A STUDY OF CERTAIN DAIRY MANAGEMENT PRACTICES AND THEIR EFFECT ON DAIRY RETURNS IN THREE AREAS OF THE UPPER PENINSULA OF MICHIGAN IN 1948

Thesis for the Degree of M. S.

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By

RICHARD W. CHRISTIAN

A Thesis

Submitted to the School of Graduate Studies of Michigan State College of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Department of Agricultural Economics

1950

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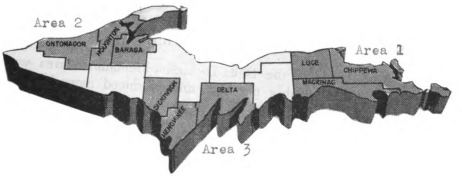

CHAPTER I

STATEMENT OF THE PROBLEM

This is a study of the dairy enterprise on farms in the Upper Peninsula of Michigan. It is known that efficiency in dairy farming varies greatly in the Upper Peninsula the same as it does in other dairy areas of the state. However, there is a general feeling that Upper Peninsula dairymen have been slow in adopting improved production practices. A recent dairy cost and returns study in the Upper Peninsula showed that some dairymen had a labor and management return per cow of over $200 while other dairymen failed to even pay for feed, labor, and other costs.[1/] This study was initiated to determine the effect of the application of certain dairy management practices on costs and returns on dairy farms in three areas of the Upper Peninsula, and to discover possible practices which might

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1/ Dairy Costs and Returns in the Upper Peninsula of Michigan, C. R. Hoglund, K. T. Wright, and E. M. Elwood, Michigan State College, Department of Agricultural Economics, Agricultural Economics Report 455, October, 1949.

contribute to increased profits from dairying.

CHAPTER II

OBJECTIVES, HYPOTHESES, AND PROCEDURE

The objectives of this study were three in number: (1) to determine the relation between certain practices followed and the resulting costs and returns, (2) to suggest practices which might lead to better returns from dairying in the Upper Peninsula, and (3) to ascertain the effect of market outlet on costs and returns.

Hypotheses

1. That size of herd, size of farm, and production per cow were the primary factors determining gross and net farm income from the dairy enterprise.
2. That high, efficient production per cow was one of the most important single factors affecting the residual left for the operator's labor and management per cow.
3. That small farms can, if intensively organized and efficiently operated, produce an adequate net income.
4. That many dairymen in the Upper Peninsula fed concentrates at uneconomically high levels.
5. That a high price for milk tended to cause dairymen to feed their cattle larger quantities of feed than did a low price.
6. That poor quality hay and inadequate quantity of hay and pasture were vital factors causing low returns on many dairy farms.
7. That increasing the percentage of cows freshening in

the fall months can increase net returns.

Procedure

The study was begun May 1, 1948, by the Farm Management Department at Michigan State College and the Bureau of Agricultural Economics of the United States Department of Agriculture, with the County Agricultural Agents helping to start and to collect monthly records. Three areas were selected for the study. Area 1 comprised Chippewa, Luce, and Mackinac counties in the eastern end of the peninsula. Area 2 comprised Baraga, Houghton, and Ontonagon counties in the northwestern part of the peninsula. Area 3 comprised Delta, Dickinson, and Menominee counties in the southwestern part of the peninsula. It was felt that these counties were representative counties for the three different type-of-farming areas in the Upper Peninsula.

In obtaining the sample, it was desired to get herds ranging from small to large, with the bulk of the herds being of medium size. The accomplished distribution, insofar as size of herd is concerned, for the three areas is shown in Table 1.

It also was desired to get a normal distribution of productiveness per cow in the various herds selected, ranging from low to high. Low producing herds were to be those producing under 200 pounds butterfat per cow; medium producing herds were to be those producing between 200 and 250 pounds butterfat per cow; high producing herds were

Table 1. Distribution of herds by area and by size.

		Accomplished distribution percentage	Average size
Area 1	5 - 9 cows	31.6	12.2 cows
	9.1 - 15 cows	36.8	
	15.1 and over	31.6	
Area 2	5 - 8 cows	15.2	13.0 cows
	8.1 - 15 cows	58.7	
	15.1 and over	26.1	
Area 3	8 - 10 cows	13.0	16.2 cows
	10.1 - 20 cows	67.4	
	20.1 and over	19.6	

to be those producing above 250 pounds butterfat per cow. The actual distribution of herds by production per cow is shown in Table 2. In each area, a majority of the herds are in the "high" group, signifying that either the herds selected were better than desired, or that the limits of each group were set too low. The writer believes that the latter was the case in this instance.

Market outlet was not thought so important, although it was desired to get a fair sample of cream producers in Area 1, comprising Chippewa, Luce and Mackinac counties.

Table 2. Distribution of herds by production of butterfat per cow.

	Low	Medium	High	Average
	Under 200 pounds	200-250 pounds	250 pounds and over	per cow
	percent	percent	percent	pounds
Area 1	18.4	26.3	55.3	252
Area 2	6.5	10.9	82.6	289
Area 3	0	15.2	84.4	318

Table 3. Distribution of sample herds by market outlet.

	Fluid		Condensary		Cheese		Cream	
	No.	%	No.	%	No.	%	No.	%
Area 1	22	57.9	--	----	5	13.2	11	28.9
Area 2	13	28.3	--	----	32	69.6	1	2.1
Area 3	13	28.3	17	37.0	16	34.7	--	----

The distribution of the sample by market outlet is shown in Table 3. It is felt by the writer that more attention should have been given to securing a better distribution among the various market outlets, to allow more accurate comparisons between the areas, and to enable the sample to more closely approach the random.

It is recognized that the farms to be studied were to be dairy farms, and thus a large part of their income would be from the dairy enterprise. Dairy farms are more likely to have higher producing cows and to have better market outlets than are farms on which the dairy enterprise is minor. Complete records were obtained from 38 herds in Area 1, from 46 herds in Area 2, and from 46 herds in Area 3 for a total of 130.

CHAPTER III

DESCRIPTION OF THE ECONOMY, AGRICULTURE AND THE DAIRY ENTERPRISE IN MICHIGAN'S UPPER PENINSULA

The Upper Peninsula of Michigan comprises 29 percent of the land area of Michigan. It had 7.6 percent of the farms in Michigan in 1945, 8.3 percent of the land in farms, and 5.0 percent of the tillable acres in Michigan.* The average size of farm in the Upper Peninsula was 115 acres, compared to 105 acres for the state as a whole in 1945. However, a much larger proportion was in non-tillable land in the Upper Peninsula than in the State. Average tillable acreage per farm in the Upper Peninsula was 43, compared to 64 for Michigan. Also, in the Upper Peninsula, a much larger proportion of tillable acreage was in hay and pasture crops than was true for the State. In Michigan, 43 percent of the tillable acreage was in hay and pasture crops in 1945, while in the Upper Peninsula 73 percent of the tillable acreage was in hay and pasture, almost twice as much, proportionately.

The population in the Upper Peninsula in 1940 was 323,544, or 6.2 percent of Michigan's total. By 1950 the population had decreased to 300,407, a drop of 7.2 percent. During the same period, Michigan's total population increased 20 percent so that at the present time, the Upper Peninsula population comprises onl7 4.7 percent of Michigan's total.** The breakdown of land area, number of

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*Appendix A, Table 1.

**Appendix A, Table 1.

farms, land in farms, crop acres, crop acres in hay and pasture, and population by counties in the Upper Peninsula is given in Appendix A.

This population decrease means that Upper Peninsula dairy farmers cannot expect an increase in the consumption of fluid milk and cream, unless the per capita consumption increases. This seems unlikely in view of the steady decline in per capita consumption of fluid milk and cream from 432 pounds in 1945 to 387 pounds in 1948.[2/]

The non-agricultural labor force in the Upper Peninsula has declined since 1940, from 111,400 to 88,000 in 1950 (Table 4). Significantly, unemployment has decreased since 1940 an amount practically equal to the drop in the labor force. The unemployed workers must have found employment outside the Upper Peninsula, which accounts for at least some of the population decrease.

Unemployment seems to be a chronic condition in the Upper Peninsula. During the war, in March, 1944, unemployment was at a minimum, but by March, 1946 unemployment had reached 23,000. This probably was partly a result of returning servicemen who could not find jobs, and partly because of the decline in the number of jobs available. This condition of large-scale unemployment outside agriculture hurts the agriculture of the Upper Peninsula because unemployed workers are not good consumers of locally produced farm products.

2/ Agricultural Statistics, 1949, United States Department of Agriculture.

Table 4. Trend of the non-agricultural labor force in the Upper Peninsula since 1940.3/

	March 1940	March 1942	March 1944	March 1946	March 1948	March 1950 4/
Non-agricultural labor force	111,400	102,500	87,700	94,900	82,460	88,000
Employed	71,400	67,600	84,400	71,900	68,940	71,800
Unemployed	40,000	34,900	3,300	23,000	13,520	16,200

The growing season in the Upper Peninsula is short. Crops must be selected which are adapted to the short season, and to the particular soil types found in the Upper Peninsula. Soil acidity varies from very acid (pH 4.0) on Munising sandy loam, to alkaline (pH 8.0) on Chatham stony loam, Berglund loam, Berglund clay, and on the Ruse loam soils. There are heavy clay soils in Chippewa, Luce, Mackinac, and Ontonagon counties. There are sandy loams in many areas, along with some silt loam and clay loam soils.

Quack grass is a very real problem in many sections, but especially in the eastern area. It must be kept in check either by the use of cultivated crops in the rotation, or by summer fallow. In the eastern area, summer fallow is largely resorted to because there are virtually no row crops which do well on the heavy clay and clay

3/ "Employment Patterns of Michigan's Upper Peninsula," by Michigan Department of Economic Development, Lansing, Michigan.

4/ Labor Market Letter, May, 1950, by Michigan Unemployment Compensation Commission.

loam soils which are poorly drained. The acid soils must be heavily limed in order to grow alfalfa, sweet clover, and barley. If white-skinned potatoes are grown as a cash crop, liming the soil proves detrimental because the white-skinned varieties of potatoes are susceptible to scab injury, which the limed soil facilitates.

Crops successfully grown in the Upper Peninsula include alfalfa; red, white, and sweet clover; timothy; barley; rye; oats; peas; spring wheat; potatoes; rutabagas; early maturing corn for silage (for grain in the southern part of the Upper Peninsula); flax; berries; and vegetables.5/

Since hay and some small grains can be grown successfully, it is perhaps natural that dairying has become an important industry in the Upper Peninsula, and the most important source of farm income in most of the Upper Peninsula. Hay and pasture crops accounted for 77.2 percent of all the tillable land in the Upper Peninsula in 1945, and most of the balance was in small grains.

It is self-evident that, since hay and pasture crops, along with small grains, are of prime importance to the agriculture of the Upper Peninsula, particular attention should be given them to assure good quality and good yields. A study of hay and grain yields over the past three years, however, indicates that yields of hay and

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5/ Much of this information was taken from "Soil Management in the Upper Peninsula of Michigan," Special Bulletin 345, Michigan State College Agricultural Experiment Station, January, 1948.

grain are below the state averages.

Appendix B contains a tabulation of hay, corn, oats, barley, and wheat yields for 1947, 1948, and 1949 for each area in this study, for the Upper Peninsula, and for Michigan. Yields of all these crops for each of these years is lower on the average in the Upper Peninsula than in the whole of the State. Hay, particularly, gives on the average much lower yields in the Upper Peninsula than in the State as a whole. Hay is the Upper Peninsula's most important crop from an acreage standpoint, but yields are very low. Much could be done to improve hay and pasture yields. The summer of 1948 was very dry in the Upper Peninsula, which accounts for the extraordinarily low yields of hay that year, .85 tons per acre, compared to the State average of 1.37 tons per acre. A major problem in the Upper Peninsula is that of providing supplementary hay and pasture in extraordinarily dry seasons.

The non-fluid market in Area 1 is much more limited and much less important than in the other two areas. Average production per cow is very low in Area 1. Two of the eleven cream producers shipped their cream to St. Paul some 400 miles away. A third sent cream to Manistique, 45 miles away. There are only three cream outlets in Area 1, one at Pickford, one at Rudyard, and one at Sault Ste. Marie. There are also two cheese factories, both at Engadine.

In contrast to this, Area 2 has seven cheese factories and creameries, all of which purchase whole milk. The single cream producer in Area 2 ships his product to Hurley, Wisconsin. Area 3 has a prime non-fluid market in the condensary, located at Stephenson, in Menominee County. In addition to this there are eleven cheese factories and creameries in Area 3. The condensary collects whole milk from a wide area in Menominee, Delta, and Dickinson Counties. Suppliers as far away as 60 miles in Dickinson County, and 65 miles in Delta County were found who shipped their milk to this condensary.

That the dairy farmers in this sample achieved better than average production per cow is shown in Table 5. The average milk production per cow on the 130 farms in this study was 7,610 pounds. The Michigan average in 1945 was

Table 5. Average production per cow in three areas of the Upper Peninsula in 1945 compared to average production per cow in our 1948 sample.

	Production per cow by 1945 census 6/	Production per cow by our 1948 sample
	pounds	pounds
Area 1	4,237	6,939
Area 2	5,214	6,795
Area 3	5,613	8,722
Combined	5,250	7,610
Upper Peninsula	5,190	
Michigan	5,257	

6/ United States Census of Agriculture, 1945, United States Department of Commerce, Bureau of the Census. This is an average of cows on all farms, commercial, part-time, and subsistence, whereas our sample is from full-time dairy farms.

Table 6. Cow numbers, 1940 to 1950, by area, on January 1, each year.7/

	1940	1945	1947	1948	1949	1950
Area 1	9,898	9,838	10,300	10,500	10,000	10,200
Area 2	17,428	21,593	21,700	22,000	15,400	14,600
Area 3	24,502	29,713	29,800	30,900	29,300	27,200

5,257 pounds, and the Upper Peninsula average in the same year was 5,190 pounds. Upper Peninsula cows, on the average, are not significantly less productive than the State's. It is clear that Area 3 is a good dairy area. The 1945 Census shows milk production per cow in that Area to be 400 pounds above the State average.

Milk cow numbers seem to change quite quickly in response to price changes and the availability of feed. Table 6 shows very clearly how cow numbers changedwith the years.

Area 1 cow numbers do not seem to change very much, Area 3 a little more, and Area 2 considerably more. On January 1, 1948, 22,000 cows were estimated in production in Area 2. A year later, on January 1, 1949, only 15,400 cows were estimated in production, a drop of about one-third. Of course, these figures are estimated, and are based on a small sample, but it is felt that they are quite accurate. The writer believes that the extreme shortage of feed in the Upper Peninsula, particularly in

7/ Annual Crop and Livestock Reports for Michigan, 1945, 1947, 1948, 1949, and 1950, Federal-State Crop Reporting Service, Lansing, Michigan.

Area 2, accounted for most of the drop in 1948. Area 2 farms are small, and in a dry year there is often a serious lack of roughage. The summer of 1948 was very dry, pastures were poor as a general rule, and hay yields were extremely poor (Appendix B).

Table 7 is a comparison of the average size of farm in each area as reported in the 1945 census with the average size of farm in our 1948 sample.

Farms were small in Area 2 in 1945, averaging only 38.3 crop acres per farm, six acres smaller than in Area 3, and 33 acres smaller than in Area 1. In the 1948 sample, on which this study is based, the average acreage was larger in each area than was the average acreage of all

Table 7. Average size of farm in three areas of the Upper Peninsula, compared to the Michigan average and to our 1948 sample averages for each area (Appendix A, Table 3).

	Area 1	Area 2	Area 3	Michigan
Percent of land in farms	12.7	15.6	30.9	50.4
Average size, 1945, acres	131	100	143	105
Average size, 1940, acres	124	80	117	96
Number of farms, 1945	2,190	3,259	4,114	175,268
Number of farms, 1940	2,284	3,733	4,051	187,589
Tillable acres per farm				
1945 census	71	38	44	64
1948 sample	151	83	102	---

Table 8. Percentage of tillable acres in hay, and percentage of tillable acres in pasture in 1945 (Appendix A, Table 3).

	Area 1	Area 2	Area 3	Michigan
Alfalfa cut for hay (acres)	3,375	1,544	26,147	1,179,987
Clover and timothy cut for hay (acres) . . .	73,328	78,007	55,333	1,342,226
Percent of tillable acres in hay (not including wild hay) . .	51	67	55	27
Percent of tillable acres in pasture* . .	20	9	15	16
Percent of tillable acres in hay and pasture	71	76	70	43
Percent of tillable acres in hay and pasture, 1948 sample (Appendix A, Table 2)	60	74	61	--

farms, according to the 1945 census but they were larger in about the same proportion in each area. The number of farms is seen to be declining in each area, and the average size of farm is increasing in each area. No comparison between tillable or crop acres in 1940 and tillable or crop acres in 1945 is possible, because the data obtained is not comparable in the two census enumerations.

In Area 2 the farms are smaller, and the percentage of the tillable acres in hay is much larger than in the other two areas.

In Area 2 forage was more of a limiting factor controlling size of herd than were concentrates. Concentrates

* Land plowed sometime in the last 7 years.

can be and were purchased readily, but forage was much more difficult to purchase. It is logical that a larger proportion of their smaller farms would be devoted to hay crops, and a smaller proportion to pasture and grain than in the other two areas.

Dairy products accounted for about 50 percent of all the farm income in the Upper Peninsula in 1945, while for the State as a whole, dairy products accounted for but 33 percent of all farm income. In all but two counties in the Upper Peninsula, dairying was the most important single source of farm income. In two counties, Chippewa and Luce, crop income was slightly higher than dairy income. Also, as is shown in Table 9, dairying was a more important source of farm income on the 130 farms in this sample than it was on all farms according to the 1945 census.

Dairying was more important to farm income in Area 2 than it was in the other two areas, both in 1945 and in

Table 9. Dairying as a source of farm income in the Upper Peninsula, (Appendix H).

