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COMPARATIVE RETURNS FROM CROPS
in
SOUTHERN AND WEST CENTRAL MINNESOTA

UNIVERSITY OF MINNESOTA
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RETURNS FROM CROPS IN SOUTHERN AND WEST CENTRAL MINNESOTA

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Introduction

The selection of crops is an important factor affecting the farmers' financial success. In any area certain combinations of crops produce either a larger net return or more or better feed than do others.

It is the purpose of this report to show (1) the comparative costs and returns and (2) the production of total digestible nutrients per acre for the major crops in order to assist in the selection of a cropping system.

The data used in this study were secured from the various farm management services which are cooperating with the University of Minnesota. Although the members of these services in general are above average in managerial ability and secure higher than average yields of crops, the data show the wide range among them in net returns and in the production of total digestible nutrients per acre.

Importance of Crops as a Source of Income

Crops are basic enterprises on practically all farms in the state. It is estimated that 30 per cent of the cash sales of agricultural products by Minnesota farmers in 1957 came from the sale of crops.^{1/} However, crops are more important as a source of income than these data indicate. In addition to sale of crops, a large proportion of the crops raised are fed to livestock. Much of the 67 per cent of the cash sales of livestock or livestock products is indirect crop income.

The data in Table 1 shows the returns to crops on the farms managed by the members of the farm management services when the value of home grown feeds consumed by livestock on the farm is included as a receipt to crops. A corresponding charge was then levied against the livestock enterprises. The proportion of the receipts from crops now becomes 64 per cent in southeastern Minnesota, 72 per cent in the southwestern section of the state and 76 per cent in the west

^{1/} Learn, Elmer W. "Cash Receipts and Net Cash Income", Minnesota Farm Business Notes No. 391, January 1958.

central area with the receipts from livestock accounting for most of the balance.

Table 1. Proportion of Farm Receipts from Various Sources

	1954	1955	1956	Ave.	%
Southeastern Minnesota					
No. of farms	166	165	165	165	
Income from livestock	\$4043	\$3659	\$4996	\$4233	32.2
Income from crops	8201	7666	9419	8428	64.1
Misc.	<u>433</u>	<u>477</u>	<u>530</u>	<u>480</u>	<u>3.7</u>
Total	12677	11802	14945	13141	100.0
Southwestern Minnesota					
No. of farms	156	146	135	146	
Income from livestock	\$4141	\$1888	\$4723	\$3584	24.5
Income from crops	10706	9038	11776	10507	72.0
Misc.	<u>477</u>	<u>481</u>	<u>565</u>	<u>507</u>	<u>3.5</u>
Total	15324	11407	17064	14598	100.0
West Central Minnesota					
No. of farms	30	24	27	27	
Income from livestock	\$2662	\$1491	\$2252	\$2135	20.4
Income from crops	7030	7904	8917	7950	75.9
Misc.	<u>464</u>	<u>394</u>	<u>299</u>	<u>386</u>	<u>3.7</u>
Total	10156	9789	11468	10471	100.0

Factors Affecting Choice of Crops

The best choice of crops depends on a large number of factors. These include size of farm, soil type, yields, prices paid for crops and livestock, type of farming followed, capital available and the labor, power and machinery available. Although certain crops will produce greater returns than others it

is not always possible to set up a cropping system with only high return crops. It is usually necessary to include several crops in a cropping system in order to (1) distribute labor, power and machinery over the entire season, (2) maintain or improve productivity of the soil and (3) insure a balance in the use of all the resources at the disposal of the operator. Since the relative importance of these factors varies widely from farm to farm, rigid rules cannot be provided.

The average yields per acre of the major crops in each of the three areas included in this study are shown in Table 2. The rather marked differences in yields between areas are due primarily to differences in annual precipitation. The average annual rainfall ranges from approximately 32 inches in the extreme southeastern corner of the state to approximately 23 inches in the west central area.

The yield of corn in west central Minnesota is 16 per cent less than that reported on the southeastern Minnesota farms. The yields of soybeans are 12 per cent less but barley yields in the two areas are essentially the same.

The average crop prices prevailing in the areas covered by the Associations over the five-year period 1953 to 1957 are shown in Table 3. The five-year average of prices received is higher than that reported for 1957 and also higher than those prevailing at the present time (February 1958).

Costs and Returns from the Major Crops

The costs and returns from the major crops are shown in Tables 4, 5 and 6. The crops are grouped into three main categories - cash crops, feed or cash crops and roughages.

Gross income per acre is the product of average yields times the average prices received by farmers in southern Minnesota during the past five years. Costs for growing each crop were based on data secured from southern Minnesota farms during 1951 to 1953. ^{2/} The cost of producing canning peas is assumed to be the same as the cost of growing a small grain crop up to harvest time.

^{2/} University of Minnesota Department of Agricultural Economics Reports No. 203, 208 and 217.

