Financing Michigan Farms: The Thumb
Michigan State University Agricultural Experiment Station and Cooperative Extension Service
Research Report
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Issued October 1963
20 pages

RESEARCH REPORT 1 BUSINESS

FROM THE MICHIGAN STATE UNIVERSITY
AGRICULTURAL EXPERIMENT STATION EAST LANSING

Financing Michigan Farms: The Thumb

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SUMMARY

THIS STUDY SUMMARIZES the results of an analysis of farm adjustment in the Michigan Thumb. The study was undertaken to provide information on the following: (1) Will capital needs in farming continue to increase in the future? (2) How do credit limitations affect farm organization? (3) Could more credit be used profitably?

Four typical farms from the Thumb were budgeted for profitable changes. These four farms included a cash crop farm, a small dairy farm, a large dairy farm and a general farm. Each farm was budgeted under four alternative credit situations to see how credit availability affected the most profitable farm organization. This approach also indicated the profitability of increased credit usage.

The four credit situations reflected the proportion of credit the farmer could obtain on various assets. The four credit situations and the percentage of asset value which could be borrowed were as follows:

	Percentage of asset which can be borrowed	
Situation	Chattel Credit	Real Estate Credit
Tight Credit	45	40
Medium Credit	60	50
Liberal Credit	80	65
Very Liberal Credit	95	75

In each of the above credit situations, additional land could be purchased. A fifth situation was analyzed for the medium credit situation in which additional land could not be purchased.

The analysis indicated that profitable organizations were possible for typical farms in the Thumb. Net incomes of $10,000 and over were shown to be possible on the typical farms, but rather large amounts of credit would be needed.

The amount of credit the operator could (or would be willing to) obtain directly affected both the net farm income and the most profitable type of farming operation. Under limited credit usage, the cash crop farm continued in a beef-cash crop operation. And the small dairy farm continued its stanchion dairy organization. However, with liberal credit situations, a parlor dairy organization returned higher net incomes on the cash crop and small dairy farms than other alternatives.

On the small, 80-acre dairy farm, $14,000 to $22,000 of credit could be used profitably to obtain a $10,000 net income under a stanchion-dairy system. But to move the small dairy farm into a more profitable parlor dairy with a $13,000 to $16,000 net farm income would require $28,000 to $38,000 of credit. In general, real estate credit was more limiting than chattel credit on the small dairy farm and the net rate of return on real estate credit was, therefore, more favorable. While dairying was the most profitable alternative for the small dairy farm at a milk price of $4.06, a beef-cash crop operation probably would be more profitable at milk prices of $3.60 or lower.

On the cash crop farm of 120 acres, $25,000 to $40,000 of credit could be used profitably under a beef-cash crop organization—primarily for expansion of farm size. This amount of credit with the other resources of the farm would return a net farm income of $11,000 to $13,000 on the cash crop farm. However,

to finance a changeover to parlor-dairy on the representative cash crop farm would require $46,000 to $65,000 of credit and would return a net farm income of $18,000 to $22,000 per year.

Similarly, the representative large dairy and general farms showed a capacity to utilize large amounts of credit profitably in a parlor-dairy enterprise. The parlor dairy system of operation returned in excess of $20,000 net farm income using very efficient technology. However, this required upwards of $20,000 of credit.

INTRODUCTION

Statement of the Problem

THE CAPITAL NEEDED to farm continues to increase. We see this in the trend toward larger farms, rising land values, and increased mechanization. While new techniques and better ways of doing things often give greater returns, they also take more capital.

These trends toward the use of more capital raise many questions: How much will capital needs increase in the future? How do limits on credit affect the farm organization? Could more credit be used profitably? These and many other questions puzzle farmers and farm credit people.

One way to answer such questions is to analyze several typical farms to see how more credit would affect them. This report summarizes such a study for four farms.

Agriculture in the Thumb

This study includes the area often referred to as the Michigan Thumb. Specifically, it includes five counties: Huron, Lapeer, St. Clair, Sanilac and Tuscola, or in other words, the area east and south of Saginaw Bay.

In 1959, this area contained the following percentages of selected Michigan crops and livestock.

Product	Percentage of State Total
Sugar beets	52.8
Dry beans	47.6
Wheat	20.5
Oats	18.4
Milking cows	18.2
Cattle & calves	16.8
Hay	15.0
Corn	11.0
Hogs and pigs	5.6

The Thumb is one of the more important agricultural areas of the state. It includes some of the most productive farm land to be found any place in Michigan as well as some of the highest priced. These five counties have 13.8 percent of Michigan farmland, but the agricultural production is a somewhat larger percentage of the state total.

The area is primarily a farming area although possibilities exist for off-farm employment. About 80 percent of the area is in farmland compared with only about 40 percent of the state as a whole. In 1960, the area contained about 3.3 percent of the state's total population.

Typical Farms

Obviously, it is not possible to analyze every farm in the Thumb. Yet, if the answers to the credit questions are to have meaning, it is necessary to consider actual farm situations. First, information was gathered for individual farms by farm interviews. In all, 362 farm interviews were completed in Southern Michigan as a part of the Lake States Dairy Adjustment Study in the summer of 1959. These interviews obtained resource information on a number of actual farm situations. Second, the farms were combined into groups of similar types and sizes. Each farm in the Thumb was put into one of four groups. The farms in each of these groups were used to describe a "typical" farm situation for the group. Four typical farms emerged: (1) cash crop, (2) small dairy, (3) large dairy and (4) general.

The resources for the typical farm situations were averages of all the farms in the group with a few exceptions. Acreages, rotations, and building capacities, for example, resulted from averaging the figures for all farms in the group. On the other hand, the amount of labor available to the farm was determined by looking at the usual situation on the farms rather than averaging the labor for all farms in the group.

Table 1 presents information on the four typical farms. Comparing the typical farms with Census data, they appear to be slightly smaller than the average found in the Census. However, two of the representative farms are larger than the Census average (167 acres) while two are smaller.

The four typical farms differed in the amount of liquid assets they had. Defining liquid assets as cash and the value of feed, crop and livestock on hand, the general farm had almost three times the liquid assets of the cash crop farm.

The cash crop farm averaged 118 cropland acres and had capacity for a few beef animals. Cash crops were dry beans, wheat, corn and sugar beets. Labor

TABLE 1—Characteristics of the representative farms[a]

Characteristic	Units	Typical farm			
		Cash crop	Small dairy	Large dairy	General
Estimated number of farms[b]	numbers	2,554	2,372	3,011	1,186
Proportion of sample farms	percent	28	26	33	13
Resource situation					
Total acres per farm	acres	121	78	175	199
Cropland acres per farm	acres	118	69	160	169
Net worth	dollars	$41,644	$26,814	$43,731	$52,219
Liquid assets	dollars	3,845	5,235	9,368	11,354
Current debt:					
real estate	dollars	3,189	1,982	5,980	6,778
total	dollars	3,534	2,315	7,922	6,878
Family labor men	number	1	1	1.38	1
Seasonal labor men	number	.39	0	0	0
Silo capacity	tons	13	49	97	110
1959 Organization					
Crops:					
Corn	acres	13	15	32	31
Sugar beets[c]	acres	10.6	1.9	3.1	4.2
Sugar beet contract[c]	acres	10.6	1.9	3.1	4.2
Other row crops	acres	45	11	18	30
Wheat	acres	24	14	18	21
Wheat allotment	acres	24	15	19	21
Other small grain	acres	10	7	19	26
Alfalfa-brome	acres	11	26	50	38
Permanent pasture	acres	3	9	15	30
Livestock:					
Milk cows	head	0	9	19	14
Dairy cow capacity, present	head	0	16	21	16
Dairy heifers	head	0	4	8	8
Dairy calves	head	0	3	7	9
Beef cows	head	8	0	0	3
Beef animal capacity	head	13	10	15	40
Beef calves	head	3	3	0	2
Sows	number	1	0	0	3
Fall pigs	number	3	0	0	60
Hens and pullets	number	197	495	306	432

(a) Average of farms in each group.
(b) Total number of farms estimated from the 1960 Census. The numbers are probably slightly low since a conservative estimate was used. Proportions among the four farm types were estimated from the survey data and are subject to sampling fluctuations.
(c) Averages may be poor indications since many farms in some groups had no sugar beet acreage.

consisted of the operator and an average of about 3½ months of seasonal labor. There were no facilities for dairy cows on the cash crop farms.