	Percentage dairy products are of value of all farm products sold		
	1945 Census	1940 Census	1948 Sample
Area 1	31.0	31.4	73.4
Area 2	62.8	57.4	76.4
Area 3	55.3	52.6	76.4
Michigan	33.2	29.0	----

1940. Also, between 1940 and 1945 dairying gained much in importance in Area 2, while in the other two areas it remained practically stationary.

In this study it is apparent that in the matter of price received for milk, Area 1 had a big advantage over the other two areas. The average price per pound of butterfat in Area 1 was $1.10, compared to $0.95 in Area 2 and $1.03 in Area 3. These average prices are averages of prices received by producers of fluid milk, milk for condensary and cheese factories, and for butterfat, all combined into one average. Since 58 percent of the dairymen in this study in Area 1 produce for the fluid market, and only 28 percent of those in Areas 2 and 3 produce for the fluid market, the average price quoted above for Area 1 is heavily weighted by the high prices received by the fluid producers.

Another important contributing reason for the average price in Area 1 being greater than the average prices in the other two areas is shown in Figure 1. In Area 2 and Area 3 all prices declined steadily from July, 1948 through April, 1949 while in Area 1 the decline was almost imperceptible. The reason was that, while prices paid for butterfat by the butter makers did decline, prices paid for fluid milk did not decline. Since the sample is heavily weighted with fluid producers the average of all the producers declined but little.

The average prices here stated should not be construed

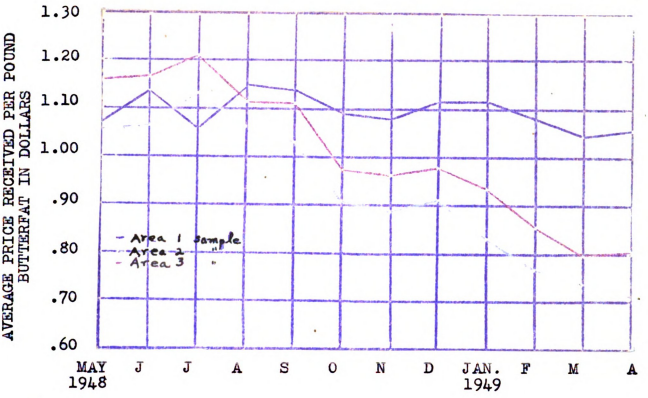
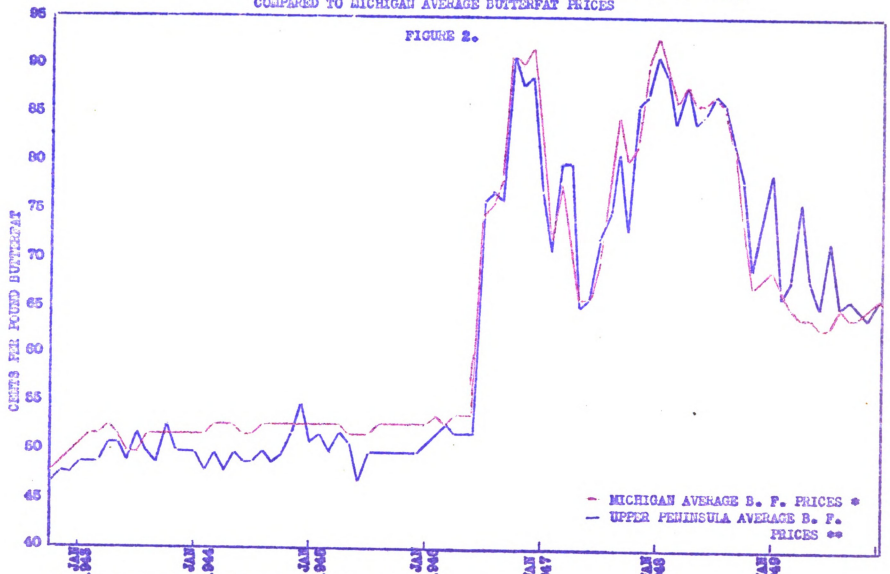


Figure 1. Average prices received in each area for milk (on a butterfat basis), by farmers in this study.

as representing the average price for each area for the period of the study. They are merely averages for the producers used in this study. Figure 1 shows the trend of prices received by dairymen in this study during the course of the study but does not show the real average price for all Upper Peninsula milk for each month.

Figure 2 shows average prices paid for butterfat, by months, in the Upper Peninsula from 1942 through 1949, compared to the average prices paid for butterfat in the whole of Michigan. As can be seen, the two follow each other closely. Unfortunately, no comparison is possible

Figure 2. CHART OF BUTTERFAT PRICES PAID IN THE U. P. FROM OCTOBER 1942 TO JUNE 1960 COMPARED TO MICHIGAN AVERAGE BUTTERFAT PRICES



*CROP REPORT FOR MICHIGAN, ANNUAL CROP AND LIVESTOCK SUMMARY 1947, 1948, 1949, 1950; FED'L - STATE CROP REPORTING SERVICE, LANSING, MICHIGAN

**UNPUBLISHED DATA FROM THE FEDERAL - STATE CROP REPORTING SERVICE, LANSING, MICHIGAN.

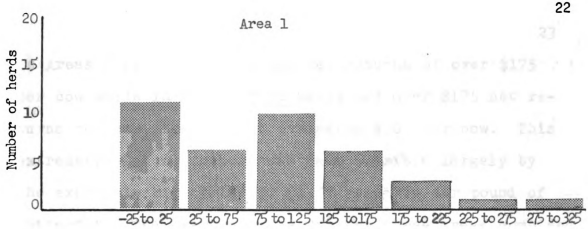
between wholesale milk prices in the Upper Peninsula and in Michigan as a whole.

CHAPTER IV

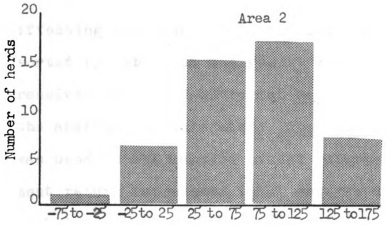
ANALYSIS OF PRACTICES ON HIGH FARMS AND LOW FARMS IN LABOR AND MANAGEMENT RETURN PER COW

Figure 3 on the following page shows the distribution of the herds in each area by labor and management return per cow from the entire herd. Net returns from the youngstock herd (a negative quantity in a large majority of the herds) were added to net returns from the milking herd, and the total for each herd was divided by the average number of cows in the herd to determine labor and management return per cow from the herd. Since the youngstock enterprise was an integral part of the whole dairy enterprise on most dairy farms it was thought that youngstock costs and returns should be included in any determination of net returns from the herd. In cases where the farmer was trying to enlarge his herd by raising extraordinarily large numbers of heifers, of course, the costs of the youngstock enterprise were abnormally large. Breeding costs in all cases were prorated to the milking herds and to the youngstock herds on the basis of average numbers of cows and average numbers of heifers over 1 year of age.

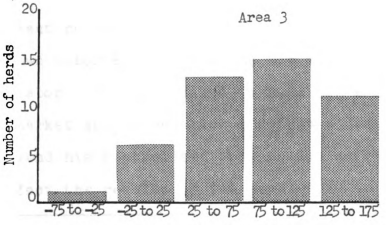
Net returns per cow (as measured by labor and management return per cow from the entire herd) in Area 1 covered a wider range than in Areas 2 or 3. More herds in Area 1 were found low on the scale but more were also very high on the scale in Area 1 compared to the other areas.



Labor and management return per cow (dollars), Area 1.



Labor and management return per cow (dollars), Area 2.



Labor and management return per cow (dollars), Area 3.

Figure 3. Distribution of herds by labor and management return per cow from entire herd (cows, youngstock, and bulls).

In Areas 2 and 3 no herds had net returns of over $175 per cow while in Area 1 five herds had over $175 net returns per cow, the highest averaging $301 per cow. This extremely high net return was made possible largely by the extremely high price of $1.52 received per pound of butterfat. The average price for the three areas combined was $1.03 per pound of butterfat.

In an attempt to determine the most important factors affecting net returns all the records for each area were sorted by labor and management return per cow, with price received per pound butterfat held constant.* In most of the analyses in this study labor and management return was used as the measure of net returns. Labor and management return represents total returns minus total costs except labor costs. It was thought advisable not to include labor as a cost because of the difficulty of placing a value on the farm operator's own labor. Labor and management return is thus a net return to the operator for his own labor and management, his family's labor, and hired labor. It was desired to hold price constant because the market and price which a dairyman obtains is largely beyond his control and thus should not be permitted to affect the results of the tabulation in Table 10.

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* In this study the method of holding a factor constant was that called "pairing." In this tabulation, all the records for each area were first sorted by the constant factor, price per pound of butterfat. Each consecutive three records were then placed in separate groups, low, medium, and high, according to labor and management return per cow. This had the effect of giving each group an average price. The same technique has been used in subsequent tabulations with other factors held constant.

Table 10. Comparison of practices on high farms and low farms in labor and management return per cow, with price per pound butterfat constant.

	Low 1/3 of farms in each area	High 1/3 of farms in each area
Size of Enterprise and Production		
Number of farms	43	43
Number of cows per farm	13.6	14.0
Tillable acres per farm	113	115
Percentage of tillable acres in hay and pasture	61	60
Pounds butterfat per cow	266	318
Pounds milk per cow	7,018	8,270
Returns		
Returns from dairy product sales, per cow	$272.00	$336.00
per pound butterfat	$ 1.02	$ 1.05
Other returns per cow*	$ 21.00	$ 24.00
Returns from youngstock per cow**	$ 68.00	$ 81.00
Total returns per cow	$361.00	$441.00
Costs		
Feed costs per cow	$162.00	$147.00
Other costs per cow***(except labor)	$ 72.00	$ 63.00
Youngstock costs per cow****.	$ 98.00	$ 87.00
Total costs per cow (except labor)	$332.00	$297.00
Net Returns		
Labor and management returns per cow	$ 29.00	$144.00
per herd	$480.00	$1,876.00
Feed Fed the Herds		
Pounds concentrates fed cows per cow	2,160	2,086
Pounds hay fed cows per cow	5,600	4,902
Pounds silage and roots fed cows per cow	2,075	2,051
Pounds concentrates fed youngstock per head	388	288
Pounds hay fed youngstock per head	2,213	1,680

(Table 10 continued on next page)

Table 10, continued.

	Low 1/3 of farms in each area	High 1/3 of farms in each area
Related Factors		
Hours labor on cows per cow	127	116
Ratio of concentrates fed to milk produced	1-3.2	1-4.0
Head of youngstock per cow	.80	.78
Percent of farms using artificial breeding	58.0	62.0
Percent of farms in D.H.I.A.	35.0	49.0
Other income, farm and off-farm	$1,470	$1,842
Number of farms using fertilizer in rotation	17	34
Number of farms with purebred or high grade herds	29	30

* Includes credit for manure of $9 per head, appreciation in cow value if any, and value of calves at 5 days of age.

** Includes credit for manure at $4 per head and appreciation in value from value at which youngstock were brought into youngstock herd to the value at which they were sold or transferred to the milking herd upon freshening.

*** Includes breeding costs, building costs, cow depreciation, interest on cows, electricity, equipment use, veterinary and medicine costs, bedding and overhead.

**** Includes calf value at 5 days of age, interest, building use, equipment use, breeding cost, other miscellaneous costs, and overhead.

Since size of herd was practically the same in the two groups in Table 10,* that factor cannot be said to be responsible for any differences in labor and management returns per cow. This does not mean that size of herd was not important, however. From the standpoint of total herd income, size of herd was obviously of very great importance. This tabulation was mainly used to find factors that affected net returns per cow. Size of herd did not appear to be a factor. Neither did size of farm appear to be a factor. Tillable acreage in the two groups was the same, as was the percentage of tillable acres devoted to hay and pasture crops.

There was a very great difference in production per cow between the two groups. The high one-third in labor and management return per cow included cows which produced an average of 52 pounds more of butterfat and 1,252 pounds more of milk than the cows in the low one-third of the herds. Production per cow was obviously of very great importance in determining net income per cow. Because of this higher production the high one-third of the herds had considerably greater returns from dairy product sales than did the low one-third.

Youngstock contributed more to total returns for the high one-third than for the low one-third. This means that either the youngstock in the high one-third of the

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* The middle one-third was omitted from Table 10 for the sake of clarity.

herds sold for more than the youngstock in the low one-third of the herds when they were sold or that the youngstock were valued at a higher price when brought into the milking herd upon freshening for the first time.

Costs per cow were considerably lower in the high group than in the low group, signifying that low costs contributed a great deal to high net return. Feed costs were particularly important both for the cows and the youngstock. The difference of $11 per cow in youngstock costs ($98 for the low one-third and $87 for the high one-third) was accounted for mostly by a difference in feed costs. The youngstock in the high one-third of the herds were fed less concentrates and hay than were the youngstock in the low one-third of the herds. This may have been due to a difference in the time the calves were born. The writer believes that fall calves are cheaper to produce than winter or spring calves.

The cows in the high group likewise enjoyed lower feed costs than the cows in the low group. This points out the superior inheritance of those cows in the high group. They produced more on less than did the cows in the low one-third of the herds. Inheritance, or the ability to produce <u>efficiently</u> large amounts of milk and butterfat was a very important factor determining net returns per cow. That inheritance and breeding are not the same things is shown in the last item in Table 10. There it is seen that there were as many high grade and purebred herds among the low one-third of the herds in labor and

management returns per cow as among the high one-third. It should be pointed out however, that each dairyman in the study used his judgment as to whether his herd was purebred or high grade or just ordinary grade. It is probable that some of these dairymen had a tendency to overrate the breeding of their herds. Thus, it should not be concluded that breeding to proven purebred sires is not important.

It can be seen that the operators of the high one-third of the herds were not only more successful than the operators of the low one-third of the herds in the matter of dairy income but they were also more successful in the matter of other farm and off-farm income. Perhaps they were just better all-around managers than the operators of the low one-third of the herds. In the use of fertilizer it is seen that twice as many of those in the high group used fertilizer in their rotations as did those in the low group. While there is no direct relationship between the use of fertilizer and net dairy returns per cow, there is an indirect relationship. It is logical to expect that a dairyman who is a good enough manager to attain a high net return from his dairy herd would also be a good enough manager to see the value in the use of fertilizer. Unfortunately, no information was obtained on kinds or quantities of fertilizer used in the past.

The ratio of the price of milk to the price of

concentrates (price of 100 pounds of concentrates divided by the price of 100 pounds of milk) averaged about .83 for all farms for the entire year of this study (Appendix C). This means that, on the average for the entire year, 83 pounds of milk were equal in value to 100 pounds of concentrates. It would have paid to feed concentrates, then, up to the point where an added 100 pounds of concentrates would have produced an added 83 pounds of milk. With heavy breed cows of low inherent productivity it is estimated that this point would have been reached at an input of approximately 900 pounds of concentrates (Appendix K). The cows in the low one-third of the herds in Table 10 were deemed to be of low inherent productivity as that term is defined in Appendix K. Assuming 900 pounds to be the most profitable level of concentrate feeding for the cows in the low group it would seem that these cows were actually overfed concentrates. It would have been more profitable for the operators of these herds to have fed considerably less concentrates and more roughage.

The cows in the high group were about midway between low and medium in inherent productivity as that term is defined in Appendix K. The most profitable level of concentrate feeding for cows of heavy breed and of that inherent productivity is estimated to be at about 1,500 pounds when the cost-price ratio is .83 (Appendix K). This indicates that the cows in the high one-third of the herds in

labor and management returns per cow were also fed concentrates at too high a rate for the most economical production.

The fact that not all the cows in this study were of heavy breed was neglected in the above analysis. The results would be altered somewhat on this account, but probably not very much. It seems apparent to the writer that many dairymen in the Upper Peninsula fed concentrates at an uneconomically high level during the period of this study. Substituting low cost but high quality roughages for high priced concentrates would result in higher net returns on many farms. The problem of how to get high quality roughage is a basic problem for agriculture in the Upper Peninsula. It is easy to say that less concentrates should be fed and more high quality hay or other roughage should be fed. Telling the farmer exactly how to produce that high quality roughage is another matter.

Differences in costs, returns, production and feeding practices between areas are made very noticeable in Table 11. Area 3 herds were larger and milk production greater than herd size and production in the other two areas. Area 3 herds were fed more concentrates, less hay, and more silage than the herds in Areas 1 and 2. This was due primarily to the better farming conditions in Area 3 compared to the other two areas. Area 3 operators appear to have been more efficient in the use of labor than the operators of dairy herds in Areas 1 and 2. Some of this greater

Table 11. Averages of significant items for the farms in each area.8/

Item	Area 1	Area 2	Area 3
Number of farms	38	46	46
Number of cows per farm	12.2	13.0	16.1
Milk production per cow	6,939	6,795	8,722
Butterfat production per cow	252	289	320
Hours labor per cow	117	134	106
Feed per cow (in pounds)			
Concentrates	1,825	1,941	2,391
Hay	5,716	5,338	4,740
Silage	39	560	6,055
Root crops	116	354	323
Costs per cow			
Feed	$133	$149	$180
Cow depreciation	6	7	16
Interest on cows	9	9	13
Building use	6	7	11
Equipment use	6	7	6
Breeding costs	5	7	8
Electricity	3	4	4
Veterinary and medicine	1	1	2
Bedding	3	2	5
Miscellaneous cash expenses	-	2	1
Overhead*	13	14	16
Total costs except labor	$185	$209	$262
Income per cow			
Dairy products sold and used	$279	$274	$331
Value of calves at 5 days	13	6	18
Manure	9	9	9
Total returns	$301	$289	$358
Dairy product sales per pound butterfat	$ 1.10	$ 0.95	$ 1.03
Labor and management return from cows, per cow	$115.00	$ 80.00	$ 95.00
per herd	$1,407.00	$1,040.00	$1,525.00
per hour labor	$ 0.98	$ 0.60	$ 0.89
Tillable acres per farm	151	83	102

8/ Dairy Costs and Returns in Upper Peninsula of Michigan, by C. R. Hoglund, K. T. Wright and E. M. Elwood, Agricultural Economics Department, Michigan State College, in cooperation with the Bureau of Agricultural Economics, United States Department of Agriculture, Agricultural Economics Bulletin 455, October, 1949, p. 4.