Table 2. Average per Acre Yield of Crops, Minn. Farm Management Services

Crop	S.E. Minn. 1952-56	S.W. Minn. 1952-56	West Central Minn. 1953-56
Corn grain, bu.	68.5	60.4	57.3
Soybeans, bu.	22.8	22.0	20.1
Oats, bu.	46.9	41.5	37.0
Barley, bu.	30.8	28.9	29.7
Wheat, bu.	23.4	21.1	17.7
Flax, bu.	--	11.7	10.9
Canning peas, dollars	\$51.97	--	--
Alfalfa hay, tons	2.9	2.6	2.4
Corn silage, tons	10.8	9.8	8.4
Oat silage, tons*	6.5	5.6	4.8

*Yields were reported only in 1955 and 1956.

Table 3. Average Farm Price of Various Crops in Southern Minnesota, 1953-57

Crop	1953	1954	1955	1956	1957	Average 1953-57
Corn grain, bu.	\$1.31	\$1.37	\$1.23	\$1.25	\$1.10	\$1.25
Soybeans, bu.	2.53	3.03	2.19	2.35	2.10	2.44
Oats, bu.	.71	.70	.61	.63	.61	.65
Barley, bu.	1.11	1.02	.93	.94	.91	.98
Wheat, bu.	2.10	2.00	2.00	2.08	2.07	2.05
Flax, bu.	3.67	3.12	2.92	3.16	2.96	3.17
Alfalfa hay, tons	17.50	17.00	18.00	18.50	17.00	17.60
Silage*	5.85	5.65	6.00	6.15	5.65	5.85

*Market quotations are not available for silage. Value is estimated at one-third the value of alfalfa hay.

Table 4. Crop Ratings for Southeastern Minnesota

Crop	Average yields per acre	T.D.N. # produced per acre	Index T.D.N. # per acre	Gross income per acre	Estimated cost per acre	Net income per acre	Index net income per acre**	Cost per 100 lbs. T.D.N.*	Index cost per cwt. T.D.N.*	Cash crop
Canning peas	-	-	-	\$51.97	\$22.81	\$29.16	60	-	-	-
Soybeans	22.8 bu.	-	-	55.63	28.45	27.18	56	-	-	-
Wheat	23.4 bu.	1128	31	47.97	34.75	13.22	28	\$3.08	38	-
Corn, grain	68.5 bu.	3082	85	85.62	35.96	49.66	100	1.17	100	-
Barley	30.8 bu.	1137	31	30.18	31.36	-1.18	0	2.76	42	-
Oats	46.9 bu.	1041	29	30.48	31.71	-1.23	0	3.05	38	-
Corn silage	10.8 tons	3629	100	63.18	45.13	18.05	38	1.24	94	-
Alfalfa hay	2.9 tons	2894	80	51.04	38.11	12.93	28	1.32	89	-
Oat silage	6.5 tons	2002	55	38.02	32.00	6.02	14	1.56	75	-

* Total digestible nutrients.

** To calculate the index of net income per acre the amount of the largest negative figure is added to each item of net income so the lowest net income figure will be zero.

Table 5. Crop Ratings for Southwestern Minnesota

Crop	Average yields per acre	T.D.N.* produced per acre	Index T.D.N.* per acre	Gross income per acre	Estimated cost per acre	Net income per acre	Index net income per acre**	Cost per 100 lbs. T.D.N.*	Index cost per cwt. T.D.N.*
Soybeans	22.0 bu.	-	-	\$53.68	\$28.45	\$25.23	68	\$ -	-
Wheat	21.1 bu.	1017	31	43.25	34.75	8.50	30	\$3.42	39
Flax	11.7 bu.	-	-	37.09	30.45	6.64	26	-	-
Corn, grain	60.4 bu.	2718	83	75.50	35.96	39.54	100	1.32	100
Barley	28.9 bu.	1066	32	28.32	31.36	-3.04	4	2.94	45
Oats	41.5 bu.	921	28	26.97	31.71	-4.74	0	3.44	38
Corn silage	9.8 tons	3293	100	57.33	45.13	12.20	38	1.37	96
Alfalfa hay	2.6 tons	2595	79	45.76	38.11	7.65	28	1.47	90
Oat silage	5.6 tons	1725	52	32.76	32.00	.76	12	1.86	71

* Total digestible nutrients.

** To calculate index of net income per acre the amount of the largest negative figure is added to each item of net income so the lowest net income figure will be zero.

Table 6. Crop Ratings for West Central Minnesota

Crop	Average yields per acre	T.D.N. # produced per acre	Index T.D.N.* per acre	Gross income per acre	Estimated cost per acre	Net income per acre	Index net income per acre**	Cost per 100 lbs. T.D.N.*	Index cost per cwt. T.D.N.*	Cash crop
Soybeans	20.1 bu.	-	-	\$49.04	\$28.45	\$20.59	79	-	-	-
Flax	10.9 bu.	-	-	34.55	30.45	4.10	33	-	-	-
Wheat	17.7 bu.	853	30	36.28	34.75	1.53	26	\$3.90	38	
Corn, grain	57.3 bu.	2578	91	71.62	35.96	35.66	100	1.62	91	Feed or cash crop
Barley	29.7 bu.	1096	39	29.11	31.36	-2.25	15	2.82	52	
Oats	37.0 bu.	821	29	24.05	31.71	-7.66	0	3.74	39	
Alfalfa hay	2.4 tons	2395	85	42.24	38.11	4.13	33	1.47	100	Roughage
Corn silage	8.4 tons	2822	100	49.14	45.13	4.01	33	1.54	95	
Oat silage	4.8 tons	1478	52	28.08	32.00	-3.92	10	2.12	69	

* Total digestible nutrients.