The small dairy farm averaged 69 cropland acres and had facilities for 16 head of dairy cows, but the capacity was not being fully utilized. The cropping program emphasized alfalfa, corn, and wheat with field beans and sugar beets for cash crops of minor importance. The operator furnished all the labor.

The large dairy farm contained 160 cropland acres and facilities for 21 cows. Facilities were being utilized near capacity. The cropping program emphasized alfalfa and corn, with wheat, field beans, and sugar beets of less importance.

The general farm was the largest farm with 169 cropland acres, 16 head of dairy capacity and 40 head of beef capacity. The cropping program consisted of 38 acres of alfalfa, 31 of corn, 30 of field beans, 21 of wheat, 26 of other small grain (mostly oats) and 4 of sugar beets. Most of the general farms had a dairy enterprise and many had other livestock—either beef or pork.

Method of Analysis

The four farm situations were analyzed for profitable changes by an advanced budgeting technique called linear programming.[1] This technique permits a great many enterprise possibilities to be compared and selects those enterprises which utilize the available resources to obtain the highest net income.

The analysis included various cropping and livestock alternatives. Crop alternatives included the

[1]For discussion of this procedure, see any of the standard references such as Dorfman, Robert, Paul A. Samuelson and R. M. Solow (1958). *Linear Programming and Economic Analysis*, McGraw-Hill Book Co., New York. Or Charnes, A., W. W. Cooper and A. Henderson (1953). *An Introduction to Linear Programming*, John Wiley and Sons, New York.

crops common to the area and the purchase of corn or hay within the limits of available capital. The livestock enterprise alternatives included hog production, beef production and dairy, each with several alternative ways of operating. In addition, each enterprise included new technology which is available and might be adopted over the next decade.

Each farm type was budgeted to make the most profitable use of its resources. An important resource restriction was credit. Credit was separated into chattel credit and real estate credit. Chattel credit was used as a means of obtaining cash at a cost of seven percent. This type of credit was limited in its use to short term. It was used for operating expenses such as feed and livestock purchase, etc. Real estate credit was used for building purposes, such as for remodeling or expanding capacity and for purchase of additional land.

Credit Rules

Five situations were analyzed for each farm. These situations differed with respect to the amount of credit available and with respect to the purchase of additional land. The five situations follow:

Situation	Percentage of asset which could be borrowed		Possible to buy extra land?
	Chattel credit	Real estate	
Tight credit	45	40	yes
Medium credit	60	50	yes
Liberal credit	80	65	yes
Very liberal credit	95	75	yes
Fixed farm sizes	60	50	no

In 1961-62, the usual credit restriction of financial institutions was the medium credit rule. A farmer could usually borrow one-half of the market value of real estate and three-fifths of the market value of chattels. At the same time, some short-intermediate term lending institutions were able to extend loans to some farmers for as much as three-fourths to four-fifths of the market value of certain chattel items. Some lenders making real estate loans were able—though not always willing—to loan as much as three-fourths of the value of real estate. Hence, while the medium credit situation of this study was the usual situation in the early 1960's, it would have been possible for some operators to approach the liberal credit situation.

The credit situations could be thought of in either of two ways. First, these could be considered institutional restrictions. In this case, the assumption would be that credit institutions are unable or unwilling to lend more than the stated proportion to farm operators for various purposes. Second, the credit situations could be considered to be self imposed by the farmer. That is to say, the farmer himself might be unwilling to borrow more than the stated credit restriction. In either case the restriction is a real one, and the important point is to find which of the two cases would be the most limiting with respect to the amount of credit a farmer could obtain.

Labor

Labor was divided into three types: family labor, hired seasonal labor, and hired year-around labor. Labor was budgeted by 2-month periods except that January, February, and March were combined into one period and August was a separate period. Seasonal labor could be hired on the cash crop farm up to the amount that had been hired historically. Other typical farms could not hire seasonal labor. Each of the representative farms hired as much year-around labor at wages of $1.70 per hour as was profitable. At this wage, farms were assumed to be competitive for labor with off-farm job opportunities.

Crops

Two types of restrictions were applied to the cropping program. The first was the acreage allotments or contracts associated with wheat and sugar beets. The farms were not allowed to exceed 15 acres of wheat unless the allotment was larger. Sugar beets were limited to historical contracts. Secondly, the acreage of cropland which could be planted to row crops in any one year was limited and depended on the quality of land contained in each of the representative farms.

Price and Yield Assumptions

To analyze profitable changes, it was necessary to make assumptions concerning prices and yields. Conservative price relationships were used with a higher than average level of technology. For the most part, the level of technology assumed for the analysis has not yet been generally attained. In other words, the productivity relationships used in the analysis are *possible*, rather than *current*, relations. Tables 2 and 3 summarize the price and yield assumptions with comparisons. (For other prices, see Appendix Table 1).

Several comments are in order concerning the price assumptions. The wheat price assumption may have been unrealistically low. However, this assumed price was used so that this study would be consistent with studies in other regions. The wheat price assumed discontinuance of government price support programs. With this low wheat price, wheat acreage and profitability may be underestimated in the results.

TABLE 2—Price assumptions with comparisons

Product	Actual prices 1959	1960	1961	Assumed price
Crops:				
Corn	1.04	.99	1.00	1.10
Field beans	5.60	5.90	6.50	6.88
Sugar beets	10.99	14.39	13.35(a)	13.67
Wheat	1.76	1.75	1.73	1.25
Oats	.65	.61	.63	.62
Alfalfa hay(a)	19.00	18.00	19.50	19.00
Livestock:				
Market hogs	14.96(b)	16.25(b)	17.36	14.53
Grade A milk	4.15(b)	4.40(b)	4.40	4.06
Veal calves	28.10	26.10	25.20	28.20
Feeder calves(b)	32.22	28.42	29.75	19.50
Yearling steers(b)	26.62	24.00	24.92	19.50
Steers, choice(b)	27.97	26.52	25.18	22.50

Sources:
(a) Estimated from published data.
(b) Dr. J. N. Ferris, Department of Agricultural Economics, Michigan State University, East Lansing, Michigan.
Other figures are from *Michigan Agricultural Statistics, 1960,* Michigan Department of Agriculture, Lansing, Michigan.

Secondly, the assumed price for alfalfa hay, while within the range of recent prices, is too low if a large amount were needed to be shipped into the region. The prices for beef appear to be overly conservative when compared to 1959-61, but one reason for this is that the beef cycle was on the high price side in 1959-61. With more normal prices, the assumptions would be closer. The milk price is low compared with recent years but may be consistent with increased production expected in the analysis and with trends from 1959-62.

Other Assumptions and Conditions

Each representative farm was budgeted for as many as three possible organizations: first with a beef-cash crop organization, second with a stanchion dairy organization, and third with a parlor dairy organization. All three organizations were considered for the typical small dairy and general farms. The stanchion dairy system was not considered for the cash crop farm. Only the parlor dairy organization was considered for the large dairy farm on the basis of early results from the Lake States Dairy Adjustment Study.

TABLE 3—Yield assumptions with comparisons

Product	Average yield 1959 census	Assumed yield
Corn	51 bu.	80 bu.
Field beans	12 cwt.	16.2 cwt.
Sugar beets	16.6 T.	15.1 T.
Wheat	36 bu.	42 bu.
Oats	57 bu.	74 bu.
Alfalfa hay	2.2 T.	3.4 T.
Feeder hogs		3.6# feed per # gain
Feeder calves		12.2# feed and hay per # gain
Milk		109 cwt. per cow at 2.5:1 grain-milk ratio.

Source: *U. S. Census of Agriculture, 1959, Michigan,* Bureau of Census, Department of Commerce, 1960.

One problem when comparing different systems of farming is deciding which system the operator would choose. It was assumed that the operator would continue under his present system of operation unless the net income from an alternative organization were at least 10 percent greater. A new organization would require new skills, new debts and other risks that a farmer would probably not undertake unless it promised to yield a sizable net income advantage over his present system of operation.

A percentage figure was used because (1) the federal income tax is progressive and would render a constant dollar amount less worthwhile to a high return operator than to a low return operator and, (2) it seemed more realistic to assume that a $1,000 increase in income would provide more incentive to a $4,000 net income per year operator than the same $1,000 would to a $20,000 per year operator.

In the following sections, each typical farm organization and the budgeted changes will be considered in detail. This is followed by a section which reviews the implications of the detailed results for farmers and farm credit people.