* This is an estimated share of such general expenses as auto, telephone, taxes, etc. that can be charged to the dairy enterprise.

labor efficiency in Area 3 was due undoubtedly to the large herds found in that area. Costs per cow were considerably greater in Area 3 than in the other areas but so were returns per cow greater. In labor and management return per cow, Area 1 herds showed up well primarily because of the high average price received for milk and butterfat in that area. As stated previously, this high average price in Area 1 was due to the comparatively large number of fluid milk producers in the sample from that area.

It may be confusing to note that while milk production per cow was slightly greater in Area 1 than in Area 2, butterfat production was considerably less, 252 pounds in Area 1 compared to 289 pounds in Area 2. Obviously, the butterfat test must have been higher in Area 2 milk than in Area 1 milk. Light breeds, Jersey and Guernsey, predominated in Area 2 while Holsteins and Holstein mixtures were predominate in Area 1. Heavy breeds were likewise predominate in Area 3.

It is noticeable that value of calves at 5 days of age was very low in Area 2. This was due to the practice of killing bull calves when they were born. There was apparently no market for veal calves in Area 2 probably because veal calves of Jersey and Guernsey stock are undesirable. Cow depreciation and interest was high in Area 3 compared to that in the other areas. This was due primarily to the high value placed on cows in Area 3. It is also believed that culling of low producing cows was practiced to a greater

extent there than elsewhere in the Upper Peninsula. High production per cow in Area 3 attests to that.

CHAPTER V

SIZE OF ENTERPRISE AND ITS EFFECT ON NET RETURNS

Size of enterprise is always regarded as a vital factor in determining net income, in studies such as this. In this analysis of the Upper Peninsula dairy enterprise, the records of each area have been kept separate, primarily because prices received varied considerably from area to area, and also because Area 1 herds were so heavily weighted with fluid milk producers. In analyzing the effect of size of enterprise on earnings, it was thought best to divide each area into three groups, first on the basis of size of herd into small, medium, and large herds, and secondly on the basis of tillable acres per farm into small, medium, and large farms.

A. Size of Herd

In Area 1, large herds (18.7 cows) had slightly larger production than small herds, 254 pounds butterfat per cow against 234 pounds butterfat per cow for the small herds. This would have been expected to yield the larger herds about $20 more per cow in income, but due to a $0.23 per pound advantage, the larger herds actually received $77 more per cow in gross income. Feed costs were higher on the large herds, and the keeping of youngstock cost more on a per cow basis on the large farms than on the small farms. The total of "other costs " was practically the same on small farms as on large farms.

Table 12. Size of herd and its effect on net returns in three areas of the Upper Peninsula.

	Area 1		Area 2		Area 3	
	Small 1/3	Large 1/3	Small 1/3	Large 1/3	Small 1/3	Large 1/3
Number of farms	12	13	15	16	15	15
Number of cows per farm	6.2	18.7	8.2	18.7	10.4	22.9
Pounds butterfat per cow	234	254	280	290	301	329
Hours labor on cows, per cow	134	101	146	129	129	86
Tillable acres per farm	99	198	58	112	76	144
Returns						
Dairy product sales, per cow	$215	$292	$269	$275	$315	$342
per pound butterfat	.92	1.15	.96	.95	1.05	1.04
Other returns per cow*	$ 22	$ 23	$ 16	$ 14	$ 26	$ 29
Total returns per cow	$237	$315	$285	$289	$341	$371
Costs						
Feed costs per cow	$120	$133	$136	$154	$168	$192
Other costs per cow*	$ 57	$ 54	$ 62	$ 58	$ 94	$ 79
Total costs (except labor)	$177	$187	$198	$212	$262	$271
Net Returns						
Labor and management returns from cows per cow	$ 60	$128	$ 87	$ 77	$ 79	$100
from herd, per cow	$ 50	$112	$ 84	$ 68	$ 79	$ 82
from herd, per herd	$309	$2,105	$684	$1,264	$825	$1,877
Other Factors						
Number of youngstock under 1 year	3.3	7.5	4.4	8.0	4.3	7.8
Number of youngstock over 1 year	2.7	7.3	2.4	6.2	4.4	9.9
Total youngstock per farm	6.0	14.8	6.8	14.2	8.7	17.7
Number of youngstock per cow	.97	.79	.83	.76	.84	.77
Number of men per farm	1.1	1.7	1.3	1.9	1.4	1.9
Tillable acres per cow	16.0	10.6	7.1	6.0	7.3	6.3

* See footnotes accompanying Table 10, page 25.

Ordinarily, it would seem that there should be considerable economies on a per cow basis on the large herd farms. Such was not the case in Area 1. In Area 1, large herds had a labor and management return of $112 per cow and $2,105 per herd, while the small herds had a labor and management return of only $50 per cow and $309 per herd.

In Area 1, the large herds were on larger farms, on the average, than were the small herds. Large herds were on farms averaging 198 tillable acres while the small herds were on farms averaging only 99 tillable acres, just half as many. Since the large herds were three times as large as the small herds, the intensity, as measured by tillable acres per cow, was greater on the large-herd farms (10.6 tillable acres per cow) than on the small-herd farms in Area 1 (16 tillable acres per cow).

The operators of large herds in Area 1 enjoyed a higher degree of labor efficiency in the care of their cows than did the operators of the small herds. Hours labor per cow was 101 on the large-herd farms and 134 per cow on the small-herd farms. This means that one man on a farm with the better labor efficiency could care for one-third more cows in the same time required by one man on a farm with the poorer labor efficiency. Where labor is a scarce factor, labor efficiency is a very important factor in determining herd income. If the man with high labor efficiency can keep a herd one-third larger than the man with the low labor efficiency he can logically expect

an income one-third larger than the income enjoyed by the man with the poor labor efficiency. On small farms, however, it is usually land which is the scarce factor rather than labor (Table 13).

Area 2 did not follow quite the same pattern as Area 1 insofar as the effects of size of herd is concerned. In Area 2, the large herds did not have the price advantage over the small herds which was enjoyed by the large herds in Area 1. In effect then, in Area 2, price per pound of butterfat was held constant, and was not a factor which affected the labor and management returns. Production of butterfat per cow was slightly higher in the large-herd group, but the difference (10 pounds) was not believed to be significant. Feed costs were higher per cow by $18 in the large-herd group, so that return over feed costs was $12 higher per cow in the small herds than in the large herds. Labor and management return was $16 per cow higher in the small herds than in the large herds, so it cannot be said that the large herds enjoyed greater efficiency per cow in Area 2, except in the matter of labor efficiency.

As in Area 1, the farms in Area 2 with the large herds tended to be on large farms; also the intensity of the dairy enterprise, as measured by tillable acres per cow, was greater on the large-herd farms than on the small-herd farms.

Large-herd farms also tended to be more efficient in the use of labor than were the small-herd farms. On the

large herds, 129 hours of labor were spent on each cow, while on the small herds 146 hours of labor were spent on each cow. This difference was not as pronounced in Area 2 as it was in Area 1. Small-herd operators are much less likely to have labor saving devices than are the large-herd operators. There are also economies in labor to be derived on large-herd farms due purely to the large scale. It takes about as long to set up a milking machine and to wash equipment for a small herd as for a large herd.

Area 3 was more nearly comparable to Area 2 than was either Area 2 or Area 3 with Area 1. In both Area 2 and Area 3 dairying was by far the most important source of farm income while in Area 1 it was not (Appendix H). The farms were relatively small in both Areas 2 and 3 but were smallest in Area 2. Herds were larger in both Areas 2 and 3 than they are in Area 1, but were considerably the largest in Area 3, 16.2 cows per farm in Area 3 compared to 13.0 cows per farm in Area 2 and 12.2 in Area 1. Price per pound of butterfat averaged 8¢ higher in Area 3 than in Area 2, even though the percentage of herds producing for the fluid market was the same in both areas. This price advantage seemed to be offset in part by feed costs per cow, $28 higher in Area 3 than in Area 2. However, production of butterfat per cow was 29 pounds higher on the average in Area 3. In other words, high feed costs were offset by high production. Area 2 had an advantage over Area 3 in "other costs" which averaged $23 per cow

higher in Area 3 than in Area 2. An analysis of Table 11 shows that heavier cow depreciation, heavier interest charges and higher building use charges in Area 3 accounted for most of the difference between Area 3 and Area 2 in the matter of "other costs."

In Area 3, the large herds outproduced the small herds, 329 pounds per cow to 301 pounds per cow. Most of this higher production was eaten up in higher feed costs, however, so that in terms of return over feed, the large herds had $150 per cow and the small herds $147 per cow. The large herds had a big advantage in other costs, amounting to $15 per cow. This indicates to the writer that in a good, specialized, dairy area there are very real economies to be had in large scale operations. The cost of raising youngstock on the large-herd farms very nearly eliminated this advantage, so that in terms of labor and management return to the herd the large-herd group averaged $82 per cow and $1,877 per herd, while the small-herd group averaged $79 per cow and $825 per herd.

In the matter of labor efficiency, the large-herd farms in Area 3 were much more efficient than the small farms. The small-herd operators used 50 percent more labor per cow than did the large-herd operators. The economies of large scale operations were very apparent when put in terms of hours labor per cow.

In each area large herds were productive of much higher returns, as measured by labor and management return

than were small herds. On a per cow basis too, the large herds had an advantage in labor and management return, except in Area 2 where the small herds had the advantage.

It was noticeable that in each area the large herds averaged higher production per cow than the small herds, and that high feed costs in the large group went a long way toward eliminating the production advantage. It was also apparent that the small herds tended to be found on small farms. It is the writer's belief that the operators of small herds, because they were on small farms, tended to be more efficient users of feed, especially of concentrates, which were purchased to a greater extent on the small-herd farms than on the large-herd farms. Two factors probably operated here. A dairyman purchasing feed is more conscious of feed costs, and there is a tendency on the part of farmers to feed what is grown and when that is gone to wait till the next harvest.

B. Size of Farm

When the records for each area were sorted on the basis of tillable acres per farm, it was found that while small herds did tend to be found on small farms, the intensity as measured by tillable acres per cow was much greater on the small farms than on the large farms. Also, the operators of herds on the small farms tended to feed less concentrates per cow than did the operators of herds on large farms. The production per cow was greater on the large farms in each area, but the difference was not

Table 13. Size of farm measured by tillable acres per farm and its effect on net returns.

	Area 1		Area 2		Area 3	
	Small 1/3	Large 1/3	Small 1/3	Large 1/3	Small 1/3	Large 1/3
Number of farms	13	12	15	15	15	16
Number of cows per farm	7.9	16.6	10.2	17.1	12.7	20.9
Tillable acres per farm	82	235	41	136	53	160
Pounds butterfat per cow	249	260	277	284	302	329
Hours labor per cow	145	114	134	119	119	98
Returns						
Dairy product sales per pound butterfat	$1.04	$1.21	$0.95	$0.96	$1.02	$1.05
per cow	$260	$315	$262	$273	$309	$346
per herd	$2,061	$5,214	$2,675	$4,666	$3,917	$7,241
Costs						
Feed costs per cow	$127	$144	$138	$148	$167	$190
Net Returns						
Return over feed costs per cow	$133	$171	$124	$125	$142	$156
Labor and management return from cows,						
per cow	$ 98	$136	$ 87	$ 79	$ 87	$101
per herd	$844	$2,261	$886	$1,348	$1,103	$2,114
Other Factors						
Number of men per farm, family	1.26	1.45	1.31	1.40	1.20	1.58
hired	.04	.15	.04	.40	.10	.52
total	1.30	1.60	1.35	1.80	1.30	2.10
Other farm and off-farm income per farm	$955	$1,504	$1,190	$1,202	$835	$2,083
Total gross income* per farm	$3,016	$6,718	$3,865	$5,868	$4,752	$9,324
per man	$2,315	$4,208	$2,861	$3,261	$3,661	$4,440
Tillable acres per cow	10.3	14.2	4.0	8.0	4.2	7.7

* Total gross income is a total of other farm and off-farm income and dairy product sales per herd.

believed significant except in Area 3 where the small herds produced 302 pounds butterfat per cow and the large herds produced 329 pounds butterfat per cow. Labor was used more efficiently on the herds on the large farms than on the herds on the small farms in each area. Mostly because of the higher rate of concentrate feeding on the large farms, feed costs were higher on those farms than on small farms.

In each area, the large farms were approximately three times larger than the small farms. Herds, however, were not proportionately larger on the large farms, indicating a higher intensity on the small farms compared to that on the large farms. Except in Area 2, herds on the large farms were between one and one-half and two times larger on the large farms than on the small farms.

In Area 1, the large farms received an average of 17¢ more per pound for their butterfat than did the small farms. A larger proportion of the large farm operators were successful in obtaining fluid outlets for their milk. In the other two areas, the operators of the large farms did not achieve this same result, so it is felt by the writer that size of farm alone is not an important factor in determining the kind of market outlet obtained. A large proportion of the operators of the small farms in Area 1 were veterans of World War II, just getting started in the business of farming, and for that reason the sample may have been slanted somewhat in favor of the large farms.

Gross income per man was considerably larger on the large farms than on the small farms. The gross income figure shown in Table 12 consists of cash income from the dairy enterprise plus the value of home used dairy products, cash income from off-farm work, and gross income from other farm enterprises. No consideration is given to costs of production in this statistic, or to inventory gains and losses. That information was not made available in this study. Gross income per farm and per man is an indication, nothing more, of the extent to which large farms in this sample have an income advantage over the small farms.

C. Effect of Size of Farm on Amount of Feed Purchased

Small size of farm has been one of the main obstacles to increased farm earnings in a large part of the Upper Peninsula. This has been especially true in Areas 2 and 3 where the smallest one-third of the dairy farms in this study averages 41 and 53 tillable acres respectively. There was not a great deal of difference in the amount of family labor available between the small farms and the large farms in those areas. Land is the scarce factor and it has proved very difficult for farmers with small acreages to intensify enough to make up for the limited acreage available to them. That the small farms were operated much more intensively than the large farms in Areas 2 and 3 is shown in Table 13. Tillable acres per cow on the small one-third of the farms was approximately

Table 14. Percentage of feed purchased on small farms and large farms in Area 2.

	Small 1/3	Large 1/3
Number of farms	15	15
Number of cows per farm	10.2	17.1
Number of animal units per farm	13.1	24.0
Acreage		
Tillable acres per farm	41	136
Tillable acres in feed crops per farm	37	125
per cow	3.6	7.3
per animal unit	2.9	5.2
Production		
Pounds butterfat per cow	277	284
Pounds milk per cow	6,371	6,834
Concentrates fed per cow in pounds	1,759	2,061
Ratio of milk produced to concentrates fed	3.6-1	3.3-1
Cost of Feed Fed and Purchased		
Feed cost per cow	$138	$148
Feed purchased per cow	$ 48	$ 34
Feed purchased per herd (includes young-stock)	$606	$804
Value of feed purchased as a percentage of value of all feed fed	35	24
Value of concentrates purchased as a percentage of value of all concentrated fed	83	57
Value of concentrates purchased as a percentage of all feed purchased	97	89
Average number of cows, May to September	10.8	17.0
Average number of cows, October to April	9.8	17.2

half of that on the large one-third of the farms. In spite of this the gross income on the small farms was probably inadequate in a majority of cases to maintain an adequate level of family living.

In Area 2 in the year of this study the operators of the small one-third of the farms purchased $48 worth

of feed per cow. Of this total, 97 percent was in the form of concentrates, indicating either an inability or an unwillingness to purchase roughages. On the small farms, 83 percent of the value of all concentrates fed the herds was purchased indicating that a very small proportion of concentrates needed was raised on the home farm. This percentage was 57 for the large one-third of the farms. The chief limiting factor on small farms then seemed to be land for the growing of roughages. That the small farm operators were more easily persuaded to sell some of their herd rather than purchase forage is shown by the figures in Table 14. The average number of cows on the small farms declined from an average of 10.8 cows during the May to September period to 9.8 cows during the following October to April period. There was an average loss in cow numbers of slightly more than one cow per herd. On the large farms, however, this was not the case. Instead of cow numbers declining between those two periods, they actually increased an average of .2 cows per farm.

If the small farm operators actually do combat feed shortages by deliberately reducing the size of their herds, it is believed by the writer to be a grave and costly mistake on their part. It is very difficult and costly to build up a herd after its size is reduced. Selling cows, especially in circumstances of drought, for what they will bring in the open market is, generally speaking, not profitable. It is very often possible to

augment short forage supplies by added grain in the ration. That the small farm operators fed on the average less concentrates per cow than the large farm operators is shown in both Tables 13 and 14. The cows in the herds on small farms received an average of 1,759 pounds of concentrates, while the cows on large farms received 2,061 pounds.

The average feed cost per cow on the small farms was $138 and on the large farms, $148. The cash cost of feed purchased, however, was $14 greater per cow on the small farms than on the large farms. On a per herd basis, the cash cost of feed purchased on the small farms was $606, and on the large farms, $804. The herds on the large farms averaged 68 percent larger in size than the herds on the small farms yet the cash cost of feed purchased was only 33 percent greater on the large farms.

The cost of raising feed on the farm cannot be determined from this study. It would be very interesting to know how much cheaper, if any, feed grains can be raised on the farm than they can be purchased. If the difference is considerable, then of course, the large farm operators have a definite advantage over small farm operators. Because feed was entered at its market value in this cost study and not at its production cost, the precise advantage enjoyed by the large farms over small farms could not be determined.

D. Effect of Intensity of the Dairy Enterprise on Dairy Returns

It was felt by the writer that intensity of operation might be a factor affecting dairy farm earnings. Since medium and large sized herds are frequently found on large farms, it was decided to sort the records on size of farm, as measured by the number of tillable acres, keeping average number of cows per farm constant. Size of herd would be eliminated as a factor determining earnings in such a procedure. The results are tabulated in Table 15.