** To calculate the index of net income per acre the amount of the largest negative figure is added to each item of net income so the lowest net income figure will be zero.

Harvesting costs were not considered since most canning companies harvest the crop. In a similar manner the cost of raising oat silage is assumed to be the cost of growing small grains up to harvest plus the cost of harvesting one crop of hay. The same costs per acre are used in all three areas.

The net income per acre is the value of the crop at the prices shown in Table 3 less the cost of producing it. This indicates the contribution to farm earnings for these crops if sold for cash. If fed to livestock, an additional contribution to earnings may accrue if the value of the livestock or livestock products produced exceeds the cost of feed and other costs involved in producing these livestock or livestock products.

Roughages are seldom sold as a cash crop but are usually fed on the farm. They add to farm earnings only as they can be used in a livestock feeding program. Their use is limited largely to roughage consuming livestock such as cattle and sheep. The fact that alfalfa hay and corn silage yield a rather large amount of digestible nutrients at a relatively low cost is important to a farmer who has a livestock feeding program involving cattle and sheep.

Corn raised for grain is by far the most profitable crop in southern Minnesota on the basis of average net returns per acre. In addition it can be fed to all classes of livestock and thus offers a possibility of making an addition to farm earnings over and above its value as a cash crop. Soybeans and canning peas rank next. Since they are cash crops and ordinarily are not fed to livestock their contribution to farm earnings can be estimated only on a net income per acre basis. Canning peas are limited to those areas in which there is a market outlet. Alfalfa hay and corn silage rank third.

Oats for silage has been coming into the picture quite rapidly during the past few years. It is a low return crop when harvested for grain but if a farmer wishes to raise oats as a nurse crop for grass or legume seedings or to spread his work load more evenly over the cropping season, he has the possibility

of securing more feed nutrients from oats as silage than as grain. To utilize this oat silage he must, of course, have some roughage consuming class of livestock on his farm.

Most farmers do not have detailed records from which they can determine the cost of producing each crop and thus arrive at net returns. The data presented in Tables 4, 5 and 6 show that gross returns for the grain crops (soybeans, wheat, flax, corn, barley and oats) vary far more than costs and that net returns vary quite directly with gross returns. This suggests that farmers may make their choices to quite an extent on the basis of gross returns. This can be refined somewhat by deducting costs of seed, commercial fertilizers and other variable items of costs if these items vary considerably from crop to crop.

Relation of Crop Selection to Earnings

The relation of a suggested index of crop selection to earnings is shown in Table 7. The index is determined by first grouping the crops into four categories based quite largely on net returns per acre. The major crops were grouped as follows:

<u>A - Crops</u>	<u>B - Crops</u>	<u>C - Crops</u>	<u>D - Crops</u>
Corn for grain	Soybeans	Wheat	Barley
	Canning peas	Flax	Oats for grain
	Corn silage	Oats for silage	
	Alfalfa hay		
	Alfalfa pasture		

The grouping of crops is the same for the three areas included in this study except for barley. It is rated as a "D crop" in southeastern and southwestern Minnesota and a "C crop" in the west central area.

The second step in determining an index of crop selection involves the assignment of numerical ratings to the acreage in each crop. These numerical ratings are:

A crops	100%
B crops	50%
C crops	25%
D crops	0

Table 7. Relation of Labor Earnings to Index of Crop Selection

Index of crop selection		Labor
Range	Average	earnings
Southeastern Minnesota, 1952, 1954 and 1956		
Lowest 1/3 of farms	43.2	\$3486
Middle 1/3 of farms	51.8	3812
Highest 1/3 of farms	59.9	4503
Southwestern Minnesota, 1952, 1954 and 1956		
Lowest 1/3 of farms	48.5	\$3603
Middle 1/3 of farms	55.6	4802
Highest 1/3 of farms	64.0	5426
West Central Minnesota, 1954, 1955 and 1956		
Lowest 1/3 of farms	41.4	\$2039
Middle 1/3 of farms	50.7	2294
Highest 1/3 of farms	57.8	3648

The index of crop selection is calculated by adding 100 per cent of the A crops plus 50 per cent of the B crops plus 25 per cent of the C crops and dividing this sum by the acres planted to these crops. The crop selection index calculated in this manner shows a strong relationship to labor earnings on farms included in this study.

Conclusions

A wise selection of crops offers an opportunity to improve farm earnings. It can result in more production from a given acreage. The net result will be more crops available for sale or feed. The increase in production spreads the cost of machinery, power and labor over a larger size of business especially if additional livestock has been added because of the increased supply of feed.

Corn for grain is by far the most profitable major crop in southern and west central Minnesota. It has a decided advantage as either a cash crop or a feed crop. It is to the advantage of a farm operator to plant as much of his acreage in tillable land to corn as the topography of the land and the diversity of crops needed to spread power, machinery and labor costs will permit.