THE CASH CROP FARM

Production Organization

In 1959, the average cash crop farm had a few head of beef cows and calves. The typical cropping program ran heavily to field beans, wheat, corn, and sugar beets in that order of importance. The farm interviews indicated that many operators hired seasonal labor on the cash crop farm.

In this study, two alternatives were considered in reorganizing a typical cash crop farm. The first continued with cash crops and beef cattle and considered the possibility of off-farm work. The second reorganized as a parlor-dairy farm. Stanchion dairying was not considered since no dairy facilities were found on the cash crop farms.

Table 4 presents the most likely farm organizations under the various credit situations in comparison with the 1959 organization. Dairying is considered only if profits are 10 percent higher than the beef-cash crop system. Part time farming is superior for both the tight credit and medium credit situations when it is possible to purchase additional land. The parlor-dairy organization would return a higher net income

TABLE 4—Cash crop farm organization for various credit conditions

Organization description	Unit mea.	CREDIT CONDITIONS					
				Medium credit			
		1959 organization	Tight credit	Acreage variable	Acreage fixed	Liberal credit	Very liberal credit
System:		Beef-crop	Beef-crop	Beef-crop	Parlor dairy	Parlor dairy	Parlor dairy
Net farm income[a]	dollars	N.A.	11,655	12,860	13,797	18,251	22,023
Chattel credit	dollars	345	6,190	12,800	11,880	21,320	32,550
Real estate credit	dollars	3,189	19,150	27,615	13,650	24,978	31,962
Annual debt chg.[b]	dollars	N.A.	3,179	5,529	4,087	7,378	10,725
Income after debt[c]	dollars	N.A.	10,058	9,884	11,361	13,864	15,494
Land bought	acres		52	73		25	37
Total acres	acres	121	173	194	121	146	158
Crops							
Corn grown	acres	13	37.7	43.6	42.8	67.1	71.2
Oats grown	acres	10	4.6	14.4		1.8	.9
Wheat grown	acres	24	24.0	17.7			
Field beans grown	acres	45	53.3	59.8	8.0		
Sugar beets grown	acres	10.6	10.6	10.6	10.6	10.6	10.6
Forage grown	acres	14	38.5	43.2	56.4	62.7	70.7[d]
Hay harvested	tons	N.A.	32.5	46.7	65.8	14.5	
Hay bought	tons	N.A.			52.6	176.1	343.6
Corn bought	cwt.	N.A.		135.2			
Livestock							
Beef cows	head	8		3			
Feeders fed	head	N.A.	43	44			
Yearlings fed	head	3	10	40			
Dairy cows	head	0			39	62	87
Milk sold	cwt.	0			4,240	6,729	8,976
Labor							
Labor hired/mo.	hours	N.A.					22
Seasonal labor hired:							
Jan. - Mar.	hours	N.A.		49	115	189	314
Apr. - May	hours	N.A.	121	209	100	142	209
June - July	hours	N.A.	84	119	58		33
Sept. - Oct.	hours	N.A.	180	209	29	49	118
Nov. - Dec.	hours	N.A.		35		3	53
Operator off-farm work per month	hours	N.A.	177	176	71	17	

(a) Taxes, interest on debt and depreciation have been deducted to obtain net farm income.
(b) Annual principal and interest payment with chattel debt amortized over a 5-year period and real estate debt amortized over a 20-year period.
(c) Income after payment of principal on debts. This is the amount available for their investments and family living.
(d) Pasture supplemented with dry lot feeding.
N.A. is not available.

when more liberal credit arrangements are possible or when additional land cannot be purchased. The following sections take up the optimal organizations in more detail under each of the credit situations. (For details on the other alternatives, see Appendix Table 2.)

Tight credit. The beef crop organization under the tight credit situation shows considerable pressure toward an expansion of acreage. This in turn, results in the use of large amounts of real estate credit to purchase approximately 52 acres of land. The crop program emphasizes field beans and corn with the full use of the wheat allotment and sugar beet contract. The livestock organization consists of feeders and yearlings. The forage and corn production is sufficient to carry the livestock enterprise.

The labor situation is particularly interesting because it is profitable for the operator to work off the farm in a full-time job and to hire seasonal labor to work on the farm. This is partly due to the fact that the seasonal labor may be hired at a lower cost per hour than the operator himself obtains in off-farm employment. Also, the operator would have time to supervise his seasonal labor and put in time himself after hours. This type of arrangement could create difficulties with untrained seasonal labor, but many farms were found to be doing this in 1959.

Net income under the tight credit situation would be $11,600 and income after payment of the debt commitments would be about $10,000.

Medium credit. Increasing credit availability results in the purchase of more land and an enlarged beef feeder operation. Under the medium credit situation the beef crop organization would return nearly $13,000 of net farm income. Seventy-three acres of land would be purchased to add to the farm size and this, in turn, would result in the use of $27,600 of real estate credit. The income after meeting the debt commitment would be lower than under the tight credit situation for the first few years because of the larger principal repayment required on the increased credit obtained.

The cropping program under the medium credit situation would run heavily to field beans, corn and forage. The wheat allotment would not be completely utilized, and over 14 acres of oats would be grown. Probably, with a more realistic wheat price, less oats and more wheat would have resulted.

The livestock enterprise would again emphasize beef feeders and yearlings, and it would be necessary to purchase almost 7 tons of corn in addition to the corn grown on the farm.

The best work arrangement would still be for the operator to work off the farm full time and hire seasonal labor to supplement his own after work time.

Farm size fixed. If the purchase of additional land under the medium credit situation was not possible, the optimal organization turns out to be parlor-dairy. Real estate credit would be used completely for constructing housing and other dairy facilities. The estimated net income would be approximately $13,800 and after the debt commitment this would amount to about $11,400. Dairying is the preferred organization because the beef-crop organization depends greatly on the purchase of additional acreage. Without additions of acreage, the dairy organization is more than 10 percent larger in income.

Under the parlor-dairy situation, the cropping program would change a great deal. The new emphasis would be on forage and corn with relatively little emphasis on wheat, field beans and oats. The operator would need to purchase over 50 tons of hay to supply sufficient forage for the 39 dairy cows that could be carried on the farm.

Seasonal labor would be hired as before but the operator would need to put more than half of his time on the farm and could work in an off-farm job slightly less than half-time if such were available. Probably with a dairy enterprise, he would choose to farm full time and hire less seasonal labor rather than attempt to work off the farm half time.

Liberal credit. With liberal credit, the parlor-dairy organization would produce a net farm income in excess of $18,000 per year. To do so would require over $46,000 of credit. The income after debt commitments were met would amount to almost $13,900 per year. For all practical purposes, the operator's labor would be fully utilized on the farm. Evidently with the assumptions of the analysis, parlor dairy is the most profitable capital intensive enterprise for this area of Michigan.

The cropping program runs largely to corn and forage. Field beans and wheat would not enter the rotation, but it would be necessary to purchase a rather large tonnage of hay. If the hay could be purchased in the amounts indicated, the farm could support a herd of 62 cows.

Very liberal credit. With very liberal credit, over $64,000 of credit would be utilized to return a net income of $22,000 per year. After meeting an annual debt commitment of almost $11,000 for principal and interest, a net income after debt commitment of nearly $15,500 would be obtained. The cropping program would consist mostly of corn and forage, and the forage would be grossly insufficient to care for the 87 cows that would be kept on the farm. It would be necessary to purchase over 340 tons of hay each year to provide adequate feed for the dairy enterprise. From a practical standpoint, it is unlikely that very many farms in the area could purchase feed in quantities such as this.

An operation of this size would require additional hired labor besides the operator and the seasonal labor used for the other credit situations.

Implications for Cash Crop Farmers

With the modern technology and prices assumed in this study, favorable incomes are possible from the resources found on the cash crop farm. Net incomes from $11,600 for a beef-crop organization under tight credit to over $20,000 for a parlor dairy organization under very liberal credit arrangements were shown to be possible. To achieve such incomes requires considerable credit for this type of operation. Over $25,000 of chattel and real estate credit would be required for the $11,600 income and over $64,000 would be required for a $22,000 net income under the parlor dairy organization. The figures also imply that, to go into a parlor dairy organization, one ought to have enough credit to put him into a rather good sized business in order to achieve an income up in the $18,000 to $22,000 range.

If the cash crop farm could add acreage to achieve a more economical size of operation, the most probable choice of enterprise would be a beef crop organization. A beef crop organization with proper layout and less than 195 acres would allow the operator to work off the farm full time if some seasonal or family labor were available to help with the farming operations.

