estimates rather than careful decisions, it seems that the rotations for the budgets are entirely realistic.

Similarly, the livestock combinations developed in the first article are reasonably close to the estimates of these farmers. They generally favor a slightly larger proportion of cattle. Their choice of livestock here may take into account risk, personal preferences, and other factors.

These estimates show a larger number of livestock per acre than was used in the previous budgets. This is due in part to feed from nontillable pasture. These men may also consider the purchase of feed. In some cases it may be explained by a natural optimism as to possible accomplishments.

In the second study we examined the records of 32 members of the Southeast and Southwest Minnesota Farm Management Services. Each of these farmers held their forage acreage constant throughout the period 1950-1954; they had adjusted their farm organizations to this level of forage production. The averages for these farms are shown in table 2.

The low forage group of 15 farms had an average of about 20 per cent of their tillable land in hay and pasture. The medium forage group of 17 farms had an average of about 40 per cent of their land in forage. In terms of the amount of forage produced, then, these groups correspond closely to the 20 and 40 per cent rotations of the hypothetical farm.

Comparisons of these groups can be used only as rough indicators. These are different farms and farmers, and may represent different conditions. For example, the medium forage group is likely to have rougher land where forage crops have a greater advantage. This is partly confirmed by the lower crop yields on these farms. There may also be differences in the abilities and preferences of these farmers.

Here, also, the organizations of the farms correspond reasonably well to the calculations in the first article. The low forage farms emphasize the grain consuming livestock—feeder cattle, hogs, and poultry. The medium forage group puts emphasis on dairy cattle.

Table 2. Farm Organization with Low and Medium Forage Acreage, 32 Southern Minnesota Farms, 1950-54

Item	Low forage group	Medium forage group
Number of farms	15	17
Crop organization, acres		
Small grain	57.4	41.7
Cultivated crops	85.0	55.7
Tillable hay	21.1	36.4
Tillable pasture	12.2	32.7
Total tillable land	175.7	166.5
Nontillable pasture	12.4	9.8
Wild hay	1.7	1.1
Total acres in farm	206.0	196.7
Livestock organization		
Milk cows, number	8.9	18.6
Beef cows, number	4.5	2.6
Cwt. beef produced	53.0	24.8
Cwt. hogs produced	367.5	259.0
Ewes, number	3.6	13.5
Hens, number	278.0	208.0
Size of business		
Total number of workers	1.7	1.8
Total animal units	60.3	62.8
Total work units	372	448
Work units per worker	219	249
Efficiency factors		
Index of crop yields	104	99
Return per $100 feed to livestock	101	101
Earnings		
Operator labor earnings	$5,013	$4,451

As was calculated in the first article, the medium forage organization takes more work than does the low forage. The number of work units for the medium forage group is 448, or 4,480 hours of labor for crops and livestock if the man works at average efficiency. For the low forage group, this is 372 work units or 3,720 hours. In addition, each group would spend about 1,000 hours at farmstead and building maintenance, farm shopping, and other general farm work.

The earnings for the medium forage group were lower than for the low forage group. To a considerable extent this is due to the smaller acreage and lower yields. However, the earnings differ in the direction indicated for the hypothetical farm.

These two studies show that the assumptions made in the first article were reasonable. It is probable that farmers would make the kinds of adjustments outlined for the hypothetical farm. They are likely to give some consideration to reducing risk and to personal preferences.

These two studies do not give any strong evidence as to the relationship of earnings to the amount of forage, but they do not contradict the conclusions of the first article.

Minnesota Farm Prices, Mar. and Apr. 1956

Prepared by R. A. Andrews

Average Farm Prices for Minnesota, March 1956, April 1954, 1955, 1956*

	Mar. 1956	Apr. 1956	Apr. 1955	Apr. 1954
Wheat	$ 2.09	$ 2.14	$ 2.22	$ 2.14
Corn	1.14	1.29	1.23	1.32
Oats	.55	.56	.66	.72
Barley	.91	.93	1.05	1.11
Rye	.97	.99	1.01	.91
Flax	3.32	3.51	2.92	3.61
Potatoes	1.70	2.10	2.00	.60
Hay	15.60	15.40	16.20	15.10
Soybeans†	2.30	2.57	2.31	3.49
Hogs	12.50	14.30	16.10	26.80
Cattle	14.00	14.80	17.70	16.20
Calves	17.60	17.30	17.40	18.50
Sheep-Lambs	17.79	17.43	18.84	21.12
Chickens	.172	.172	.171	.182
Eggs	.340	.320	.300	.295
Butterfat	.620	.620	.620	.630
Milk	3.00	3.00	2.95	2.90
Wool†	.40	.40	.42	.48

* Average prices as reported by the USDA.
† Not included in Minnesota farm price indexes.