In Areas 2 and 3, the small farm group with their high intensity showed higher returns than the large farm group when the measure of returns was labor and management return per cow. The same would have been true in Area 1 if price had not favored the large farm group to the extent of 10¢ per pound of butterfat. In Areas 2 and 3 labor and management return was $13 greater per cow in the small farm (high intensity) group than in the large farm (low intensity) group.

When other income and number of men are taken into consideration, it is seen that there was very little difference between the large farms and the small farms. Total gross income per man was practically the same on large farms and on small farms in all areas.

The conclusion to be drawn is that small farms intensively operated were just as productive of gross income as the large farms less intensively on a per man basis. Whether feed can be purchased as cheaply as it can be

Table 15. Effect of size of farm on earnings when size of herd is kept constant.

	Area 1		Area 2		Area 3	
	Small 1/3	Large 1/3	Small 1/3	Large 1/3	Small 1/3	Large 1/3
Number of farms	13	12	15	15	15	16
Number of cows per farm	12.1	12.4	12.8	13.3	16.2	15.9
Tillable acres per farm	110	197	54	115	73	132
Pounds butterfat per cow	254	266	300	273	300	316
Returns						
Dairy product sales per pound butterfat	$ 1.05	$ 1.15	$ 0.93	$ 0.96	$ 1.02	$ 1.04
per cow	$ 266	$ 306	$ 278	$ 263	$ 306	$ 327
per herd	$3,215	$3,819	$3,546	$3,483	$4,981	$5,185
Costs						
Feed costs per cow	$ 125	$ 147	$ 154	$ 147	$ 166	$ 185
Net Returns						
Return over feed costs per cow	$ 141	$ 159	$ 124	$ 116	$ 140	$ 142
Labor and management return from cows,						
per cow	$ 110	$ 126	$ 83	$ 70	$ 89	$ 76
per herd	$1,336	$1,575	$1,062	$ 931	$1,446	$1,207
Other Factors						
Number of men per farm	1.4	1.6	1.4	1.7	1.5	1.9
Other farm and off-farm income per farm	$1,395	$1,953*	$1,005	$1,944	$1,132	$2,449
Total gross income** per farm	$4,610	$5,772	$4,551	$5,427	$6,113	$7,644
per man	$3,300	$3,608	$3,251	$3,192	$4,075	$4,023

* The income from a retail dairy on one farm in this group was not included; consequently the figure here stated is less than it should be.

** Total gross income is a total of other farm and off-farm income and dairy products sales per herd.

raised is, of course, another question. Also, nothing is known regarding the quality of the land on the farms in the small farm and large farm groups.

CHAPTER VI

EFFECT OF PRODUCTION PER COW ON DAIRY RETURNS

In any study such as this, it is soon perceived that about the most important factor affecting returns is production per cow, or the production efficiency of the cows. High production at low cost is greatly to be desired in any dairy herd. The generally accepted meaning of efficiency is the ratio of output to input. Oftentimes high output is achieved at a high cost in terms of input. That is not efficiency.

In all areas it was very obvious that on the average the high producing herds had a tremendous advantage over the low producing herds in the matter of labor and management return to the herd. This does not mean that there were not some high producing herds, which, because of high costs were low in labor and management returns. On the contrary, there were some very glaring examples of farms where the return was low in spite of high producing cows. Several of these will be cited later.

Labor and management returns per cow in the high groups of Area 2 and Area 3 are about equal, $95 in Area 2 and $96 in Area 3. Because of the larger herds in Area 3, however, labor and management returns per herd were largest in Area 3. The high producing herds were on the average, fed more efficiently than the low producing herds. Their higher production much more than made up for their

Table 16. Production per cow and its effect on dairy returns with price received per pound butterfat held constant.

	Area 1		Area 2		Area 3	
	Low 1/3	High 1/3	Low 1/3	High 1/3	Low 1/3	High 1/3
Number of farms	13	12	15	15	15	16
Number of cows per farm	12.5	12.1	12.7	13.9	14.9	17.0
Pounds butterfat per cow	207	300	237	339	252	377
Returns						
Dairy product sales per pound butterfat	$1.09	$1.14	$0.96	$0.94	$1.04	$1.02
per cow	$ 227	$ 344	$ 227	$ 317	$ 263	$ 387
Other returns per cow*	$ 22	$ 26	$ 12	$ 16	$ 24	$ 32
Total returns per cow	$ 249	$ 370	$ 239	$ 333	$ 287	$ 419
Costs						
Feed costs per cow	$ 123	$ 149	$ 139	$ 162	$ 143	$ 212
Other costs per cow*	$ 53	$ 55	$ 51	$ 64	$ 80	$ 93
Total costs per cow	$ 176	$ 204	$ 190	$ 216	$ 223	$ 305
Net Returns						
Labor and management returns from cows, per cow	$ 73	$ 166	$ 49	$ 117	$ 64	$ 114
from herd, per cow	$ 58	$ 159	$ 47	$ 95	$ 40	$ 96
from herd, per herd	$ 725	$1,925	$ 596	$1,315	$ 586	$1,633
Feed fed cows (in pounds):						
Concentrates per cow	1,493	2,056	1,736	2,185	1,421	3,081
Hay per cow	6,396	4,727	5,376	5,343	4,372	5,290
Silage and roots per cow	0	348	947	1,270	3,910	7,107
Related Factors						
Tillable acres per farm	141	172	82	83	91	111
Number with milkhouse	9	11	7	10	8	11
Number in D.H.I.A. now or in past	0	1	7	12	3	12
Number with drinking cups	7	7	13	13	13	16

* For definition of other returns and other costs see footnote accompanying Table 10, page 25.

higher feed costs. Other costs are higher in all areas in the high groups than in the low groups. These higher costs are partly made up by higher other returns.

In Area 3, the dairymen with high producing herds had a higher proportion of barns equipped with drinking cups than did the dairymen with low producing herds. In Area 2 and Area 3 there was no difference between the two groups in this item. Unheated tanks outside were found more frequently in the low groups, especially in Area 1, where three herds in the low group had unheated water tanks outside, and no herds in the high group had unheated tanks outside. More herds in the high groups had the benefit of D.H.I.A. assistance. This is particularly true in Area 3 where 12 herds in the high group were in the D.H.I.A. and only 3 herds in the low group were in the D.H.I.A. In Area 1, the difference between the two groups, insofar as membership in D.H.I.A. is concerned, was not considered significant since only one dairyman in this area was a member.

Milkhouses were more frequently found on dairy farms with high producing herds than on farms with low producing herds. This was true in each area to about the same extent but may have been due to differences in herd size rather than to herd productivity.

Tillable acreage was found to be somewhat higher on the farms with the high producing herds than on the other farms in Areas 1 and 3. In Area 2 there was no difference.

The reason for the high feed costs in the high production group was found to be simply that more feed was fed particularly concentrates. For Area 3 it was found that the low group received an average of only 1,421 pounds of concentrates per cow, 4,372 pounds of hay per cow and 3,910 pounds of silage per cow, while the high group received 3,081 pounds of concentrates, 5,290 pounds of hay, and 7,107 pounds of silage per cow. This difference in quantity of feed fed per cow accounted for the difference of $69 in feed costs per cow. There was a difference of $124 per cow in returns from dairy product sales, however. With inferior cows, it is doubtful if the extra cost of heavy feeding would pay. In fact, if this high production group in Area 3 were to be further analyzed it would no doubt be found that some of the herds were fed concentrates too heavily, that more profit could have been made by feeding less concentrates and more roughage.

It should be noted that price was <u>not</u> held <u>completely constant</u>. In Area 1 the high one-third still had a 5¢ per pound price advantage over the low one-third. With price held completely constant, it is probable that the high group would still have received approximately 2½ times more labor and management return per cow and per herd than the low group. This was a tremendous advantage, and makes one wonder whether the owner of a low producing herd might not better have spent his time in some other occupation. It was found that on the average (at 117 hours per cow) the

operators of the low producing herds in Area 1 received 50¢ per hour for their labor and management, and for their family's labor and for any labor hired. Milk used in the household and fed to the farm livestock was counted as income in this computation.

CHAPTER VII

EFFECTS OF CERTAIN FEEDING PRACTICES ON DAIRY RETURNS

As stated before, efficiency in milk production is what is to be desired in a cow. High output per unit of input is the criterion of efficiency. Cows of high efficiency are generally cows with good breeding. They are cows that produce well at any level of feeding, and that are capable of responding to good feeding and good treatment. Whether they are fed well or not so well logically should depend on the existing cost-price relationship. When prices are high and feed costs are low, more feed can be fed profitably than when milk prices are low and feed costs are high. In between these two extremes there is an infinite number of other combinations of costs and returns. An efficient cow will respond more satisfactorily to heavier feeding than will an inefficient cow at any level of feeding. To study the effects of feeding practices on returns, knowledge of the effects of various rates of feeding concentrates on returns was desired.

It was thought by the writer that many dairy operators fed too much concentrates, that under normal cost-price relationships they could earn a greater return by feeding less concentrates and more high quality roughages. The ratio of milk produced to concentrates fed is one of the measures used to guide farmers in the best rates to feed concentrates to their cows. The best rate will, of course, depend on feed prices, the cost of hay and silage

Table 17. Effect of ratio of concentrates fed to 4 percent milk produced on returns.

	Area 1			Area 2			Area 3		
	Low	Med.	High	Low	Med.	High	Low	Med.	High
Number of farms	13	12	13	15	16	15	15	16	15
Average number of cows per farm	14.7	11.7	10.3	12.1	13.2	13.8	14.9	17.1	16.4
Pounds butterfat per cow	240	274	244	278	304	284	283	333	333
Pounds 4 percent milk per cow	6,202	7,187	6,396	6,710	7,531	6,856	7,245	8,667	8,685
Pounds concentrates fed per cow	1,061	1,968	2,738	1,379	2,069	2,433	1,231	2,424	3,393
Ratio of concentrates fed to 4 percent milk produced	1-5.8	1-3.7	1-2.3	1-4.9	1-3.6	1-2.8	1-5.9	1-3.6	1-2.6
Dairy product sales per cow	$ 250	$ 314	$ 284	$ 266	$ 287	$ 273	$ 292	$ 335	$ 354
per pound butterfat	$1.04	$1.15	$1.16	$0.95	$0.94	$0.96	$1.03	$1.01	$1.06
Feed costs per cow	$ 106	$ 130	$ 166	$ 118	$ 161	$ 166	$ 144	$ 179	$ 207
Returns over feed cost, per cow	$ 144	$ 184	$ 118	$ 148	$ 126	$ 107	$ 148	$ 156	$ 147
Tillable acres per farm	155	156	142	73	86	90	85	109	112
Number of farms with fluid market	8	4	10	2	3	8	4	2	7

compared to the cost of concentrates, the extent to which hay and silage can be substituted for concentrates, and vice-versa, and the price received for milk sold. The records for each area were sorted into three groups, low ratio (small quantity of concentrates per unit of milk produced), medium ratio, and high ratio (large quantity of concentrates per unit of milk produced). The results are tabulated in Table 17. The tabulation shows that in Areas 1 and 3 a medium rate was the most profitable, and that in Area 2 a low rate of feeding concentrates was most profitable. Here we run up against the problem of differences in the inherent productivity between cows and groups of cows. In Area 3, the medium ratio group, 1 pound of concentrates fed for each 3.6 pounds of 4 percent milk produced, included cows which averaged 333 pounds of butterfat. The high ratio group were fed concentrates at an average rate of one pound to each 2.6 pounds of 4 percent milk produced, but these cows also averaged 333 pounds of butterfat per cow. Clearly, the medium ratio group of cows were producing milk more cheaply than the high ratio group; they produced the same quantity of product with considerably less input of concentrates. But, it is impossible to measure accurately the profitability of the different rates of feeding concentrates. In both Area 1 and Area 2 the same situation holds, only it is more evident. In both areas, the medium ratio groups averaged higher production per cow than the high ratio groups in

spite of the fact that they were fed considerably less. It cannot be claimed that differences in prices account for the differences in rates fed because, in each area, the average prices received in the medium and high groups were very similar.

It is felt that this procedure was not conclusive in determining the most profitable level of feeding because of the impossibility of keeping the inherent productivity of the various groups constant. It is felt, however, that in each area, the high ratio group of cows were being overfed, and that the feed price-milk price relationship would have had to be much more favorable than it was during the time of this study before feeding even 2,400 pounds of concentrates would have been profitable. Of course, one still has to make the allowance for the dry 1948 season, and admit that perhaps some of the overfeeding of concentrates was due to necessity and not to choice, because of a shortage of hay.

With low producing cows of heavy breed such as composed the high group in Area 1, it has been estimated the most efficient level of concentrate feeding would be at approximately 900 pounds * per cow, assuming a ratio of concentrates price to milk price of .77 (Appendix C). The high group was actually fed an average of 2,738 pounds of concentrates per cow.

This figure of 900 pounds of concentrates assumes also feeding around 5,600 pounds of hay and 6,600 pounds

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* Appendix K.

of corn silage. In the absence of the corn silage, of course, more hay would have to be fed, or more concentrates.

In Area 3, the severe effects of the overfeeding of concentrates were not so noticeable because of the generally higher producing cows on that area compared to Areas 1 and 2. The cows in the medium and high ratio groups were classified as about midway between low producing and medium producing cows. With a ratio of concentrate price to milk price of .87 (Appendix C), it has been estimated the most efficient level of concentrates to feed would have been around 1,500 pounds per cow.* It would seem that both the medium ratio and high ratio groups were considerably overfed in Area 3.

It was considered noteworthy that in both Area 2 and Area 3 the farmers who fed the most concentrates were the ones who had the largest farms. This same conclusion was reached from studying Table 13. There, the largest farms were found to have the highest feed costs. More fluid producers were found in the high ratio group in each area than in either the low or medium ratio groups. It is entirely possible that the mere possession of a good market outlet induces some dairymen to feed concentrates too heavily.

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* Appendix K.

A. Overfeeding of Concentrates.

That some dairymen did feed concentrates extremely liberally and that the result was a sacrifice in earnings is shown in Table 18a where three Area 3 herds are analyzed as to feeding practices.

Farm 56 is the most glaring example of overfeeding and apparent mismanagement of resources. The operator received only $1.25 in return for every $1 in feed fed his cows. Feed costs represented 81 percent of his receipts from dairy products and this in spite of the fact that he had a good fluid market, and received on the average $1.06 per pound of butterfat. His ratio of concentrates to milk was 1 to 1.55, an extremely high ratio. Of course, we must keep in mind that he might have been experiencing an acute shortage of hay, and was possibly intentionally overfeeding concentrates to make up for the hay shortage. However, in his farm organization he had allotted only 38 percent of his 47 tillable acres to hay, a very low percentage for that area. Twenty of his 47 acres he had in oats, and 9 acres was in corn for silage. His yields of both were fair, but it seems to the writer that his farm organization was at fault in not allotting more of his acreage to hay and less to oats. It is much cheaper, normally, to feed nutrients in hay than in oats. It seems that even in a good year for hay crops, this operator would still be short of adequate hay for his 18-cow herd. That he had only $58 per cow left after paying all

Table 18a. Effects of overfeeding of concentrates on dairy earnings in Area 3.

	Farm 56	Farm 46 9/	Farm 36 9/
Number of cows	18	24	18
Breed	Guernsey	Holstein	Holstein
Pounds butterfat per cow	276	410	441
Pounds 4 percent milk per cow	6,713	10,785	11,790
Pounds concentrates fed per cow	4,324	4,305	2,219
Pounds of concentrates purchased per cow	2,272	2,030	1,564
Pounds hay fed per cow	4,611	5,720	5,475
Pounds silage per cow	6,305	8,565	7,045
Ratio of concentrates fed to 4 percent milk produced	1-1.55	1-2.50	1-5.30
Dairy product sales per cow	$ 292	$ 409	$ 444
per pound butterfat	$1.06	$1.00	$1.00
Feed costs per cow	$ 234	$ 274	$ 195
Cash cost of concentrates purchased, per cow	$ 104	$ 78	$ 55
Return per dollar feed fed	$1.25	$1.50	$2.28
Return over feed per cow	$ 58	$ 135	$ 249
Tillable acres in feed crops	47	250	82
Acres in hay and yield per acre	18 Alf. 1½ T	80 Alf. 1½ T	26½ Alf. 1 T
Acres in tillable pasture per farm	0	104 old meadow	24 clover
Acres oats and yield per acre	20 40 bu.	50 40 bu.	10 50 bu.
Acres corn silage and yield per acre	9 10 T	16 6½ T	10 7½ T
Fertilizer used this year on hay and pasture	None	100 lbs./A of 0-20-20 and 3-12-12 on 80 A of hay; also 100 loads manure on 104 A pasture	None
Member of D.H.I.A.	Yes	Yes	Yes
Hours labor per cow	66	85	89

9/ How Can Upper Peninsula Dairymen Reduce Costs? by C. R. Hoglund and R. W. Christian, Agricultural Economics Department, Michigan State College and Bureau of Agricultural Economics, U.S.D.A., Michigan Agricultural Experiment Station Quarterly Bulletin, Vol. 32, No. 4, May, 1950, p. 603, Table 4. Farm 36 in Table 17 is Farm A and Farm 46 is Farm B in the above named article.

his feed expenses is adequate proof that he cannot have much left as a return to his labor and management.

Farm 46 is an excellent example of a farmer with large acreage, with a large herd, and who uses generally good practices, but who achieves high production at the expense of exceedingly high feed costs. His primary goal would seem to be high production rather than economic production. His cows returned him $1.50 for every $1 of feed fed. Feed costs represented 67 percent of his receipts. His ratio of concentrates fed to milk produced was 1 to 2.66, far too high to be economic. He is still much better off than the previous farmer in that he had $133 per cow left after paying all feed costs, compared to $58 for the operator of Farm 56.