If the operator could not find off farm work or if extra farm labor were not available, it is likely that a higher income could be obtained by organizing the farm into a parlor dairy. However, such organization would require over $25,000 of credit with almost half of the credit on a short time (chattel) basis. In fact, it is likely to be chattel credit which is most limiting for a dairy organization unless quite liberal credit arrangements are available.

It is likely that those farmers who voluntarily limit their credit, as well as those who are unable to get large amounts of credit, will tend to organize as beef-cash crop farmers. Other farmers who are willing and able to get large amounts of credit may wish to build into a parlor dairy operation.

To the extent that sugar beet contracts and wheat allotments are negotiable or subject to bargaining, such contracts or allotments will tend to move to the beef-cash crop operations and away from dairy farms. Information from other phases of this study suggests that some of the best farm land in the area might sell for prices approaching $1,000 per acre to cash crop farmers operating under a beef-crop set up. Even the more rolling land in the area could sell for as much as $200 to $400 per acre for dairy organizations.

THE SMALL DAIRY FARM

Production Organization

In 1959, the average small dairy farm contained 78 cropland acres of which 69 were tillable according to the farm interviews. Stanchions were available for 16 cows and an average of nine cows were milked. The cropping program emphasized pasture, corn, and wheat, with a few beans, other small grains, and sugar beets. The labor was furnished completely by the operator. Often the small dairy farm was owned and operated by an older than average family.

Three alternatives were considered for the small dairy farm. First, a stanchion-dairy setup was considered. Second, it was budgeted as a parlor dairy, but this required the building of new facilities. Third, it was budgeted without a dairy enterprise.

Table 5 presents the most likely organization under the different credit situations. (For the other alternatives, see Appendix Table 3.) The stanchion dairy system appears to be the better organization for the tight and medium credit situations. However, for the liberal and very liberal credit situations, parlor dairy is sufficiently more profitable than the stanchion dairy to make it worthwhile to build new parlor facilities. With limited credit, it would not be possible to build enough new facilities for a profitable size parlor dairy.

The sugar beet acreage deserves comment. The 1.9 acre contract is an average for all the farms from which this typical farm emerged. Obviously, it would not be profitable in practice for this representative farm to raise 1.9 acres of sugar beets. Rather, the result should be interpreted to mean that sugar beets are a profitable crop for a farm with the specialized equipment needed and with a contract. Without the sugar beet machinery, a farm might not raise beets.

Tight Credit

Under the tight credit situation the stanchion dairy organization would produce a net farm income of $9,970. This requires chattel credit in the amount of $5,100 and real estate credit in the amount of $9,180. Approximately one-third of the real estate credit is used to purchase 16 acres of additional land. Income after debt commitment is about $8,800.

The cropping program shows an intensification with almost 31 acres of field beans being produced and 22 acres of corn. Only 9 acres of the wheat allotment would be planted. With this emphasis on row crops it is necessary for the operator to purchase about 62 tons of hay and over 100 hundredweight of corn to feed the 23 dairy cows.

Medium Credit—Acreage Variable

Under the medium credit situation the stanchion dairy organization would produce a net farm income of almost $10,500. This net income would require over $21,000 of credit and would leave an income after debt of about $8,600 which is actually slightly less than the income after debt with the tight credit situation. The difference, of course, is that assets are being accumulated more rapidly with the greater principal repayment under medium credit. Twenty-five acres would be purchased to give the farm a total of 94 acres.

The cropping program would be very similar to the cropping program under the tight credit rule. Field beans, corn, and wheat would be emphasized. As before, it would be necessary to purchase a large part of the forage and corn from off the farm to feed the dairy herd.

The livestock program would consist of 24 dairy cows with a few yearling steers fed on the side to utilize extra labor and facilities. This intensity of

TABLE 5—Small dairy farm organization for various credit conditions

Organization description	Unit mea.	CREDIT CONDITIONS					
		1959 organization	Tight credit	Medium credit		Liberal credit	Very liberal credit
				Acreage variable	Acreage fixed		
System:		Stanchion dairy	Stanchion dairy	Stanchion dairy	Stanchion dairy	Parlor dairy	Parlor dairy
Net farm income(a)	dollars	N.A.	9,970	10,443	9,998	13,443	15,729
Chattel credit	dollars	333	5,100	8,590	8,300	15,270	23,170
Real estate credit	dollars	1,982	9,180	13,055	8,680	12,645	14,322
Annual debt chg.(b)	dollars	N.A.	2,044	3,233	2,781	4,826	6,900
Income after debt(c)	dollars	N.A.	8,834	8,595	8,319	10,445	11,310
Land bought	acres		16	25		6	5
Total acres	acres	78	94	103		84	83
Crops							
Corn grown	acres	15	22.1	24.7	27.1	43.9	44.1
Oats grown	acres	7				5.4	5.9
Wheat grown	acres	14	9.1	9.6	2.5		
Field beans grown	acres	11	30.9	33.8	11.0		
Sugar beets grown	acres	1.9	1.9	1.9	1.9	1.9	1.9
Forage grown	acres	35	19.8	22.9	26.2	22.9(d)	21.6(d)
Hay harvested	tons	N.A.	9.7	16.6			
Hay bought	tons	N.A.	61.9	62.6	101	224	360.2
Corn bought	cwt.	N.A.	108.6	495	336		
Livestock							
Yearlings fed	head	3	2	18			
Dairy cows	head	9	23	24	32	49	67
Milk sold	cwt.	N.A.	2,455	2,590	3,489	5,226	6,744
Labor							
Labor hired/mo.	hours	N.A.			9	4	61
Operator off-farm work/mo.	hours	N.A.	22				

(a) Taxes, interest on debt, and depreciation have been deducted to obtain net farm income.
(b) Annual principal and interest payment with chattel debt amortized over a 5-year period and real estate debt amortized over a 20-year period.
(c) Income after payment of principal on debts. This is the amount available for their investments and family living.
(d) Pasture supplemented with dry lot feeding.
N.A. is not available.

operation would completely utilize the operator's labor, but it would not be necessary to hire additional labor from off the farm.

Medium Credit—Acreage Fixed

With farm size limited to the beginning 69 acres the stanchion dairy organization would produce a net income of about $10,000. This level of profit would require about $17,000 of credit, with about half of the total credit being chattel (short term) credit. The income after principal repayment would amount to about $8,300.

With only 69 acres in the farm, the cropping program shifts to emphasize corn and forage. Field bean acreage is down to 11 acres. Wheat is practically eliminated. It is necessary to purchase a very high proportion of hay and corn from off-the-farm sources.

The livestock program would be intensified to compensate for less land with 32 head of dairy cows. The 32 dairy cows would fully utilize the operator's labor, and it might be necessary for him to hire supplemental labor for a day each month.

Liberal Credit

Under the liberal credit situation, the small dairy farm would build parlor dairy facilities and could produce $13,440 of net farm income. Almost $28,000 of credit would be needed to give this size net income and $15,000 of the $28,000 would be in the form of short-term chattel credit. However, the income after debt of $10,400 would be larger than the comparable income for any of the stanchion dairy organizations with tighter credit situations. Only six acres of land would be purchased.

With liberal credit, the cropping program shifts almost entirely to corn and forage. The forage would be insufficient even for pasture. Hay would be needed to supplement the pasture during the summer as well as for the winter feeding. An estimated 224 tons of hay must be bought from off-the-farm sources, but

all the corn necessary for the 49 cows could be produced on the home farm from 44 acres of corn.

Labor requirements for the 49 cows could be met essentially by the operator's own labor.

Very Liberal Credit

With very liberal credit arrangements, credit of $37,000 would be used to return a net farm income of about $15,700. Over two-thirds of the total credit would be in the form of short-term chattel credit. Income after debt commitment in the first few years would be about $11,300.

The cropping program would run almost completely to corn and forage. The corn would be sufficient to cover the corn requirements for the dairy herd, but the forage would need to be supplemented, even on pasture, to the extent of 360 tons of hay each year.

The livestock system would consist of 67 dairy cows. This size herd would require approximately 61 hours of additional farm labor per month or the equivalent of about one-third to one-half a man per month.

Implications for Small Dairy Farmers

With the assumptions of this study, the small dairy farm could provide a net farm income of $9,900 upwards to $15,000. To provide income of these magnitudes would require large amounts of credit—over $14,000 to achieve a $9,900 income and about $37,500 to organize as a parlor dairy and achieve the $15,000 net farm income.