Minnesota farm prices averaged 5 per cent higher in April compared with March. Marked increases occurred in the prices of corn, potatoes, oilseeds, hogs, and cattle. Livestock product prices remained about the same.

Both the crop and livestock price indexes were much below those of April 1955. There was a slight increase in the livestock products price index.

Comparison of March and April Prices

Commodity class	Average April prices as a percentage of average March prices
Crops	112
Livestock	108
Livestock products	99
All commodities	105

The Outlook Corner — Cropland

Changes in Cropland Use in Minnesota, 1940-1954*

Crop	1940	1950	1954	1955
	thousands of acres			
Corn	4,366	5,185	5,486	5,815
Soybeans	53	1,148	2,014	2,316
Flax	1,590	1,217	992	843
Wheat (all)	1,588	927	708	625
Barley	1,994	1,252	1,100	1,155
Oats	4,254	5,101	5,191	4,828
Rye	331	162	92	112
All hay	4,466	3,985	3,740	3,795

* Minnesota Agricultural Statistics, State Federal Crop Reporting Service.

Row Crops

There has been an upward trend in corn acreage with a larger proportion of the corn being harvested for grain. In 1954, 85 per cent of the corn acreage harvested was for grain compared to 75 per cent in 1950 and 1940.

Soybean acreage has increased from 53,000 to 2,316,000 acres. This makes soybeans a major crop in Minnesota.

These increases in row crops have been due to the use of more adaptable varieties in the northern and central part of the state and the basically favorable profit position of these crops throughout the state.

Small Grains

Except for oats, small grain acreage has declined. The reduction in flax acreage has been due in part to difficulty of seedbed preparation and weed control. New chemicals and techniques will likely cause farmers in the western part of the state to reconsider this crop.

Wheat acreage reduction has been strongly influenced by acreage allotments. Higher yields in the face of lower consumption of cereal products and a doubtful wheat export situation may cause further declines.

Oat acreage has not been reduced. Yet, the basically poor profit position of this crop coupled with the increased acreage of corn and beans may cause farmers to reduce future acreage or utilize the crop for forage instead of grain. As a result, the proportion of corn acreage harvested for grain will continue to increase.

Hay

No definite trend in all hay acreage is evident. There is wide variation in the percentage of cropland in hay. It varies from 75 per cent in northeastern Minnesota to less than 15 per cent in southwestern Minnesota. With the increasing trend toward row crops, the hay acreage should increase from the soil conservation standpoint. Whether it will or not is questionable.

The general trend in Minnesota is toward larger acreages in the more profitable crops—corn and soybeans. This has moved Minnesota into third place as a corn producing state and to second place in the production of soybeans, compared to fifth and sixth respectively in 1950.

Indexes for Minnesota Agriculture*

	Average April 1935-39	April 1956	April 1955	April 1954
U. S. farm price index	100	213.0	225.8	234.9
Minnesota farm price index	100	199.0	209.8	224.6
Minnesota crop price index	100	221.6	229.6	184.5
Minnesota livestock price index	100	197.4	226.7	275.6
Minnesota livestock products price index	100	192.7	189.2	190.4
Purchasing power of farm products				
United States	100	94.3	100.0	104.4
Minnesota	100	88.1	92.9	99.8
U. S. hog-corn ratio	12.5	10.8	12.2	18.3
Minnesota hog-corn ratio	15.4	11.1	13.1	20.3
Minnesota beef-corn ratio	12.6	11.5	14.4	12.3
Minnesota egg-grain ratio	13.7	11.9	10.8	10.5
Minnesota butterfat-farm-grain ratio	36.8	32.0	29.2	27.5

* Minnesota index weights are the average of sales of the five corresponding months of 1935-39. U. S. index weights are the average sales for 60 months of 1935-39.

UNIVERSITY OF MINNESOTA, INSTITUTE OF AGRICULTURE, ST. PAUL 1, MINN.

Cooperative Extension Work in Agriculture and Home Economics, University of Minnesota, Agricultural Extension Service and United States Department of Agriculture Cooperating, Skuli Rutford, Director. Published in furtherance of Agricultural Extension Acts of May 8 and June 30, 1914.

UNIVERSITY OF MINNESOTA
Institute of Agriculture
Agricultural Extension
St. Paul 1, Minn.
SKULI RUTFORD, Director
Minn. 7—5-56—2,150
Permit No. 1201

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300

FREE—Cooperative Agricultural Extension Work, Acts of May 8 and June 30, 1914.