It is estimated* that this farmer could have increased his returns by $40 per cow, at least, by feeding 2,000 less pounds of concentrates per cow. It is estimated that this reduction in feed would have reduced butterfat production by only 30 pounds or $30 per cow while feed costs would have been reduced by $70. Also, this operator had space in his barn for 37 head of cattle but he was keeping only an average of 24.1. He could have had his barn full of cows without the addition of any more feed except the required protein supplement. The author estimates that overfeeding his cows cost this operator a sum of approximately $960. He could have sold the excess

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* Appendix K.

concentrates fed for $1,680 while at the same time, he would have taken a reduction in receipts of only $720.

This operator, perhaps because of misplaced emphasis on high production, in magazine articles and by educational institutions, achieved the desired high production but it proved to be an extremely uneconomical achievement.

In justice to the operator of Farm 46 it should be stated that some of his large acreage was devoted to the production of feed for a large herd of youngstock. He was obviously in the process of enlarging his herd, with 10 heifers over one year and 11 heifers under one year of age. This fact does not cloud the issue of his overfeeding concentrates to his cows, however.

Farm 36 is an excellent example of cows efficiently fed. Admittedly, they were cows of high producing ability. They outproduced the cows on Farm 46 with considerably smaller quantities of feed, particularly concentrates. The cows on Farm 36 attained high production economically, in contrast to those on Farm 46. Each cow on Farm 36 earned $249 over the cost of its feed, whereas each cow on Farm 46 earned only $135 over the cost of its feed. Available resources were used to much better advantages on Farm 36 than on Farm 46.

B. Underfeeding of Concentrates.

Underfeeding of concentrates is probably practiced as frequently as overfeeding. From the results in Table 18b however, it would seem that underfeeding of concentrates,

Table 18b. Effects of underfeeding of concentrates on dairy earnings in Area 3.

	Farm 11	Farm 51	Farm 20
Number of cows	10.1	17.0	18.3
Breed	Guernsey	Holstein	Guern.-Holst.
Pounds butterfat per cow	324	303	227
Pounds 4 percent milk per cow	7,545	8,016	5,674
Pounds concentrates fed per cow	948	996	513
Pounds concentrates purchased per cow	726	244	0
Pounds hay fed per cow	4,711	4,611	5,217
Pounds silage fed per cow	5,450	5,924	8,614
Ratio of concentrates fed to 4 percent milk produced	1-7.96	1-8.05	1-11.07
Dairy product sales, per cow	$ 376	$ 303	$ 233
per pound butterfat	$1.16	$1.00	$1.03
Feed costs per cow	$ 130	$ 153	$ 102
Cash cost of concentrates purchased per cow	$ 29	$ 10	0
Return per dollar feed fed	$2.90	$1.98	$2.29
Return over feed cost per cow	$ 246	$ 150	$ 131
Tillable acres in feed crops per farm	31½	67½	90
Acres in hay and yield per acre	19½ 1½ T	35 1 T	58 1 T
Acres in tillable pasture per farm	2	7 Alfalfa 14 rye in May	0
Acres in oats and yield per acre	5 46 bu.	18 35 bu.	18 35 bu.
Acres in corn silage and yield per acre	5 7 T	7½ 10 T	14 7 T
Fertilizer used this year on hay and pasture	None	500#/A of 0-20-0 on 6 A hay	None
Member of D.H.I.A.	Yes	Tests own	Yes
Hours labor per cow	115	64	65

as a practice, was less uneconomical than overfeeding.

Farm 11 is an excellent example of an operator with cows of fairly high producing ability losing money by underfeeding. That the cows were of fairly high producing ability is evidenced by the 325 pounds of butterfat per cow average despite the low concentrate feeding. High quality cows respond much better to increased feeding than do low quality cows. A combination of high quality cows and a relatively high price for milk would have made heavier feeding of concentrates profitable. If this dairy operator would have fed twice as much concentrates, or more, if he had fed 2,500 pounds instead of 948 pounds per cow, it is estimated that he could have increased his butterfat production per cow by close to 70 pounds,[10/] or from 324 pounds to from 390 pounds to 400 pounds. At an average of $1.16 per pound butterfat this would have increased his returns by $80 per cow, while his feed costs would have risen probably no more than $50 per cow. Instead of a return over feed costs of $246 per cow, he could have obtained a return over feed of around $275 per cow. Even if the operator of Farm 11 had had to buy the extra amount of concentrates, and he likely would have had to with a tillable acreage of only 31½ acres, he could still have made the extra return. With feed price-milk price relationships existing at the time of this

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10/ Input-Output Relationships in Milk Production, Einar Jensen, et al. United States Department of Agriculture Technical Bulletin No. 815, May, 1942, p. 27.

study, he could theoretically have fed concentrates profitably up to the point where an additional 100 pounds of concentrates produced only 61 pounds additional milk.[11/]

It must be conceded that even feeding at the low rate of 1 pound of concentrates to each 7.96 pounds of 4 percent milk, this dairy operator made an exceptionally high return over feed. It is apparent, however, that with the good fluid market that he had, he could have increased his returns considerably by heavier feeding.

Farm 51 is another example of a good herd being underfed concentrates to the detriment of net income. The concentrates price-milk price ratio at the time of this study for this dairyman averaged .93, i.e. 100 pounds of concentrates were equal in value to 93 pounds of milk. It would have been profitable for this dairyman to have fed concentrates up to the point where an increment of 100 pounds of concentrates resulted in only an increment of 93 pounds of milk. It is believed that at a concentrates price-milk price ratio of .93, the most profitable level of feeding for a cow of medium producing ability is in the neighborhood of 1,750 pounds of concentrates.*

If this dairyman would have fed at the rate of 1 pound of concentrates to every 5 pounds of milk instead of 1 pound of concentrates to every 8 pounds of milk as he did he would have had to feed in the neighborhood of

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11/ Ibid., p. 60.

* Appendix K.

1,750 pounds of concentrates per cow, at an increased cost in feed of $25 (at an average concentrates cost in Area 3 of $3.30 per cwt.).* It is estimated that this increase in concentrates fed would have resulted in an increase in butterfat production of about 30 pounds per cow which, at $1.00 per pound would leave a net increase in per cow income of roughly $5.00. For the herd, this increase in net income would amount to roughly $85.

Farm 20 is an example of extremely low rations fed to low producing cows. This operator fed no concentrates at all during the pasture season; in fact, no concentrates were fed until December. Silage was fed liberally in October, and hay and silage together in November. From December through April, about 3 pounds of ground oats and protein supplement were fed per cow per day. On this ration, his cows averaged about 19 pounds of milk daily for the year. They slumped badly starting in the latter part of July, due to poor pasture and no supplementary feed. It is believed that the cows in this herd were not as poor in producing ability as the low butterfat production made them seem. Poor pasture and generally poor herd management made them appear much less productive than they really were.

The principle employed in the above analysis is the principle that cows should be fed up to the point of diminishing returns, i.e. to the point where a given increment

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* Appendix C.

in feed costs produces a similar increase in milk receipts, but no more or no less. In the lingo of economic theory it is the point where marginal costs equal marginal returns. That is the point of maximum net returns. Roughage costs should be included for high accuracy but are ignored here since this is not meant to be a perfectly precise calculation.

CHAPTER VIII

THE EFFECT OF MARKET OUTLET ON DAIRY EARNINGS

Market outlet was an important factor determining the return from the dairy herd. It is generally conceded that the fluid market offers the best opportunity for high returns. Prices are generally considerably higher for fluid milk than they are for the other classes. Of course, costs are higher too, due to state and local health regulations which require certain standards of cleanliness to be maintained on farms where milk is produced for the fluid market.

It is apparent that during the period of this study (May, 1948 to April, 1949) the fluid producers in Area 1 had a tremendous advantage in price over the cheese and cream producers in that area. Furthermore, the suppliers of the cheese factories in Area 1 had a considerable price advantage over the cream suppliers.

The fluid milk suppliers in Area 1 had a 21¢ per pound butterfat price advantage over the cheese suppliers during the period of this study. As would be expected, the producers of fluid milk in Area 1 had somewhat higher feed costs. They fed concentrates to their cows at an average rate of 2,044 pounds per cow, a ratio of 1 pound of concentrates to every 3.4 pounds of 4 percent milk produced. Their average production of milk and butterfat was likewise considerably higher than was the average

Table 19. Effect of market outlet on dairy earnings.

	Area 1			Area 2		Area 3		
	Fluid	Cheese	Cream	Fluid	Cheese	Fluid	Cheese	Cond.
Number of farms	22	5	11	13	32	13	16	17
Number of cows per farm	14.4	14.0	7.2	13.9	12.9	16.3	17.1	15.2
Range in number of cows per farm	5-27	8-20	4-14	5-26	6-30	7-32	8-30	8-28
Pounds butterfat per cow	261	236	228	276	296	325	319	310
Pounds 4 percent milk produced per cow	6,875	6,058	5,717	6,759	7,209	8,487	8,326	7,965
Hours labor per cow	108	118	150	134	134	121	104	94
Returns								
Dairy product sales per pound butterfat	$1.19	$0.98	$0.87	$0.99	$0.94	$1.10	$1.01	$1.00
per cow	$ 310	$ 231	$ 199	$ 275	$ 277	$ 358	$ 322	$ 311
Other returns per cow*	$ 23	$ 24	$ 24	$ 15	$ 14	$ 27	$ 27	$ 26
Total returns per cow	$ 333	$ 255	$ 223	$ 290	$ 291	$ 385	$ 349	$ 337
Costs								
Feed costs per cow	$ 138	$ 115	$ 124	$ 159	$ 146	$ 189	$ 180	$ 166
Other costs per cow**	$ 55	$ 62	$ 63	$ 66	$ 58	$ 90	$ 79	$ 81
Total costs per cow	$ 193	$ 177	$ 187	$ 225	$ 204	$ 279	$ 259	$ 247
Net Returns								
Return over feed costs per cow	$ 172	$ 116	$ 75	$ 116	$ 131	$ 169	$ 142	$ 145
Labor and management return from cows, per cow	$ 140	$ 78	$ 46	$ 65	$ 87	$ 106	$ 90	$ 90
per herd	$2,013	$1,093	$ 331	$ 898	$1,122	$1,725	$1,545	$1,362
per hour labor	$1.29	$0.66	$0.31	$0.48	$0.65	$0.87	$0.86	$0.95
Feed Fed Cows per Cow								
Pounds concentrates fed per cow	2,044	1,205	1,455	2,274	1,880	2,805	2,232	2,210
Pounds hay fed per cow	5,593	5,681	5,828	5,241	5,392	5,086	4,872	4,413
Pounds silage and roots fed per cow						4,732	6,355	5,320
Ratio concentrates fed to 4 percent milk produced	1-3.4	1-5	1-3.9	1-3	1-3.8	1-3	1-3.7	1-3.6
Tillable acres per farm	176	152	101	106	75	96	106	103

* Includes credit for manure of $9 per cow, appreciation in cow value, if any, and value of calves at 5 days.

** Includes breeding costs, building costs, cow depreciation, interest on cows, electricity, equipment use, veterinary and medicine costs, bedding, and overhead.

production of the herds producing for the cheese outlet. Production was far from being good, the high price notwithstanding. A cow producing 261 pounds of butterfat (the average among the cows producing milk for the fluid market in Area 1) is certainly not a high producing cow.

In this sample of Area 1 herds, there were only three herds producing over 300 pounds butterfat per cow, one averaged 308 pounds, another averaged 380 pounds, and the third averaged 432 pounds per cow. All three produced for the fluid market. With their high price and relatively high producing cows, the producers for the fluid market received $172 per cow in return over feed, while the producers for the cheese market received only $116 and the producers for the butter market only $75 per cow.

The producers of cream for the butter market in Area 1 were in a very unhappy position during the course of this study. The price was low, averaging only 87¢ per pound of butterfat, their herds were small, averaging only 7.2 cows per herd, and production per cow was very low at 228 pounds butterfat. The suppliers of cream for the butter manufacturers in Area 1 had also the lowest labor efficiency of any of the three outlets. They spent an average of 150 hours labor per cow, while those supplying the cheese factories spent an average of only 118 hours per cow, and the fluid milk suppliers, the most efficient of all, spent 108 hours per cow. The cream producers were

at the bottom in everything which measures efficiency. In terms of labor and management return per hour, the cream producers received only 31¢. That was an extremely low wage. Unless those dairymen put a very high premium on farming as a way of life they would most certainly have been better off, and the community would have been better off, if they had been engaged in almost any other activity than dairying.

In Area 3, the situation was quite comparable to that in Area 1 except that the price premium to the fluid milk producers was less in Area 3. The fluid milk suppliers received an average of $1.10 per pound of butterfat, while the cheese suppliers received an average of $1.01 per pound, and the condensary suppliers $1.00 per pound of butterfat. Thus, there was only a 9¢ spread between the average fluid price and the average price paid by the other users of milk. Producers for the fluid market fed their cows somewhat better, and thereby achieved a slightly higher production per cow than the other two groups of producers. They fed an average of 2,805 pounds of concentrates per cow, and their ratio of concentrates fed to 4 percent milk produced was 1 to 3. The other two groups fed approximately 2,200 pounds of concentrates per cow, for a ratio of 1 to 3.6 and 1 to 3.7.

It is believed by the writer that, as a general rule, and for the quality of cows represented in this sample, each group fed concentrates at an unprofitably high level.

However, it must be recognized that the year of this study was a poor one for the production of roughage. It is entirely possible that in a normal year these dairymen feed less nutrients in the form of concentrates and more in the form of roughages and silage.

The fluid milk producers in Area 3 as a group, fared considerably better in terms of return over feed and labor and management return than did the other producers. This, in spite of somewhat higher feed costs and higher "other costs." In labor efficiency the fluid milk producers were the least efficient of the three groups, spending an average of 121 hours per cow, whereas the cheese suppliers and the condensary suppliers spent 104 hours and 94 hours respectively per cow. This result is to be expected but is contrary to that obtained in Area 1, where just the reverse was true. This result in Area 1 is probably due to the fact that the fluid producers had herds twice as large as those of the cream producers.

It is also true that in Area 3 the producing ability of cows owned by the fluid producers was not superior to that of the cows owned by the producers for the other outlets. This too, is contrary to the results in Area 1. It must be concluded that, as a group, the fluid producers are not in any way the most efficient producers. They are fortunate in having the best outlet, but that good fortune does not stem from superior efficiency or productivity.

In Area 2 the situation was somewhat different. There was very little difference between the price paid for fluid milk and for cheese. The difference of 5¢ per pound butterfat is not considered significant and is believed to be due entirely to the sample. The high feed costs, high "other costs," and low production per cow of the fluid group were significant contributing factors in the low labor and management return of the cows in that group. The cows in the fluid group averaged 276 pounds of butterfat per cow, while the cows in the cheese group averaged 296 pounds per cow. The labor efficiency in the two groups was the same; each averaged 134 hours per cow. This represents extremely low labor efficiency when compared to the other two areas.

In return over feed costs per cow the cheese group in Area 2 had $131, and the fluid group had only $116. Because the fluid producers had higher "other costs," the difference in labor and management return between the two groups was even greater in favor of the cheese producers. Labor and management return per cow for the cheese group was $87 and for the fluid group, $65. It is evident that cows of high producing ability can easily make up for a low quality market.

It would seem that in any area and with any kind of a market outlet it pays to have cows of high producing ability. It is not necessary to despair just because it is impossible to find a fluid outlet for milk. Plenty of

profit can be made and is made where the outlet is not a fluid outlet.

It is interesting to note that in both Area 1 and Area 2 the farms with a fluid milk market were, on the average, the largest farms. The herds were not significantly larger but the farms, as measured by tillable acres, were significantly larger than the farms where the market was other than a fluid milk market. In Area 3 this relationship did not hold. There was no significant difference in the size of farm between any two of the three market outlet groups in Area 3.

CHAPTER IX

EFFECT OF FALL-FRESHENING ON DAIRY RETURNS

Sixty-eight percent of the dairymen in this study indicated that they liked to have their cows freshen in the fall months. The reasons generally given for this preference were four: the first reason was that fall-freshening helped promote high production at two different times, in the fall as the cows freshened, and in the spring when they were turned out to pasture; the second reason was that fall-freshening enabled them to achieve a higher base when they were on the base-surplus plan; a third reason sometimes given was that fall-freshening enabled them to better utilize their labor supply. The cows would then be dry during part of the harvesting season, and the months of heavy production would occur when other demands for their labor was lowest. The fourth reason, given by 19 of the 88 dairymen desiring fall-freshening, was that prices were better in the fall months. Presumably, the 11 dairymen who operated under the base-surplus plan also had price in mind because fall-freshening would give them a better average price for their milk for the entire year. The main motivating forces behind a desire for fall-freshening then were better production, better price, and better labor distribution.

It is a generally accepted fact that both milk and butterfat prices do average higher in the fall months than in

the summer months.[12] This is because the supply is higher during the summer months. It is also known that in years of generally falling farm prices, milk prices fall from September through December. Butterfat prices, in years of falling farm prices, while they do not tend to fall from September to December, they do tend to stay rather steady.[12] Consequently, in a year of generally falling farm prices, one would not expect there to be the price advantage accruing from fall-freshening which there would be in a year of steady or rising farm prices. The year chosen for this study happened to be a year when farm prices were generally falling, as shown in Figure 4.