It appears that a stanchion dairy enterprise organization would be the likely organization if, because of either internal or external credit rationing, the operator is relatively limited in his access to credit.[2] There would be pressure to expand the farm size to 90 or 100 acres to more fully utilize the operator's time and resources. Under the stanchion operation there is a tendency to produce some cash crops while at the same time purchasing considerable hay and corn from off the farm.

This suggests that for this size and type of operation it is not profitable for the small dairy farm operator to attempt to grow his own forage and feed when corn can be bought at $1.20 per bushel at the farm and hay at $19 per ton delivered. Rather, the operator would market his labor through cash crops and dairy herd management practices and purchase the needed extra feed from off the farm. With the farm plan described under the tight-medium credit situations a relatively small farm of 85 to 100 acres can be intensive enough to market the full time labor of the operator.

If the small dairy farm operator is willing and able to get sufficient credit, a higher net farm income is possible under a parlor dairy organization. But this higher income requires $28,000 or more of credit on a farm operation which had only about $27,000 of farm assets to start with. Hence, if sufficient credit is not available to move into a parlor operation of economical size, both the farmer and the lender would be well advised to make adjustments within the stanchion organization or within existing resources. However, with enough available credit, a relatively favorable net farm income is possible under the parlor organization.

The farm interviews indicated that older operators tended to be associated with the small dairy farm; so probably few of the small dairy farms will organize as parlor operations. Instead it is expected that the stanchion dairy with cash cropping will continue to be the predominant type of organization.

THE LARGE DAIRY FARM

Production Organization

In 1959, the average large dairy farm had a herd of 19 dairy cows with capacity on the farm for 21 head. The cropping program emphasized forage, corn, wheat, other small grains, probably oats, and field beans. On the average, the large dairy farm held a sugar beet contract of just over 3 acres although this probably represents some farms which had substantially more sugar beet acreage and many others which had none. The labor available to the large dairy farm amounted to about 1.4 men—or the equivalent of the full time labor of the operator and the part time labor of a son in high school.

From information in the Lakes States Dairy Adjustment Study, it was found that the parlor dairy enterprise organization would be the only relevant alternative to consider given the resources on the large dairy farm. The parlor dairy is generally superior to a stanchion organization for an operation this large. Since dairy facilities are already present, a dairy enterprise would return more than a beef or crop organization.

The optimal production organizations of the large dairy farm are presented in Table 6. In general, the organizations under the parlor dairy are intensive dairy production organizations. Net farm income ranges upward from $20,000. Little additional land would be purchased for any of the credit situations. Instead, real estate credit is used to improve buildings and facilities.

[2] Probably with lower milk prices than assumed in this study, the small dairy operator would organize to produce cash crops or beef and work off the farm.

TABLE 6—Large dairy farm organization for various credit conditions

Organization description	Unit mea.	1959 organization	CREDIT CONDITIONS: Tight credit	Medium credit: Acreage variable	Medium credit: Acreage fixed	Liberal credit	Very liberal credit
System:			Parlor dairy system for all credit situations				
Net farm income(a)	dollars	N.A.	20,112	22,765	22,680	27,216	31,254
Chattel credit	dollars	1,942	10,280	17,010	17,010	29,450	44,200
Real estate credit	dollars	5,980	10,720	13,935	12,810	20,160	21,685
Annual debt chg.(b)	dollars	N.A.	3,486	5,364	5,266	8,941	12,670
Income after debt(c)	dollars	N.A.	17,989	19,428	19,373	21,546	22,979
Land bought	acres		0	3	0	12	6
Total acres	acres	175	175	178	175	187	181
Crops							
Corn grown	acres	32	57.6	81.9	80.3	87.2	87.5
Oats grown	acres	19	0	0	0	.4	2.1
Field beans grown	acres	18	22.7	0	0	0	0
Sugar beets grown	acres	3.1	3.1	3.1	3.1	3.1	3.1
Forage grown	acres	65	76.7	78.1	76.7	81.0(d)	73.0(d)
Hay harvested	tons	N.A.	81.6	54.1	45.6	0	0
Hay bought	tons	N.A.	51.2	133.9	141.0	348	616.2
Grass silage	tons	N.A.	32.3	8.2	13.2	32.3	15
Corn silage	tons	N.A.	0	72.4	57.3	0	0
Livestock							
Dairy cows	head	19	52	70	69	97	130
Milk sold	cwt.	N.A.	5,701	7,609	7,558	10,202	12,993
Labor							
Labor hired/mo.	hours	N.A.	0	0	0	64	168
Operator off-farm work/mo.	hours	N.A.	64	20	23	0	0

(a) Taxes, interest on debt, and depreciation have been deducted to obtain net farm income.
(b) Annual principal and interest payment with chattel debt amortized over a 5-year period and real estate debt amortized over a 20-year period.
(c) Income after payment of principal on debts. This is the amount available for their investments and family living.
(d) Pasture supplemented with dry lot feeding.
N.A. is not available.

Tight Credit

Under the tight credit situation, $21,000 of credit would be needed to produce a net farm income of $20,000. This would leave an income after debt commitment of almost $18,000.

The cropping program would run heavily to corn and forage with a few acres devoted to field beans. The forage production would not be quite large enough to furnish the needs of the dairy herd, and it would be necesary to purchase an estimated 50 tons of hay.

The livestock enterprise would consist of 52 dairy cows. A herd of this size would not quite require all the labor available to the large dairy farm. The operator could work off the farm as much as 64 hours per month if such part time work were available.

Medium Credit—Acreage Variable

Under the medium credit situation the parlor dairy system could produce a net farm income of nearly $23,000 but $30,000 of credit would be needed. There is little tendency to purchase additional land although the analysis indicated that 3 acres of additional land could be profitably employed. In practice, of course, purchase of a parcel this small is out of the question.

The cropping program runs almost entirely to corn and forage. The field beans which were profitable under tight credit have completely disappeared. Over 80 tons of silage would be harvested, the largest share of it, corn silage. Even so, the forage would not meet the demands of the dairy herd, and it would be necessary to buy about 134 tons of hay from off the farm.

The livestock program would consist of 70 dairy cows with replacements. A small amount of excess labor would exist on the farm.

Medium Credit—Acreage Fixed

With the farm size under the medium credit rule, the organization would be very similar to that found with acreage variable since little additional land was purchased.

The cropping rotation would consist almost entirely of corn and forage. A considerable amount of silage would be harvested as before and it would be necessary to purchase over 140 tons of hay from off-farm sources.

The livestock enterprise would consist of 69 cows and this would leave an excess of approximately 23 hours of labor each month.

Liberal Credit

Under the liberal credit condition, a net farm income of over $27,000 could be produced from credit usage of about $50,000. About three-fifths of the credit would be in the form of chattel credit on a relatively short-term basis. Only a nominal amount of extra land, 12 acres, would be purchased.

The cropping program emphasizes corn and forage. At this point the acreage in forage would be too small to cover even pasture requirements. Hence, there would be no hay harvested on the farm and a part of the purchased hay would have to be used to supplement pasture. It would be necessary to purchase an estimated 350 tons of hay from off-farm sources.

The livestock program would consist of almost 100 cows, and the labor requirements for a dairy herd of this size would require approximately 64 hours per month of additional hired labor. This could come from either additional family labor or from part-time hired help.

Very Liberal Credit

Under conditions of very liberal credit, the large dairy farm could utilize credit of over $65,000 to produce a net farm income in excess of $31,000 per year. Over two-thirds of this credit would be in the form of chattel credit. Even with the large annual debt commitment of over $12,000 there would be income after the debt commitment of almost $23,000 per year. As shown by the small added acreage, there is evidently little pressure toward farm expansion on the large dairy farm with a parlor dairy enterprise.

Under these liberal credit conditions the cropping program does not come close to producing the amount of forage that would be needed for the 130-cow dairy herd. The operator would specialize in dairy herd management and buy most of the forage from off the farm. It is estimated that over 616 tons of hay would need to be purchased in order to adequately feed the dairy herd.

To care for the 130 dairy cows would require the hiring of another full time man. Total labor on the farm would be approximately 2.4 men the year around.