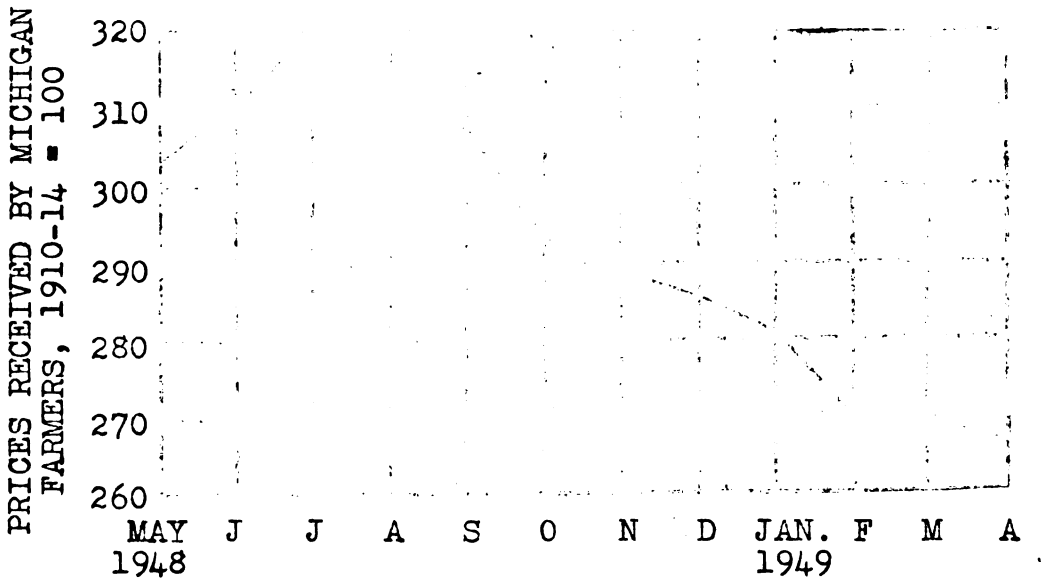

Figure 4. Average prices for all farm products received by Michigan farmers during the period of this study, May 1948 to April 1949.[13]

12/ "Seasonal Price Changes of Major Michigan Farm Products," L. L. Boger, Michigan State College, Agricultural Experiment Station, Special Bulletin 355, January, 1949.

13/ "Prices Received by Michigan Farmers," Michigan Farm Economics, Michigan State College Extension Service, Department of Agricultural Economics, May 1948.

Prices received by Michigan farmers fell approximately 17 percent from July, 1948 to April, 1949. Prices received for butterfat fell 26 percent during this same period, and the prices received for milk fell 24 percent (Figure 1).

Average prices for milk and butterfat, on a butterfat basis, in our sample of Area 2 and Area 3 dairymen fell from July, 1948 to May, 1949 36 percent in Area 2 and 31 percent in Area 3 (Figure 1). Instead of fall-freshening being an advantage to them, it was a disadvantage. This was an extraordinary year, however, and it is believed that normally prices are higher during the six-month period, September to February, than during any other six-month period in the year. Fall-freshening is designed to obtain the highest production during this period.

A sort was made by percentage of cows freshening during the five-month period, August to December inclusive. It was wondered whether fall-freshening during this particular year produced better results than non-fall-freshening. Several of the records were discarded because the information was not available. The results are tabulated in Table 20.

It is apparent that those dairymen with a high percentage of fall freshening generally achieved better results from their herds than did the dairymen with a low percentage of fall freshening, despite the disadvantage of falling milk and butterfat prices in Area 2 and Area 3.

Table 20. Effect of fall freshening on herd income.

	Area 1		Area 2				Area 3			
	Fluid outlet		Fluid outlet		Other outlet		Fluid outlet		Other outlet	
	1/3 High %	1/3 Low %	1/3 High %	1/3 Low %	1/3 High %	1/3 Low %	1/3 High %	1/3 Low %	1/3 High %	1/3 Low %
Number of farms . . .	10	10	6	7	15	15	6	7	17	16
Average number of cows	14.3	13.3	15.2	12.7	11.8	12.6	17.6	15.1	16.8	15.4
Number of cows freshening, August-December, as percent of total number freshening	43	15	44	21	45	17	52	28	63	28
Pounds butterfat per cow	286	241	284	268	298	282	331	319	341	284
Dairy product sales per cow	$ 349	$ 280	$ 286	$263	$278	$265	$ 366	$ 349	$ 342	$ 288
per pound butterfat.	$1.22	$1.16	$1.01	$.98	$.93	$.94	$1.10	$1.09	$1.00	$1.01
Feed costs per cow .	$ 145	$ 127	$ 148	$170	$147	$138	$195	$ 184	$ 189	$ 154
Return over feed cost per cow	$ 204	$ 153	$ 138	$ 93	$131	$127	$171	$ 165	$ 153	$ 130
Labor and management return per cow . . .	$ 177	$ 121	$ 96	$ 34	$ 90	$ 82	$124	$ 92	$ 99	$ 80

Those with a high percentage of fall-freshening cows had greater production per cow, larger herds, greater return over feed costs, and greater labor and management returns than those with a low percentage of fall-freshening cows. It must not be presumed however, that all the difference shown in this tabulation was due to the difference in percentage of fall-freshening cows. Rather, it shows that those dairymen practicing fall-freshening on the largest scale were also high in other efficiency factors. They tended to have cows of better inherent productivity; they probably had better feed; they had slightly larger herds and could thus be more efficient in the care of the cows; they may, as a group, have taken better care of calves and other youngstock to assure good cows when they entered the producing herd. There are many possible contributing factors which might tend to produce the results shown in Table 20. In a year of rising instead of falling prices it is believed the results would have been even more in favor of the group with the high percentage of fall-freshening.

Approximately 60 percent of the dairymen in this sample were using or had used artificial insemination. Many of them had used it less than a year, and were having considerable trouble "settling" cows. Slightly over 40 percent of those using artificial insemination indicated that it was less satisfactory than was natural service. Of course, that was a matter of opinion on their

part and statistical methods might prove to some of them that, from the standpoint of success in settling cows, artificial was no less satisfactory than natural breeding. However, it is believed that many of the dairymen experiencing difficulty in the settling of the cows really were having more trouble than they usually had. This upset their freshening schedule so that a smaller percentage of their cows freshened in the fall than they intended to have.

Not all the dairymen believed in the fall-freshening principle. In Area 3, 28 percent of the dairymen in our sample desired their cows to freshen evenly throughout the year, and in Area 1, 13 percent indicated this preference. The reason usually given for this preference was that an even milk flow throughout the year was liked. It is significant that no economic reason was given for this preference. One man wanted his cows to freshen after December so that they would be dry during deer hunting season.

A large proportion of Upper Peninsula dairymen believed in the efficacy of fall-freshening as a management principle. A considerably smaller proportion achieved the desired level of fall-freshening in the year of this study.

Studies in other states indicate that fall-freshening of cows is an important factor in obtaining high production. A study made in New York state in 1939 and 1940[14/]

14/ "Factors That Affect Costs and Returns in Producing Milk," Cornell University Agricultural Experiment Station, Bulletin 804, March, 1944, p. 23.

indicated that fall-freshening cows, other things being equal, usually had a higher total production of milk than spring-freshening cows. Also, because of the seasonal increase in milk prices during the fall and early winter, the margin between milk cost and feed prices was more favorable for the herds practicing fall-freshening. A study made in Minnesota continuously between 1928 and 1937 showed a similar result.[15/] In addition to the production and price advantages resulting from fall-freshening, the Minnesota study listed a further beneficial result - that accruing from a higher return over feed from cattle other than cows. The raising of fall calves proves more profitable than the raising of spring calves, according to the Minnesota study.

In Figure 5 is shown a graph of butterfat prices in the Upper Peninsula by months for each of the years 1940 to 1950. In those 10 years, butterfat prices were higher during the last four months of the year in six of those years; they were lower in two of the years, the last two; and there was very little change in two of the years. Of course, it can be argued that those years certainly were not normal years, that prices in the whole economy were rising during that period. Nevertheless, it is a valuable indication and, along with other information already

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15/ "Managing the Dairy Herd for Greater Returns," University of Minnesota Agricultural Experiment Station, Bulletin 378, June, 1944, p. 14.

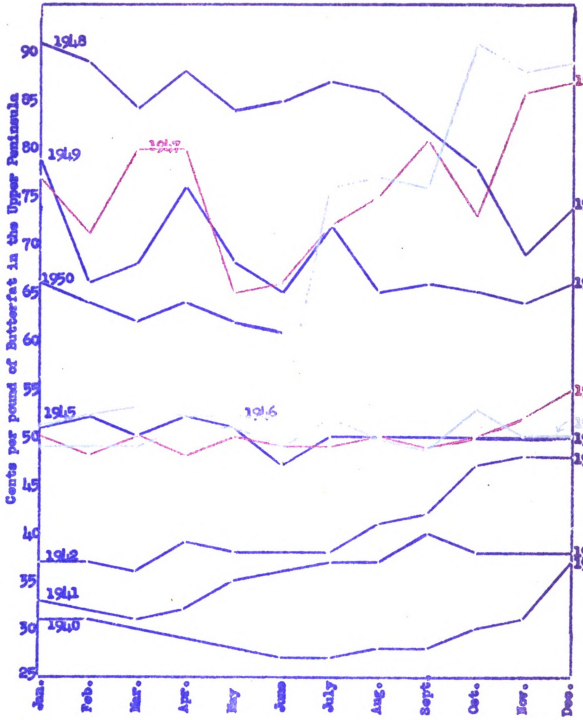

Figure 5. Graph of butterfat prices paid in the Upper Peninsula by months from 1940 to 1950.*

* Unpublished data from Federal-State Crop Reporting Service, Lansing, Michigan.

cited, shows that one can usually expect a price advantage to accrue from a fall-freshening program.

CHAPTER X

UPPER PENINSULA DAIRYMEN CAN IMPROVE RETURNS BY BETTER CROP MANAGEMENT

Good quality hay and pasture is very scarce in the Upper Peninsula, despite the importance of these crops in the agricultural economy of the region. As shown in Table 8, between 70 percent and 80 percent of the tillable land in the Upper Peninsula is devoted to hay and tillable pasture. Although alfalfa is probably the most productive of hay crops, very little is grown in the Upper Peninsula. In Area 1, in 1945* only 30 percent of the tillable acreage in hay and pasture was alfalfa or alfalfa mixture hay. In Area 2 the percentage was only 1.6 percent. Area 3 grew the largest amount of alfalfa, 20.6 percent of the tillable hay and pasture acreage being of that kind. The balance of the hay and tillable pasture acreage was in clover or timothy, or combinations of the two, and june grass in 1945. Yields of timothy are very low, considering the fact that it is the major crop from the standpoint of acreage, on a great many farms in the Upper Peninsula. In many rotations it is the fourth or fifth crop which depletes the nitrogen supply. Average yields are between three-fourths and 1

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* Appendix A, Table 3.

ton per acre.[16] Average hay yields (all kinds) are very low in the Upper Peninsula, 1.2 tons per acre in 1947, .85 tons per acre in 1948, and 1.1 tons per acre in 1949 being reported by the Michigan Crop Reporting Service (Appendix B).

The need for considerable quantities of lime to raise the pH of the soils to 6.5 or higher is, of course, one of the reasons why more alfalfa is not grown. Another important reason is that the liming of the soil interferes with the growing of the white-skinned varieties of potatoes.

This latter reason should not affect the application of fertilizer, however. Fertilizer in adequate amounts will vastly improve the yields of any hay, timothy in particular. Average timothy yields of 3 to 4 tons per acre were achieved in experiments run in the Upper Peninsula between 1938 and 1946.[17] In the same experiment, yields of alfalfa were increased two-thirds ton per acre by the application of 400 pounds of 0-14-6 fertilizer per acre. This application would, of course, also increase the production of other crops in the rotation. It should be noted that an additional reason why alfalfa is not grown on a larger scale in Area 1 is that poor

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16/ "Soil Management in the Upper Peninsula of Michigan," James Tyson, Michigan State College, Agricultural Experiment Station, Department of Soil Science, Special Bulletin 345, January 1948, p. 26.

17/ Ibid., Tables 7 and 14, Appendix 4.

natural drainage of the clay soils causes the winter killing of alfalfa. Alsike-timothy mixtures are recommended for those soils.[18/]

The records for each area were separated into two groups, those that never used commercial fertilizer on their hay and pasture crops, and those that used some commercial fertilizer sometime in the rotation. The results were surprising. Among these supposedly better-than-average farmers in Area 1, 55 percent of the dairymen used no fertilizer anywhere in the rotation in which hay and pasture was included. In Area 2 the percentage using no fertilizer was 48 percent, and in Area 3 the percentage was 26 percent using no fertilizer in the rotation. Area 3 dairymen used fertilizer to a larger extent than did the dairymen in the other two areas. It is significant that feed crop yields are consistently greater in Area 3 than in the other two areas (Appendix B).

In each area the labor and management return per cow on the farms where fertilizer was used in the rotation, was in the neighborhood of double the labor and management return per cow on the farms where fertilizer was not used in the rotation. Production per cow was between 20 percent and 25 percent higher on those farms that used fertilizer than on those which used no fertilizer. Size of farm and size of herd were generally greatest on those

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18/ Ibid., p. 17.

Table 21. Dairy returns on farms where fertilizer was used compared to returns where fertilizer was not used in rotation.

	Area 1		Area 2		Area 3	
	No Fert.	Fert.	No Fert.	Fert.	No Fert.	Fert.
Number of farms	21	17	22	24	12	34
Number of cows per farm	11.3	13.4	12.7	13.3	14.1	16.9
Pounds butterfat per cow	229	275	259	315	267	333
Dairy product sales per cow	$ 239	$ 321	$249	$299	$ 283	$ 342
per pound butterfat	$1.05	$1.16	$.96	$.95	$1.06	$1.03
Feed costs per cow	$ 125	$ 140	$148	$151	$ 147	$ 187
Return over feed costs per cow	$ 114	$ 181	$101	$148	$ 136	$ 155
Labor and management return from herd,						
per cow	$ 68	$ 137	$ 52	$ 90	$ 51	$ 95
per herd	$ 769	$1,841	$659	$1,209	$ 723	$1,599
Pounds concentrates fed per cow			1,923	2,049	1,442	2,666
Tillable acres in feed crops per farm	115	154	76	78	66	106
Percent of tillable acres in hay			69	54	55	44
Percent of tillable acres in tillable pasture			14	22	14	20
Acres rotation pasture per cow			.88	1.27	.68	1.20
Acres second crop hay pasture per cow			2.26	1.74	2.14	2.04
Percent in D.H.I.A. now or in past or who test own	24	35	41	83	53	58
Percent with milk house	62	88	36	58	50	65

farms where fertilizer was used, although in Area 2 this was not the case. It should not be claimed that this difference in production in favor of those dairymen using fertilizer on their crops was due only to the fact that they did use fertilizer. Rather, that they use fertilizer is in the nature of a contributing factor. It can be seen that in Areas 2 and 3 those dairymen using fertilizer devoted a smaller proportion of their acreage to hay crops and a larger proportion to tillable rotation pasture. It is logical to assume that in Area 2 at least, the use of fertilizer permitted larger yields of hay, and the larger yields in turn permitted more acreage to be used for rotation pasture.

An adequate acreage of good quality pasture reduces considerably the amount of concentrates required to keep up production during the summer. It is also much cheaper feed than is grain because the cattle do their own harvesting (Appendix D). Top dressings of commercial fertilizer do much to preserve legume crops the second year, and the application of 200-300 pounds per acre is a highly recommended practice,[19/] yet in Areas 1 and 2 only 15 percent of the dairymen made use of this recommendation, and in Area 3, 37 percent.

19/ "Fertilizers for Legumes," R. L. Cook and C. E. Millar, Michigan State College, Agricultural Experiment Station, Department of Soil Science, Special Bulletin 328, April, 1944, p. 1.

Good rotation pasture can, of course, be the most productive pasture, but Upper Peninsula dairymen should not overlook the possibilities of increasing their pasture yields by renovating old bluegrass pastures which are too hilly or too stony for normal cultivation. Many dairy farms, particularly in Areas 2 and 3 are so small that an adequate acreage of rotation pasture is not possible. However, on those farms it is often noted that a considerable acreage of wild, brush covered pasture is available. It is on these farms that the renovation of permanent pasture would be very profitable. In Richland county, Wisconsin, during a 5-year period, 1941-1945, renovated pasture produced an average of 1,800 more dry weight pounds per acre than the untreated pasture, at a cost of only $3.75 per ton.[20/] In this experiment, the renovated pastures were seeded to a mixture of sweet clover and medium red clover. The production was doubled, besides which more feed was available for grazing each year in July and August.

In the same experiment it was found that woodland pastures produced only 276 pounds of dry matter per acre per year, and that untreated open pastures produced 5.3 times more forage per acre than the woodland pasture. Also, during the same period, the renovated pasture

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20/ "Wisconsin Needs Better Pastures," F. V. Burcalow, L. F. Graber, and H. L. Ahlgren, University of Wisconsin Extension Service, Circular 373, January, 1947.

described above produced 11.6 times more pasturage per acre than the woodland pasture.

In Ionia county, in 1949, it was found that renovation costs per acre on two farms where the soil had not been worked for 10 to 15 years was in the neighborhood of $40. This included seed and fertilizer costs. Traction type power had to be used for the most part.[21/]

Assuming the yields in the Wisconsin experiment, the cost per ton of dry weight feed would still be only $9.50 approximately, when the cost is spread over a period of 5 years. That would still be very cheap feed, and extremely valuable feed on small farms where the supply of forage is the chief limiting factor.

In the Upper Peninsula excellent yields can be obtained from wild white clover mixed with native grasses when 300 pounds of appropriate fertilizer is broadcast as early as possible in the spring. Where renovation is possible, and where sufficient lime has been added to the soil, alfalfa-brome grass, or alfalfa-timothy mixtures do very well.[22/]

On low, poorly drained areas, reed canary grass can be, and was during the period of this study, used successfully for permanent pasture. Very few dairymen have made use of this high yielding pasture in the Upper Peninsula

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21/ Unpublished data from Greener Pastures Contest, Ionia county, H. S. Wilt, Michigan State College and Bureau of Agricultural Economics, U. S. Dept. of Agriculture, 1949.

22/"Soil Management in the Upper Peninsula of Michigan," p. 41.

but there is no reason why it cannot be used successfully all over the Upper Peninsula on poorly drained land. Of the dairymen in this study, only 4 made use of reed canary grass, all 4 being in Menominee county.

In a study made in Ionia county in 1949 it was found that, although rotation pasture can yield better returns than renovated pasture, on the average good lowland renovated pasture (mostly reed canary grass) gave better average results in terms of cow credit over feed cost than did the rotation pasture.[23/]

Although the fertilization of permanent pasture does produce good results, very few of the dairymen interviewed in this study practiced it. In Area 1 only one man used fertilizer on his permanent pasture, in Area 2 two men used fertilizer, and in Area 3 two men fertilized their permanent pastures. Pasture renovation was not reported by any of the dairymen in this study.