Implications for Large Dairy Farmers

Under the price and technological assumptions of this analysis, the large dairy farm could provide a very favorable income to its operator. Indications were that a net farm income of over $20,000 could be obtained by using about $21,000 of additional credit. Considering that the average large dairy farm net worth was near $44,000, then $21,000 of credit for expansion should be relatively easy to obtain.

Probably few operators—or lenders for that matter—would be willing to finance the large dairy operation to the extent shown under the very liberal credit situation. This would require a very large credit obligation as well as a need to purchase very large quantities of hay from off the farm. Probably a supply of hay such as needed could not be found at the prices assumed.

The analysis suggests that a one-man operation under parlor dairy could handle about 50 cows to fully utilize the operator's labor. Probably a full time operator with a son of high school age could handle about 70 to 75 cows.

Judging by the labor figures, a 100 to 110 cow dairy herd organized with modern know-how would fully utilize the labor of two full time men on a farm of 170 to 175 tillable acres. If the acreage were increased sufficiently to grow all their own forage on the farm, additional labor would be needed at peak work seasons of the year. When credit is very limiting, it is economical to grow field beans as a cash crop, even in an intensive dairy operation such as that shown.

THE GENERAL FARM

Production Organization

At the time of the 1959 farm interviews, the general farm averaged 14 milking cows, three beef cows, two beef calves and 60 head of fall pigs. The cropping program had 38 acres of forage, 31 acres of corn, 30 acres of beans, 21 acres of wheat, 26 acres of other grain (probably oats) and over 4 acres of sugar beets. The operator spent full time on the farm. The net worth for the average general farm was over $52,000, the highest of the four representative farms.

All three alternatives were compared for this farm since the stanchion facilities were already present on the farm. However, with the credit available to this operation, the parlor dairy enterprise was the high income organization for all credit situations analyzed. The organizations under the various credit situations

are shown in Table 7. (For other alternatives, see Appendix Table 4.) These are considered in more detail under each credit situation.

Tight Credit

Under the tight credit situation, the general farm could produce a net farm income of $20,400 with a parlor dairy enterprise system. This return would require the use of about $26,000 of credit. Only a little additional land would be purchased under the tight credit situation.

The cropping program would run heavily to corn and forage with field beans and sugar beets grown as a cash crop. About three-fifths of the hay needed would be produced on the home farm and about 64 tons would have to be bought from off the farm.

The livestock herd amounts to 62 cows. Labor needs for this size of operation require 72 hours of off-farm labor to be hired each month. This is roughly the equivalent of a half-time man.

Medium Credit—Acreage Variable

Under medium credit rules, the parlor dairy enterprise could return a net farm income of over $23,500 using credit of $38,000. Some of the increased credit compared with the tight credit rule is used to purchase additional land. However the 14 acres purchased is still relatively small and is too small to be practical.

The cropping program would emphasize corn and forage. With the increase in cow numbers under medium credit, it would be necessary to buy over 150 tons of hay from off the farm.

The livestock enterprise consists of 80 cows and would require 120 hours per month of additional hired labor or roughly two-thirds of a man the year around.

Medium Credit—Acreage Fixed

Without the possibility of purchasing additional land, net farm income would still be maintained at near $23,000 and this income would require use of about $32,000 of credit.

The cropping program would still emphasize corn and forage, but a larger proportion of the forage would need to be purchased from off the farm.

TABLE 7—General farm organization for various credit conditions

Organization description	Unit mea.	CREDIT CONDITIONS					
				Medium credit			
		1959 organization	Tight credit	Acreage variable	Acreage fixed	Liberal credit	Very liberal credit
System:		Parlor dairy system for all credit situations					
Net farm income(a)	dollars	N.A.	20,401	23,579	22,902	29,029	34,166
Chattel credit	dollars	100	11,820	19,140	18,830	33,080	50,320
Real estate credit	dollars	6,778	14,084	19,015	13,850	28,770	35,489
Annual debt chg.(b)	dollars	N.A.	4,111	6,326	5,799	10,576	15,367
Income after debt(c)	dollars	N.A.	17,962	19,734	19,252	22,495	24,451
Land bought	acres		6	14	0	32	33
Total acres	acres	199	205	213	199	231	232
Crops							
Corn grown	acres	31	67.6	89.4	84.0	105.8	107.7
Oats grown	acres	26	0	0	0	2.8	3.5
Field beans grown	acres	30	20.3	0	0	0	0
Sugar beets grown	acres	4.2	4.2	4.2	4.2	4.2	4.2
Forage grown	acres	68	82.2	90.4	81.0	87.6(d)	86.0(d)
Hay harvested	tons	N.A.	93.8	95.9	66.6	0	0
Hay bought	tons	N.A.	64.0	157.6	183.9	391.6	684.5
Grass silage	tons	N.A.	36.6	0	0	0	0
Livestock	head	14	62	80	79	112	151
Dairy cows							
Milk sold	cwt.	N.A.	6,707	8,754	8,512	11,847	15,191
Labor							
Labor hired/mo.	hours	N.A.	72	119	107	218	343

(a) Taxes, interest on debt, and depreciation have been deducted to obtain net farm income.
(b) Annual principal and interest payment with chattel debt amortized over a 5-year period and real estate debt amortized over a 20-year period.
(c) Income after payment of principal on debts. This is the amount available for their investments and family living.
(d) Pasture supplemented with dry lot feeding.
N.A. is not available.

Under this credit rule, 79 cows could be carried on the general farm and additional labor of slightly over 100 hours per month would be required.

Liberal Credit

An income of about $29,000 could be produced on the general farm under the liberal credit situation. This income would require credit usage of over $61,000. Part of the credit would go to purchase an additional 32 acres of land. The cropping program, as before, would run heavily to corn and forage. Hay would come entirely from off-farm sources. It would be necessary to purchase about 392 tons of hay. Part of this purchase would be used to supplement the pasture.

Under the liberal credit situation, the general farm could move up to 112 dairy cows. However, to carry a herd this large would require that 218 hours of additional labor be purchased each month. This amounts to about one and one-quarter man equivalents of hired help each month.

Very liberal credit. For the very liberal credit rule, the general farm organization would return over $34,000 of net farm income but would require credit in excess of $85,000 to do so. Over $50,000 of this $85,000 total credit would be in the form of chattel credit or short-term credit. This in turn would be reflected in an annual debt commitment of principal and interest amounting to over $15,000. Income after debt would be $24,400. Thirty-three acres of land would be purchased to add to the beginning operation.

The cropping program would continue to be very intensive with emphasis on corn and forage. The forage would be completely utilized for pasture. Even then, it would be necessary to supplement the pasture with hay feeding. It would be necessary to purchase an estimated 684 tons of hay from off-farm sources.

The livestock herd under the very liberal credit arrangements would consist of approximately 151 dairy cows. To handle this many cows would require the hiring of two full time men in addition to the operator.

Implications for General Farm Operators

With the assumptions of this analysis, the general farm is perhaps in the most favorable position of any of the four representative farms. This is because it is large enough to carry on an economic size of business, and according to the farm interviews, has access to greater amounts of credit than the other farms. In fact, the general farm actually appears in a better position to go into a parlor dairy organization than the large dairy farm.

The analysis indicated that a parlor dairy organization would offer the higest income opportunity for the resources found on the general farm. Net farm income of over $20,000 could be achieved with credit usage of about $26,000. However, to move into a specialized parlor dairy organization would require hiring additional labor unless family labor were available.

The results suggest that operators who are unable or unwilling to obtain credit in excess of the tight credit rule might find it profitable to grow field beans and purchase some of their hay from off-farm sources. There was no indication from the analysis as to how much of an increase in the price of hay would be needed before the general farm would produce its own hay rather than purchasing it from off-farm sources.

GENERAL IMPLICATIONS OF THE STUDY

Previous sections of this report summarize the optimal organizations for four representative farms from the Thumb, given the average resources on the farms in 1959. Each farm was analyzed under different credit availabilities. This section of the report interprets the optimal organizations and draws implications for farmers and farm credit people.

Before drawing any implications from this study, it might be well to consider how well the assumptions of the study describe reality. Interpretations and implications of the results must be examined in this light. If they are not, rather erroneous conclusions could result.

Several critical assumptions underlie the foregoing analysis. First, it is assumed that farmers desire to make the highest profit possible. This assumption is relaxed to the extent that we felt the typical farms would not change enterprises unless the new enterprise would give at least a 10 percent increase in net income over their present organization. As a matter of fact, though, all farmers are not profit maximizers. Security, independence, and satisfactions of rural living are other motivations of prime importance to many farm operators. But given the same security or independence, probably a higher net income is preferred to a lower net income. Hence, while this assumption is not completely accurate, it is believed to describe the motivations of enough operators to be useful in the analysis.