On the whole, Upper Peninsula dairymen do not practice good pasture management. Their problems are somewhat greater than the problems faced by dairymen in the Lower Peninsula, but they are not insurmountable. Much could be done which is not done to insure good hay and good pasture. In Area 2, 28 percent of the dairymen in this study depended entirely on wild and woods pasture

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23/ Greener Pastures Contest, H. S. Wilt, Michigan State College and Bureau of Agricultural Economics, U. S. Dept. of Agriculture, Washington, D. C.

for their summer pasture. Another 42 percent depended on a combination of wild pasture and second crop hay pasture. Pasture consisting entirely of rotation pasture or a combination of wild pasture and rotation pasture was found to be the practice on 30 percent of the farms in Area 2. Sixty percent of those who used a combination of wild and rotation pasture applied fertilizer either as a top-dressing or sometime in the rotation. Only 30 percent of those using all wild pasture or a combination of wild and second crop hay pasture used fertilizer in their rotations. A comparison between those farms using all wild pasture with those using all rotation pasture is shown in Table 22.

Higher returns over feed costs were attained on those farms using all rotation pasture than on those using all wild pasture in Area 2. The size of farm and the average number of cows per herd were larger on the farms using all rotation pasture than on the other farms. The intensity, as measured by tillable acres in feed cost per cow was practically the same for the two groups. It would seem that devoting a portion of the tillable acreage to rotation pasture was a profitable maneuver. Those that used all rotation pasture had a return over feed $25 per cow greater than those using all wild pasture; they also purchased a smaller proportion of concentrates. The use of fertilizer undoubtedly permitted those farmers using all rotation pasture to obtain higher yields of feed crops.

Table 22. Comparison of dairy returns between farms using all wild pasture and farms using all rotation pasture in Area 2.

	Rotation pasture	Wild pasture
Number of farms	8	10
Number of cows per farm	18.1	11.3
Pounds butterfat per cow	300	267
Dairy product sales per cow	$ 290	$ 257
per pound butterfat	$.966	$.962
Feed costs per cow	$ 152	$ 144
Return over feed per cow	$ 138	$ 113
Tillable acres in feed crops per farm	116	71
Tillable acres in feed crops per cow	6.4	6.3
Acres rotation pasture per cow	2.6*	---
Acres wild pasture per cow	---	4.8
Pounds concentrates fed per cow	2,157	1,683
Pounds hay fed per cow	5,360	5,094
Percent of concentrates fed herd that were purchased	45	56
Percent using fertilizer in rotation on hay	87	20

It can be seen that, after the acreage used for rotation pasture is deducted on those farms using all rotation pasture, their remaining acreage in other feed crops is less than that on those farms using all wild pasture, despite their 60 percent larger average herds. It seems that the general productivity of those farms using all rotation pasture was greater than that on the other farms.

The writer does not mean to suggest that all dairymen should use all rotation pasture. The men with the

* Does not include second crop hay used for pasture. One and one-half acres per cow of this kind of pasture was also used on these farms.

large herds on the small farms will have to use different management practices than the men with the large herds on the large farms. The most will have to be derived from the facilities at hand on small farms. That is what is not being done at the present time in the Upper Peninsula.

Emergency pasture crops in the Upper Peninsula present more of a problem than in the Lower Peninsula. The preferred kinds such as soybeans and sudan grass are not adaptable to Upper Peninsula growing conditions, except for a small area along Lake Michigan in Menominee county. Rye planted in August is probably the most suitable for pasture. It can sometimes be pastured in October, and furnishes good early spring pasture until July. Oats and barley planted in the early spring can supply good pasture in part of June and part of July.[24/] One-half acre of rye, barley or oats per cow, if properly handled, should be sufficient.[25/] One source says that with normal fertility and rainfall, Balbo rye can carry 6 head per acre for a period in June and July.[26/]

Of the dairymen in this study in Area 1, none of the 38 used any of the above emergency or supplementary pastures; in Area 2, two of the 46 used oats for spring

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24/ "Well-managed Pastures," University of Minnesota Extension Bulletin 241, April, 1945, p. 5.

25/ Ibid., p. 5.

26/ "Grasses and Legumes on Michigan Farms," p. 38.

pasture; and in Area 3, one used oats, one used rye for spring pasture before planting to potatoes, one used rye for fall pasture, and one used sudan grass (Appendix F).

These annual pastures, of course, are somewhat more costly than the perennial grasses and legumes to establish. Oats has been estimated to cost 22.3 cents per cow per day of pasture, compared to 12.5 cents for alfalfa-brome, and 4.9 cents for reed-canary grass.[27] This included all costs relative to fitting the land, seed, fertilizer at 200 pounds per acre, and lime. The cost of even the most expensive kind of pasture certainly is not excessive.

There is another supplementary benefit from the use of these annual grains for spring and fall pasture: seeding perennial legumes and grass-legume mixtures in rye, oats or barley is much safer when the grain is pastured than when it is harvested as grain.[28]

There is no doubt that much could be done in the Upper Peninsula to insure good all summer pasture. On the farms which are large enough to permit an adequate acreage of rotation pasture, yields of pasture could generally be greatly increased. On the smaller farms where there is at present an inadequate amount of rotation pasture, much could be done to increase hay yields so

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27/ "Grasses and Legumes on Michigan Farms," p. 17.

28/ "Hay and Pasture Crops for Emergency Use," Michigan State College Cooperative Extension Service, Extension Folder F-151, May, 1950, p. 5.

that more rotation pasture could be utilized thus reducing feed costs. A great many of the dairymen could increase their yields of small grains to make room for good pasture. Yields of all crops could generally be greatly improved through the use of lime, fertilizer, and better rotation practices. Better yields will permit larger herds, and larger herds will permit larger incomes. Space in barns is already available for larger herds on a great many Upper Peninsula farms. In Area 1, 53 percent of the dairymen reported space available for at least 3 more cows; in Area 2, 59 percent reported similarly; and in Area 3, 72 percent reported space available for at least 3 more cows (Appendix E).

That crop yields are an important factor in determining labor incomes is shown in the Farm Business Analysis of 1948 for type-of-farming areas 15, 16, and 17 The farms with the high labor incomes were also the farms with above average crop yields, and the farms with the low labor incomes were farms with below average crop yields.[29/]

Good quality hay is oftentimes very difficult to harvest in the Upper Peninsula even when good quality is grown. The frequency of rains at the time when the hay is at its best stage of maturity make field curing

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29/ "Farm Business Analysis," Areas 15, 16, and 17, Michigan State College Cooperative Extension Service, May, 1949, p. 10.

very hazardous. As a consequence, a great deal of hay is harvested in July and some not until August. When the hay is cut at the proper stage of maturity the chances are great that the quality will be reduced by rain.

The answer to poor quality hay seems to lie at present in barn-dried hay and hay silage. Both systems have been used with notable success in the Upper Peninsula.[30/] The dilemma is in getting a large enough business to justify purchasing the expensive equipment needed to harvest and cure forage in the above-mentioned ways.

As would be expected, most of the dairymen put up their hay loose, with a rake and hay loader. Two of the dairymen raked the hay and cocked it immediately, which probably insured good quality but at a high labor cost. Many of those putting up their hay loose were unsatisfied, however, and had plans to change their method. Most of the unsatisfied ones in Areas 1 and 2 were thinking in terms of a baler in the future. In Area 3 most were thinking in terms of a field chopper. Area 3 also had the highest number of dairymen already using balers and field choppers, 9 using a baler, and 9 using a field chopper. Several of these had the work custom hired, and one owned his chopper in partnership with a neighbor.

30/ "Seasonal Adaptation of Three Methods of Curing and Storing Grass and Legume Forage as Reflected in the Milk Production of Dairy Cows," Quarterly Bulletin, Michigan State College, Agricultural Experiment Station, Vol. 32, No. 2, p. 231.

Table 23. Number of dairymen putting up hay by the three different methods, and number now using hay silage or intending to use hay silage.

	Area 1	Area 2	Area 3
Number of farms	38	46	46
Number using loose hay	34	38	28
Percent satisfied	44	58	46
Number using baled hay	3	6	9
Percent satisfied	100	100	100
Number using field chopper . .	1	2	9
Percent satisfied	100	100	100
Number with hay drier	0	2	2
Number using grass silage . . .	1	0	2
Number wanting baler	8	7	6
Number wanting field chopper .	4	3	8
Number wanting hay drier . . .	3	2	6
Number wanting to use hay silage	2	1	1
Number with field chopper who want drier	0	0	3
Number with silo	2	4	36

Another, who intended using a chopper in the future, intended buying the equipment in partnership with two neighbors. This partnership buying was not contemplated by any of the dairymen in Areas 1 and 2, although it would seem to be one answer to the problem of high cost equipment, especially in Area 2 where the farms are small.

In Area 2, two of the men in this study owned field choppers, and these same two men had mow driers in their barns. They had farms of 89 and 150 tillable acres, with herds of 19 and 12 cows respectively. The one man in Area 1 who used chopped hay did not have a mow drier and did not contemplate the purchase of mow drying equipment. It is significant that all three of these dairymen were in the process of expanding their herds, each having a

large number of heifers over 1 year old.

In Area 3, two of the nine men using chopped hay already had drying equipment and three more intended installing drying equipment. Of the 8 men who contemplated using chopped hay in the future, 3 also wanted the hay drying equipment. These two who already had chopping and drying equipment had herds of 17 and 24 cows. Those who used chopped hay but did not have the drying equipment had herds ranging from 8 to 32 cows, with most being above average in size of herd.

All the dairymen who were presently using balers to put up their hay were apparently satisfied, and all those using field choppers were satisfied with their method. One of the reasons often stated for preferring baled hay was that it conserved space; another reason given was that baled hay was better if it was to be sold. A study made in Central Michigan in 1946 shows that, from a labor efficiency standpoint, baling hay was less efficient than either putting it up loose with a loader or buck rake or putting it up with a field chopper and blower.[31] Another study made in South-Central Michigan in 1949 showed that the cost per ton of harvesting hay was greater with both 3-man and 1-man balers than with either hay loader and slings or field chopper.[32] There are other factors to

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31/ "Haymaking Job Analysis," B. R. Bookhout, Journal of Farm Economics, Vol. XXIX, No. 3, pp. 761-67.

32/ "Grasses and Legumes on Michigan Farms," p. 35.

consider besides labor efficiency per ton and cost per ton when choosing a method, however. The best method will depend also on other factors such as available labor supply, use to which the hay is to be put, alternative uses for the expensive equipment, possibility of doing custom work, barn space, size of herd, and distance the hay must be hauled, among others.

Very few dairymen were using grass silage at the time this study was made; one in Chippewa county made 60 tons of grass silage, and two men in Menominee made grass silage, one from oats. Also, very few indicated a desire to use grass silage. Probably a factor discouraging the use or contemplated use of grass silage is the lack of silos, particularly in Areas 1 and 2. In Area 3, 80 percent of the farms in this study had silos and were already feeding corn silage, whereas in Area 2 only 9 percent had silos, and in Area 1 only 4 percent had silos. It is evident that those dairymen in Areas 1 and 2, before they can put up grass silage, will first have to have silos. That fact may have influenced their decisions to not want to use grass silage in the future. In Area 3 the lack of preference for hay silage was very likely due to the present general use of corn silage. It is ironical that the area best equipped already to use improved methods of forage production is the area with the least need for the better methods.

Good quality forage can reduce the amount of con-

centrates needed in the dairy ration a great deal. In order to get good quality forage in the Upper Peninsula it is believed that these improved methods are going to have to be utilized. The dairymen who first proceed to adopt them will be the ones to get the most advantage from the reduced costs gained from their use. The initial cost is a prohibiting factor for most of those who want to use the improved methods. Expanding the size of business would seem to be the best way to make this initial cost less prohibitive. Also, it is believed that more dairymen should explore the possibilities of purchasing some of the expensive equipment in partnership with others, even though partnerships sometimes lead to trouble. With complete understanding of the difficulties which might be encountered in such partnerships, there is no reason why two or three operators cannot own expensive machinery jointly and make the arrangement work. It is being done successfully in many places at present.

CHAPTER XI

BREEDING METHODS CURRENTLY USED IN THE UPPER PENINSULA

Table 24 shows the methods of breeding used in the three areas. No attempt was made to determine differences in income resulting from the different breeding methods. Positive effects of a good breeding program requires a number of years. Since no information was acquired on past breeding practices, it was not thought desirable to make tabulations showing financial results of breeding practices.

It can readily be seen that in Area 1, a larger percentage of dairymen were still using grade bulls for breeding than was true in the other areas. One-fourth of those using grade bulls were using young bulls loaned by cattle buyers, the rent being the feed and care given the animal. That is a particularly bad practice from a breeding standpoint. Also, of the 53 percent using artificial breeding in Area 1, almost half had used it less than one year. Any good effects of the artificial breeding in Area 1 would probably not have been noticeable at the time the survey was made in June, 1949. It is significant that in Area 3, where the breeding program appears to have been the best, production per cow was also the highest of any of the three areas (Table 5). In Area 1, where the breeding program appears to have been the

Table 24. Tabulation of breeding methods.

	Area 1	Area 2	Area 3
Number of farms	38	46	46
Number in Artificial Breeding Association	20 9 used A.B. less than 1 year	29 12 used A.B. less than 1 year	28 6 used A.B. less than 1 year
Number using purebred bull	10 3 used A.B. concurrently	15 3 used A.B. concurrently 3 rented from rental service	14 1 used A.B. concurrently 1 rented from rental service
Number using grade bull	12 1 used A.B. concurrently 1 rented from neighbor 3 rented from a cattle buyer	7 2 used A.B. concurrently	5 1 rented from neighbor

least adequate, production per cow was the lowest.

CHAPTER XII

SUMMARY AND CONCLUSIONS

It is obvious that there are many independent factors which affect net returns from the dairy herd. Among them are the noticeable ones like size of herd, market outlet, producing ability of cows, and size of farm. Then there are some less obvious ones like relationship between milk prices and feed prices, number of youngstock kept, crop yields, quality of forage produced, feeding practices, care of cows and youngstock, amount of family labor available, availability of capital for new equipment and improvements, quantity and quality of summer pasture, percentage of cows freshening in the fall months, labor efficiency, and extent of use of manure and commercial fertilizer. There are undoubtedly other factors. Some of the last-named factors are not direct in their influence on net returns, but affect returns indirectly. For example, the use of fertilizer has no direct bearing on production per cow, but it does permit higher yields of feed crops and thus has a bearing on the size of herd that can be carried. Labor efficiency influences net returns in a similar way, that is, through the number of cows that can be cared for with the existing labor supply.

Some of these factors have been examined in the foregoing analysis. Others were outside the province of the study. The exact order of importance of the above factors

could not be determined by the statistical method used by the writer. However, an examination of the data showed that of all the factors the two most important in their effect on net income were size of enterprise and production per cow. On a per cow basis the operators of large herds were not conclusively shown to be more efficient than the operators of small herds. Table 12 shows this. In Area 2, the small herds produced more in labor and management return per cow than did the large herds. In Area 1 the large herds had a larger return per cow primarily because of their large price advantage for milk sold. In Area 3 there was very little difference on a per cow basis between large herds and the small herds in labor and management return. Size of farm was found to be an important factor influencing size of herd in all areas, although the correlation was not perfect.

Total gross income per man was found to be considerably higher on large farms than on small farms, indicating greater efficiency of labor on large farms. In all areas the operators of large farms were more liberal in feeding concentrates to their cows than were the operators of small farms. Also, less feed was purchased per cow on the large farms compared to the small farms in Area 2.
In Area 2 the average number of cows declined during the last half of the year on the small one-third of the farms reflecting the shortage of feed following the pasture season. The larger farms apparently were able to withstand the situation.

When size of herd was kept constant, the operators of the small one-third of the farms seemed to be more efficient producers than the operators of the large one-third of the farms (Table 13). Of course, other farm and off-farm income was greater on the large farms than on the small farms, but on a per man basis, total gross income was practically equal on small farms and on large farms in all areas when size of herd was kept constant. Small farms, if organized intensively and operated efficiently, can be made as productive of gross income per man as large farms organized extensively.

In labor efficiency, the operators of large herds were found to far excel the operators of small herds. It is difficult to know whether one of the reasons they had large herds was their superior labor efficiency or whether they had high labor efficiency because their herds were large. There is probably a little bit of both involved. It is evident that where labor is a scarce factor high labor efficiency will permit a larger herd than low labor efficiency, and thus will permit of a greater net income.

Table 16 shows that production per cow was of very great importance in determining labor and management return from the herd. In each area the one-third of the herds with the highest production per cow had much greater net returns per cow and per herd than the lowest one-third of the herds. Part of the high production was achieved

by heavier feeding, and certain cases were cited where high production was achieved at a great sacrifice in net returns simply by overfeeding concentrates. It is safe to say, however, that as a general rule the cows with high production were cows of high inherent productivity. They would have outproduced the low producing cows even if fed the same rations. It was found that the operators of high producing herds were slightly more likely to have their barns equipped with drinking cups, that more of their herds were D.H.I.A. tested, and that a higher proportion of them had milkhouses than was true of the operators of the low producing herds.

Market outlet was found to be a potent factor affecting rates of feeding. In all areas those dairymen with the best market fed considerably larger amounts of concentrates, on the average, than did those dairymen with a lower class market (Table 19). There was some evidence to support the belief that in some instances the mere possession of a fluid outlet induced feeding concentrates at high levels although the price differential did not warrant it. In Area 2, those dairymen with a fluid market averaged less net return per cow and per herd than those with a cheese market. This was due mostly to low average production per cow in the herds producing for the fluid market.

Size of farm and the availability of home-grown feed also affected rates of feeding. Table 14 shows that the

operators of the largest farms in each area fed their cows from 300 to 400 pounds more concentrates per cow than the operators of the small farms fed their cows. In Area 1 this heavier feeding by the large-farm operators was partly justified by their good market.