Second, we assumed that farmers can and will achieve a rate of technology somewhat more efficient than was achieved in 1959-60. There is little question about whether the level of assumed technology can be reached. Some farmers in the area have already

achieved the assumed technology. The important question is when the average farmer in the area will achieve the assumed level. On the basis of the recent rate of technological advance on farms, the assumed level of technology could well be achieved on the average by 1965 to 1967 for crop yields. It is entirely possible that milk production per cow will achieve the assumed rate of output even before 1965. In general, the assumed technology is expected to be descriptive of average technology of about 1965-67.

Third, price assumptions are likely to be in error by varying degrees. In this respect, however, relative prices are more important than absolute prices. In other words, a milk price which is 20 percent too high with a hay price 20 percent too low is more serious than if both prices were 20 percent too high, since in the latter case, the ratios are approximately correct. Undoubtedly, some of the price assumptions are in error. With less than perfect foresight, it could not be otherwise.

By 1962, several assumed prices were suspect. The wheat price of $1.25 per bushel is likely too low. Probably, this would not affect the organizations shown for the parlor dairy operations, but it is probable that more wheat would have been indicated for the cash crop and small dairy farms with an assumed price of say, $1.75. Second, the price assumed for hogs was probably too low. However, results from other analyses in the Lake States Dairy Adjustment Study indicated that hogs would not be competitive even at an average hog price of $16.20.[3] Finally, the assumed prices for feeder calves and yearling steers may have been unrealistically low, but, in light of the results on the various farms at the assumed prices, probably a higher price would result less in organizational changes in farms than in a slight change in net income on the cash crop farm. In addition, the assumed price may be less in error than is suggested by a comparison with 1959-61 prices since the cattle cycle was on the high price side in 1959-51.

Finally, it was assumed that the farm operator could hire or purchase as many farm inputs as was profitable at the given price. In addition, it was assumed that farms could sell all their production at the given prices. This may be unrealistic for several items. The amount of hay some farms were shown to need could probably not be obtained for the prices shown. Perhaps with higher hay prices, some of the farms would grow more of their own hay—or maybe hay could be a profitable cash crop for the non-livestock farms. The assumption of a constant milk price may be open to question, too. It is unlikely that the milk price would be unaffected if production such as is indicated did occur. It is somewhat more likely that rather strong downward pressure on milk price would occur or surplus problems would surely result.

What is the meaning of this discussion about assumptions? It is simply that the reader should know of the underlying premises which were necessary to carry out this analysis. Because the assumptions may be somewhat in error, the results and the following implications should not be accepted as projections or estimates of exactly what farming will look like in 1965, 1966, or 1967. Rather, the results should be interpreted as suggesting how change may occur. They should be interpreted as suggestive of the trends and directions in which farming will move and of the credit needs that will accompany this movement. In short, the implications which follow are general indications rather than specific predictions.

Implications for Individual Farm Operators

1. Results from this study indicate that relatively favorable incomes are possible for four typical types of farms found in the Michigan Thumb if the operator is able to obtain an up-to-date level of technological efficiency. Net farm incomes of about $10,000 per year and higher could be obtained on farms as small as 80-100 acres.

2. To achieve incomes in the amount of $10,000 and higher by the average operator will require a *willingnes* and *ability* to use fairly large amounts of credit. Typically, this increased use of credit will be needed to intensify the operation to more fully utilize the labor and other resources available to the farm. While returns above cost on the increased credit usage were generally lower on the cash crop and small dairy farms, the return was typically near 10 percent or higher even for the cash crop and small dairy farms.

3. The analysis suggested that cash crop farm operators will be under considerable pressure to enlarge their acreage to something aproaching at least 170 to 190 acres. The cash crop operation will tend to be a beef feeding and cash crop set up. A rather large acreage of corn will be grown to feed the beef, and cash crops will consist of sugar beets, field beans and possibly, wheat. Probably a high proportion of cash crop farmers will seek off-farm jobs and will farm part time.

4. Dairy enterprises have substantial possibilities for becoming more intensely operated, but to increase the

[3] McKee, Dean E. (Feb., 1962). The competitive position of the dairy enterprise in farming, thumb area of Michigan. Department of Agricultural Economics, Mich. State Univ., Ag. Econ. 861.

intensity of the operation requires large amounts of credit. Given sufficient credit, the parlor dairy operation on a larger than average farm can provide a relatively high net farm income.

5. Small dairy farmers who presently have stanchion facilities may prefer to continue with a stanchion type of operation rather than to borrow a great deal of money to invest in a parlor dairy organization. This would be true especially for operators who might be in their late 50s or older since these operators might be less inclined to undertake a large debt commitment when approaching retirement age.

6. Part time farming is expected to continue to be important as a source of income for many cash crop farmers. Whether a cash crop farmer will desire off farm work will depend to some extent on whether he has a sufficiently large operation to require his full time on the farm or, if not, whether he is *willing* and *able* to obtain enough credit to build a sufficient size of business to market his own labor through his farming enterprises.

7. Cash crop farmers are expected to be able to outbid dairy farmers for the best quality land in the area. This is to be expected since the cash crops require high quality land to get high yields. On the other hand, dairy farms can utilize lower quality land by growing forage.

Implications for Farm Credit People

1. Well organized and well managed farms in the Michigan Thumb can be profitable businesses. Such operations like many other businesses will require considerable amounts of credit. With the increasing amounts of credit needed on farms, lenders will need to become more adept at evaluating farming enterprises. It will be to his advantage that the farm lender be able to evaluate whether the farmer is achieving or will be able, with a new plan, to achieve an up-to-date, competitive level of technology. Profits and repayment capacity are likely to be diminished for those farmers who cannot keep up with the improving level of technology.

2. To finance existing farm operations into more productive and better paying propositions will require large amounts of credit. If, on the average, farms in the thumb borrowed 40 percent on real estate and 50 percent on chattels, it would require almost four times as much credit as was estimated to be outstanding in this region in 1959. While this much change is unlikely to occur within a matter of only 2 or 3 years, the trend in credit usage is likely to be strongly upward. Another factor which reinforces this observation is that considerable opportunity was shown for capital to be substituted for land and labor on the representative farms. Then too, this quantity of credit is completely apart from the amounts that are needed to finance transfers from one generation to another.

3. In general, returns to capital are favorable on well organized farms. In many cases, the return above costs per dollar of credit ranged from 10 to 20 percent at the margin. This also suggests that, as farmers become aware of possibilities for applying new technology and equipment to their operation, the demand for credit will increase.

4. This analysis used 5-year repayment terms for chattel credit items. Even then, there were occasions on the representative farms where the income after debt commitment was well below the net farm income. To shorten maturities on some of the chattel items (such as equipment or breeding stock) to 2 or 3 years could well have the effect of keeping the farmer from making a profitable investment with a good rate of return. With a secure loan, a good operator, and a profitable investment possibility, there appears to be good reason for having terms of 5 years or even more available for many chattel items.

5. To finance a parlor dairy enterprise requires large amounts of capital. The figures in preceding tables suggest that, to finance a cash crop or small dairy farm into a parlor dairy set up, the lender should plan to extend a considerable amount of capital to the farmer or else not attempt to finance him at all. That is to say, it might well be more profitable to finance a different enterprise if credit is limiting than to under-finance a parlor dairy enterprise. In restricted credit situations, beef, cash crops and stanchion dairy enterprises were inclined to be more applicable for the farms than was the parlor dairy enterprise.

ACKNOWLEDGMENTS

In the early summer of 1959, a survey was made of 362 Southern Michigan commercial farmers. These data were gathered for use in the Lake States Dairy Adjustment Study, a cooperaive project of the Michigan Agricultural Experiment Station and the Agricultural Adjustments Branch, Farm Economics Division, Economic Research Service, USDA. Dr. Dean E. McKee was in charge of the Michigan phase of the project.

The survey information was used to describe farms which represented typical operations for five different areas of the state. These representative farms were then analyzed for profitable adjustment possibilities.

The present study used the same representative farms as the Lake States Dairy Adjustment Study as a basis for analysis. Slight modifications in the method of analysis

were made to allow a more complete study of the financial problems of making adjustments in farm businesses.

The author wishes to express his appreciation to Dr. Dean E. McKee, Dr. George D. Irwin, and the Agricultural Adjustments Branch for making the data available and for other assistance at various phases of this study. Appreciation is expressed also to the Michigan Rural Rehabilitation Corporation from whom a grant was received to help support this research.

APPENDIX

APPENDIX TABLE 1—Product and factor prices

Seasonal labor	$ 1.13/hr.
Year around labor	1.70/hr.
Corn (on the farm)	1.10/bu.
(delivered to farm)	1.20/bu.
Field beans	6.88/cwt.
Sugar beets	13.67/ton
Wheat	1.25/bu.
Oats	.62/bu.
Alfalfa hay (delivered to farm)	19.00/ton
Feeder pigs—spring	29.50/cwt.
fall	28.62/cwt.
Market hogs—spring sold	14.75/cwt.
fall sold	14.31/cwt.
Sows 1 or 2 litters	13.43/cwt.
Boars	7.35/cwt.
Milk Grade A	4.06/cwt.
Dairy cows	13.15/cwt.
Veal calves	28.20/cwt.
Feeder calves (450# choice)	$ 19.50/cwt.
Yearling steers (693# choice)	19.50/cwt.
Fat steers (1000# choice)	22.50/cwt.
Beef cows	15.05/cwt.
Beef bull	300/hd.
Seed corn	12.00/bu.
Field beans	.104/lb.
Sugar beets	3.50/acre
Wheat	3.20/bu.
Oats	1.70/bu.
Alfalfa-brome	.452/lb.
Fertilizer:	
N	.123/lb.
P	.087/lb.
K	.052/lb.
Soybean meal	.042/lb.
Mineral	.02/lb.
Gasoline	.22/gal.
Bedding	.002/lb.

APPENDIX TABLE 2—Alternative production organizations of cash crop farm under different credit situations

Organization description	Unit mea.	CREDIT SITUATION: Tight credit	Medium Credit: Acreage variable	Medium Credit: Acreage fixed	Liberal credit
System:		Parlor dairy	Parlor dairy	Beef-crop	Beef-crop
Net income	dollars	12,206	14,111	10,661	13,221
Chattel credit	dollars	6,760	11,400	12,940	21,950
Real estate credit	dollars	11,870	16,240	2,000	31,620
Annual debt chg.	dollars	2,684	4,196	3,320	8,110
Income after debt	dollars	10,708	11,687	8,367	8,545
Land bought	acres		8		80
Crops					
Corn grown	acres	23.1	38.4	23.1	45.4
Oats grown	acres	4.7	3.2	19.9	33.1
Wheat grown	acres	1.9			
Field beans grown	acres	37.2	23.1	37.2	61.9
Sugar beets grown	acres	10.6	10.6	10.6	10.6
Forage grown	acres	40.3	50.7	26.9	44.6
Hay harvested	tons	62.4	55.4	33.54	55.59
Grass silage	tons				
Corn silage	tons				
Hay bought	tons	5.15	54.7	42.72	
Corn bought	cwt.			512.64	584.16
Livestock					
Dairy cows	head	23	23		
Milk sold	cwt.	2,505	2,505		
Beef cows	head			2	3
Feeders fed	head			24	41
Yearlings fed	head			62	98
Labor					
Monthly labor	hours				
Seasonal labor					
Jan.-Feb.-Mar.	hours	165	165	60.8	83
April-May	hours	191	191	131.2	209
June-July	hours	151	151	6.2	13
Aug.-Sept.-Oct.	hours	133	181	49.2	86
Nov.-Dec.	hours	38.2	38	42.4	56
Operator off-farm work per month	hours	143	143	177	115

APPENDIX TABLE 3—Alternative production organizations of small dairy farm under different credit situations

Organization description	Unit mea.	CREDIT SITUATION							
		Tight credit		Medium Credit				Liberal credit	
				Acreage variable		Acreage fixed			
System:		Beef-crop	Parlor dairy	Beef-crop	Parlor dairy	Beef-crop	Parlor dairy	Beef-crop	Stanchion dairy
Net income	dollars	8,727	9,326	9,102	10,998	8,225	10,998	9,942	11,474
Chattel credit	dollars	5,700	5,130	10,680	8,450	10,780	8,450	15,730	7,460
Real estate credit	dollars	10,580	6,940	15,155	8,680	2,110	8,680	26,978	26,295
Annual debt chg.	dollars	2,313	1,856	3,927	2,818	2,813	2,818	6,189	4,112
Income after debt	dollars	7,448	8,246	6,832	9,292	6,293	9,292	6,473	9,462
Land bought	acres	26		37				69	66
Crops									
Corn grown	acres	25	26.3	28.0	34.8	17.7	34.8	36.9	36.1
Oats grown	acres				4.8		4.8		
Wheat grown	acres	13.7	3.2	15.0		9.4		15.0	11.8
Field beans grown	acres	34.2	12.5	37.5	5.7	26.1	5.7	47.3	46.5
Sugar beets grown	acres	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9
Forage grown	acres	19.3	24.6	22.2	21.5	13.5	21.5	34.5	36.6
Hay harvested	tons	34.5	20.9	41.6		34.0		45.4	72.5
Grass silage	tons								
Corn silage	tons								
Hay bought	tons		54.5		123.5		123.5		
Corn bought	cwt.	254.4		570.2		690.8		817.2	
Livestock									
Dairy cows	head		24		34		34		21
Milk sold	cwt.	6		7		6			
Beef cows	head		2,607		3,662		3,662		2,322
Feeders fed	head	14		15		6		33	23
Yearlings fed	head	41		64		73		80	
Labor									
Monthly labor	hours								21
Seasonal labor									
Jan. - Feb. - Mar.	hours								
April - May	hours								
June - July	hours								
Aug. - Sept. - Oct.	hours								
Nov. - Dec.	hours								
Operator off-farm work	hours	161	83	135	50	160		93	
Store feed					13.3		13.3		

APPENDIX TABLE 4—Alternative production organizations of general farm under different credit situations

Organization description	Unit mea.	CREDIT SITUATION							
		Tight credit		Medium Credit				Liberal credit	
				Acreage variable		Acreage fixed			
System:		Beef-crop	Stanchion dairy	Beef-crop	Stanchion dairy	Beef-crop	Stanchion dairy	Beef-crop	Stanchion dairy
Net income	dollars	13,229	15,933	14,002	16,640	12,330	16,315	14,533	18,106
Chattel credit	dollars	11,710	11,400	21,470	19,180	22,050	17,110	34,820	18,830
Real estate credit	dollars	20,370	15,330	29,130	20,852	3,780	16,530	33,960	37,502
Annual debt chg.	dollars	4,632	4,135	7,777	6,496	5,708	5,615	11,454	7,863
Income after debt	dollars	10,638	13,516	9,476	12,738	8,392	12,890	7,554	13,811
Land bought	acres	51	15	72	19			80	61
Crops									
Corn grown	acre	58.4	48.4	64.2	49.5	44.2	44.2	66.5	61.1
Oats grown	acre	4.5							
Wheat grown	acre	21.0	14.0	21.0	14.2	21.0	13.1	21.0	16.4
Field beans grown	acre	73.0	61.9	79.3	63.1	57.2	57.2	81.8	76.0
Sugar beets grown	acre	4.2	4.2	4.2	4.2	4.2	4.2	4.2	4.2
Forage grown	acre	57.9	55.5	70.4	56.8	42.6	50.5	73.5	70.3
Hay harvested	tons	97.0	122.5	115.5	108.5	93.2	65.3	130.5	151.5
Grass silage	tons								
Corn silage	tons								
Hay bought	tons				38.5		95.5		
Corn bought	cwt.	492	420.6	1,635	912	2,160	1,443	3,141	647.4
Livestock									
Dairy cows	head		35		41		47		43
Milk sold	cwt.		3,857		4,502		5,192		4,677
Beef cows	head	21		21		20		21	
Feeders fed	head	46		56		23		54	
Yearlings fed	head	71	46	110	70	138	44	179	70
Labor	hours		144	21	193		193	75	230
Monthly labor									
Operator off-farm work	hours	24				27			

This is the first in a new series called **Research Reports.** The publications are aimed at audiences such as farmers, home owners, industry people, etc. They will be designated by subgroupings under the following audience classifications: (1) Farm Science, (2) Home and Family Living, (3) Business, (4) Natural Resources, (5) Development and Public Affairs and (6) Recreation and Tourism.

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