Those dairymen who fed the largest amounts of concentrates to their cows were not proven to have the greatest returns. The impossibility of keeping inherent productivity in the various groups constant makes the evaluation of the data very difficult, however, and one cannot make any hard and fast rules as to the correct rate of feeding based on this study. The results do show that many dairymen fed more grain and grain supplement than was economical, assuming they had adequate amounts of forage. The results also show that in Area 2, where price received for milk was lower than in the other two areas, the most profitable level of feeding concentrates was at a lower level than in the other two areas. This gives credence to the argument that when feed costs are high relative to milk prices less feed should be fed.

It is very difficult to judge feeding practices in an abnormally dry year. Dairymen react differently to the prospect of a poor hay crop. Some will purchase hay or grain or both to make up for their short supply of home-grown hay, others will deliberately underfeed, and others will reduce the size of their herds. In talks with Upper Peninsula agriculturists the writer found that in

the summer of 1948 and in the following fall and winter it was very hard to find hay to buy. Assuming this to be true it is understandable that some dairymen would seem to have been overfeeding concentrates even when they were not, given the supply of forage available to them.

The writer considers it very unfortunate that the year chosen for this study happened to be an extremely dry year. It is also unfortunate that no information was obtained on quality and feeding value of hay fed, or on quality and carrying capacity of summer pasture.

There was found to be a close relationship between the extent of fall-freshening in the herd and net returns. Those herds with the highest percentage of fall-freshening cows had the highest labor and management returns per cow. It cannot be claimed that this was due to a higher average price for milk sold, however, because milk prices fell gradually from July 1948 to the end of the study in April 1949, except to the fluid producers in Area 1. The year chosen for the study was extraordinary in this respect also. Ordinarily, milk and butterfat prices rise during the latter part of the year, and decline during the spring months to a low in June. In view of this it must be assumed that those dairymen with the highest proportion of fall-freshening cows must also have been higher in other important efficiency factors than those with the lowest proportion of fall-freshening cows.

Those dairymen using fertilizer in their rotations

were found to have much higher average net returns per cow than those not using fertilizer. The writer believes it is reasonable to assume that those dairymen on small acreage farms could effectively increase their size of business and thereby their net returns simply by using fertilizer as recommended by the Michigan State College Department of Soil Science. A defect of this study is that a past record of fertilization was not obtained. It is probable that, even on many of those farms where fertilizer was reported used, recommended quantities and kinds were not used. Much of the fertilizer used was phosphate which was paid for partly by the government as part of the soil conservation program.

Very little renovation of permanent pasture has been accomplished in the Upper Peninsula. Also, very few dairymen use commercial fertilizer or manure on their wild, permanent pasture. It seems evident to the writer that on the small dairy farms of the Upper Peninsula much could be done to improve the pasture yields of permanent pasture. There is a large acreage of cleared land in the Upper Peninsula which has grown up to wild pasture grasses which could be easily renovated and made productive of higher pasture yields.

In Area 2 where the tillable acreage of the dairy farms in this study averaged 83, 57 percent of the farmers relied on wild pasture and second crop hay for pasture

entirely, and 40 percent of this number depended entirely on wild pasture. In Area 3, 35 percent of the dairymen depended entirely on wild pasture and a combination of wild pasture and second crop hay pasture. In a dry season the amount of pasture offered by the second crop of hay is small unless it is pastured dangerously late in the fall. Neither wild pasture nor second crop hay pasture offer pasture when it is needed the most, in late July and August.

Very little use was made of emergency pasture and hay crops like oats, barley, and rye in the Upper Peninsula. Extension Service advisers are presently encouraging farmers to grow Balbo rye in the Upper Peninsula for pasture in June and July. Crops like these can increase the total productivity of a farm and thus permit an increase in size of herd, providing adequate use is made of commercial fertilizer.

Answers to the problem of poor quality hay in the Upper Peninsula seem to lie, at present, in the extended use of hay silage and mow driers. In June 1949, more of the dairymen in the sample were thinking in terms of hay balers than were thinking in terms of field choppers for future use, except in Area 3. Likewise, very few appeared interested in hay-drying equipment or in the use of hay silage. Prime deterrents were of course the high cost of equipment and the absence of silos in Areas 1 and 2.

Lack of barn space has been cited as a reason why

farmers do not expand their herds. As shown in Appendix E availability of additional barn space was not the limiting factor on most of the dairy farms in this study.

Improving the inheritance and producing ability of a herd can increase net returns as effectively as increasing the size of herd. It is a slow process, however. Fifty-nine percent of the dairymen in this study were members of an Artificial Breeding Association. A considerable number kept purebred bulls because they thought it cheaper or better than using artificial breeding. The writer believes that a majority of Upper Peninsula dairymen are cognizant of the importance of good breeding. However, between 27 percent in Area 1 and 11 percent in Area 3 of the dairymen in this study were still using grade bulls. Much still remains to be done in educating farmers as to the need for good breeding, particularly in Area 1.

Farming conditions are admittedly more difficult in the Upper Peninsula than elsewhere in the state, chiefly because of the short growing season. Dairying is the most important single source of farm income in most of the Upper Peninsula, and hay crops are the most important crops from an acreage standpoint in the Upper Peninsula. It seems logical, then, that a great deal of attention should be paid to improving hay yields and hay quality, both of which are far below what is possible of achievement with present techniques. The crop varieties and the techniques

are known which could vastly improve hay yields and hay quality. It is an old economic doctrine that says with any new INNOVATION, after it is proven and found sound, the first farmers to adopt it will benefit from the reduced costs; later on, as more and more adopt it, prices will fall and this advantage will be nullified. It is the "early bird," the first to adopt the new technique, who benefits the most from it.

Dairymen in the Upper Peninsula must compete for markets with dairymen in Wisconsin and the lower peninsula of Michigan. It appears to the writer that in order to continue competing with these other areas and at the same time, maintain and improve their living standards, Upper Peninsula dairymen are going to have to lower their unit costs, and to do this they are going to have to adopt the best methods known to exist.

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APPENDIX A

Table 1. Tabulation of land area, land in farms, crop acres, crop acres in hay and pasture, number of farms, and population, by county in the Upper Peninsula, in 1945.*

	Land area	Number of farms	Land in farms	Crop acres	Crop acres in hay and pasture	Population		Percent change
						1940**	1950***	
	acres (000)		acres					
Michigan	36,494	175,268	18,392,227	11,209,638	4,813,114	5,256,106	6,308,794	+ 20.0
Chippewa	1,011	1,445	198,538	118,623	83,502	27,807	28,936	+ 4.1
Mackinac	649	448	53,871	25,409	19,510	9,438	9,113	- 3.4
Luce	585	297	33,668	12,275	7,861	7,423	8,105	+ 9.2
Schoolcraft	767	478	40,296	16,599	10,735	9,524	9,102	- 4.4
Alger	584	552	54,373	16,461	12,678	10,167	9,878	- 2.8
Delta	755	1,472	205,172	64,244	45,177	34,037	32,725	- 3.9
Marquette	1,178	860	97,623	28,141	19,704	47,144	47,475	+ .7
Dickinson	484	593	81,924	20,995	14,545	28,731	24,630	- 14.3
Menominee	660	2,049	300,181	97,095	67,393	24,883	25,188	+ 1.2
Keweenaw	348	93	6,092	1,886	1,632	4,004	2,901	- 27.5
Houghton	659	1,554	155,507	65,081	46,118	47,631	39,525	- 17.0
Baraga	579	692	60,316	20,772	16,459	9,356	8,014	- 14.3
Iron	766	928	82,777	23,469	17,497	20,243	17,628	- 12.9
Ontonagon	845	1,013	109,300	39,026	32,722	11,359	10,245	- 9.8
Gogebic	712	798	44,789	15,671	12,416	31,797	26,942	- 15.3
Total Upper Peninsula	10,584	13,272	1,524,434	565,747	407,949	323,544	300,407	- 7.2

* U. S. Census of Agriculture, 1945, Mich., U.S. Dept. of Commerce, Bureau of the Census.

** U. S. Census of 1940, Michigan, U. S. Department of Commerce, Bureau of the Census.

*** Preliminary count as reported by the Associated Press in the Detroit Free Press of September 24, 1950.

Table 2. Percentage of farms in three areas of the Upper Peninsula growing alfalfa, and clover and timothy, for hay, and the percentage of tillable acres in each.

	Percentage of tillable land in hay and pasture		Alfalfa cut for hay*		Clover and timothy cut for hay*	
	1945 Census*	1948 Sample	Percent of farms	Percent of tillable acres	Percent of farms	Percent of tillable acres
Michigan	43		41	10.5	44.7	12.0
Area 1	71	60	7.7	2.2	78.6	46.9
Area 2	76	74	3.3	1.2	89.7	62.5
Area 3	70	61	36.1	14.3	64.7	30.3

* U. S. Census of Agriculture, 1945, Michigan, U. S. Department of Commerce, Bureau of the Census.

Table 3. Tabulation of number of farms, average size of farm, and percentage of tillable acres in hay and pasture, by area.

	Number of farms		Average acreage per farm		Tillable acres per farm		Alfalfa and grass mixture*	
	1945*	1940*	1945*	1940*	1945*	1948 sample	No. farms	Acres
Michigan	175,268	187,589	104.9	96.2	64.0	----	72,007	1,179,987
Area 1								
Chippewa	1,445	1,584	137.4	127.1	82.1	----	80	1,043
Luce	297	189	113.4	131.7	41.3	----	32	715
Mackinac	448	511	120.2	112.1	56.7	----	57	1,617
Total	2,190	2,284	131.0	124.0	71.4	151.0	169	2,375
Area 2								
Baraga	692	850	87.2	69.0	30.0	----	22	176
Houghton	1,554	1,644	100.1	85.0	41.9	----	26	262
Ontonagon	1,013	1,239	107.9	81.8	38.5	----	61	1,106
Total	3,259	3,733	100.0	80.0	38.3	83.0	109	1,544
Area 3								
Delta	1,472	1,426	139.4	111.8	43.6	----	240	3,343
Dickinson	593	623	138.2	98.1	35.4	----	297	5,941
Menominee	2,049	2,002	146.5	126.5	47.4	----	949	16,863
Total	4,114	4,051	143.0	117.0	44.3	102.0	1,486	26,147

	Clover and timothy*		Tillable pasture**		Tillable acres in hay and pasture*	
	No. farms	Acres	Acres	% of T.A.	Acres	% of T.A.
Michigan	78,327	1,342,226	1,785	16	4,813,114	43
Area 1						
Chippewa	1,195	55,705	24,594	--	83,502	--
Luce	167	3,502	3,040	--	7,861	--
Mackinac	360	14,121	3,090	--	19,510	--
Total	1,722	73,328	30,724	20	110,873	71
Area 2						
Baraga	637	14,285	1,768	--	16,459	--
Houghton	1,360	36,333	5,197	--	46,118	--
Ontonagon	928	27,389	3,796	--	32,722	--
Total	2,925	78,007	10,761	9	95,299	76
Area 3						
Delta	1,181	28,018	11,830	--	45,177	--
Dickinson	278	4,550	1,851	--	14,545	--
Menominee	1,201	22,765	14,415	--	67,393	--
Total	2,660	55,333	28,096	15	127,115	70

* U. S. Census of Agriculture, 1945, Michigan, U. S. Department of Commerce, Bureau of the Census.

** Land plowed sometime during the last seven years.

APPENDIX B

Table 1. Comparison of crop yields in the Upper Peninsula with crop yields for Michigan as a whole.*

	Average yields of all hay in tons per acre			Average yields of oats in bushels per acre			Average yields of corn in bushels per acre**			Average yields of barley in bushels per acre			Average yields of winter wheat in bushels per acre		
	1947	1948	1949	1947	1948	1949	1947	1948	1949	1947	1948	1949	1947	1948	1949
Upper Peninsula	1.15	.85	1.1	32.6	31.6	32.0	31.4	38.7	40.2	28.1	26.9	26.0	17.7	18.1	17.9
Michigan	1.32	1.37	1.32	35.0	38.5	36.0	27.5	39.0	48.0	30.0	32.0	28.5	25.0	26.0	27.0
Area 1															
Chippewa	.93	.70	.89	27.4	29.0	29.0	28.8	32.2	32.0	20.6	21.0	20.0	15.0	16.8	15.5
Luce	1.24	.96	1.02	23.4	25.0	24.0	20.4	25.3	22.0	19.5	18.9	19.0	12.0	11.7	11.2
Mackinac	1.05	.70	1.02	28.6	30.0	29.0	26.7	30.7	30.0	27.0	25.0	26.0	19.0	18.7	19.2
Average	.98	.71	.93	27.3	28.8	28.5	24.3	28.6	26.3	21.7	21.5	21.3	15.4	17.0	15.8
Area 2															
Baraga	1.17	.79	1.12	26.4	27.0	27.0	27.5	30.0	30.0	21.8	21.1	21.0	10.0	10.0	10.0
Houghton	1.17	.70	.99	30.5	31.0	31.0	16.7	25.8	25.0	26.0	25.0	24.0	16.0	16.0	16.7
Ontonagon	1.12	.70	.98	21.3	25.0	21.0	20.0	30.0	30.0	17.5	17.0	17.0	11.0	10.8	10.4
Average	1.15	.72	1.01	26.5	28.1	26.5	20.9	27.9	27.7	22.5	21.9	21.0	13.8	13.3	12.3
Area 3															
Delta	1.30	1.14	1.33	35.6	30.0	33.0	30.0	40.5	42.0	30.4	30.0	29.0	24.0	24.7	23.0
Dickinson	1.27	.75	1.22	30.5	32.0	32.0	29.0	31.4	32.0	31.5	30.0	29.0	20.0	25.0	20.0
Menominee	1.18	1.09	1.27	40.7	37.0	38.0	32.9	40.5	43.0	39.0	35.0	34.0	24.0	24.7	24.6
Average	1.23	1.07	1.29	38.3	34.1	35.8	32.1	39.8	41.8	34.3	32.2	30.9	24.0	24.7	23.8

* Includes corn for grain, silage, cut green, and hogged down.

** Crop Report for Michigan; Annual Crop and Livestock Summary, 1948, 1949, 1950, Federal-State Crop Reporting Service, Lansing, Michigan.

APPENDIX C

Table 1. Tabulation of average prices of concentrates, silage, and hay in the Upper Peninsula by area, for 1948 survey sample.

	Area 1	Area 2	Area 3
Total pounds concentrates fed	846,949	1,189,566	1,774,658
Total value of concentrates fed	$26,254	$41,179	$58,383
Average price per cwt. conc.	$3.10	$3.40	$3.30
Average price per cwt. milk	$4.01 3.5%	$4.06 4.2%	$3.79 3.7%
Ratio of price of concentrates to the price of milk	.77	.84	.87
Total pounds of hay fed	2,658,372	3,197,715	3,549,938
Total value of hay fed	$28,363	$39,512	$45,783
Average price of hay per ton	$22	$24	$26

APPENDIX D

Table 1. Cost of feed nutrients derived from various feeds.*

Crop	Yield per acre	TDN pounds	Cost per 100 lbs. of TDN
	tons		
Pastured			
Kentucky bluegrass	1.2	1,469	$ .45
Sweet clover	2.0	2,448	.31
Alfalfa and bromegrass	2.3	2,815	.29
Harvested	bushels		
Corn	50	2,212	.78
Oats	50	1,144	1.38
Corn silage (tons)	8	2,784	.79
Alfalfa hay (tons)	2.5	2,515	.64

APPENDIX E

Table 1. Availability of space for more cows.

	Area 1	Area 2	Area 3
	No data on 7 out of the 38 farms	No data on 5 of the 46 farms	No data on 1 of the 46 farms
Percent of farms with space for at least 3 more cows	64	65	72
Percent of farms with space for at least 5 more cows	55	54	50
Percent of farms with space for at least 8 more cows	26	34	33

* "Well Managed Pastures," University of Minnesota Extension Bulletin 241, April 1945.

APPENDIX F

Table 1. Use of rye, oats, and for hay, pasture, and silage on 130 farms in the Upper Peninsula in 1948.

	No. farms	No. using rye for pasture	No. using oats for pasture	No. using oats for hay	No. using oats for silage
Area 1	38	0	0	0	0
Area 2	46	0	2	3	0
Area 3	46	2	1	3	1

APPENDIX G

Table 1. Summary of herd improvement practices by area.

	Area 1	Area 2	Area 3
Member of A.B.A.	55%	63%	63%
Member of D.H.I.A.	8	54	59
Never in D.H.I.A.	92	36	39
Purebred herds	8	11	20
High grade herds	37	52	74

APPENDIX H

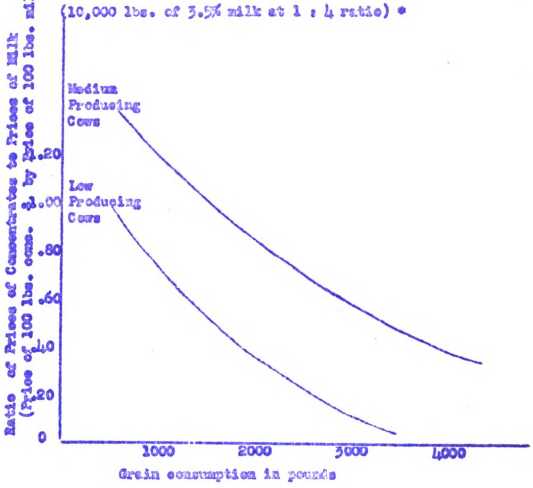
Table 1. Value of dairy products sold as percentage of all farm products sold in 1945 and 1940 compared to 1948 sample.

	Value all farm sales	Value dairy sales	Percent dairy sales of total farm sales		
	1945*	1945*	1945	1940	1948 sample
Michigan	$366,270,712	$121,700,688	33.2	29.0	----
Area 1					
Chippewa	1,663,663	477,718	28.7	28.0	----
Luce	419,439	101,345	24.2	33.3	----
Mackinac	451,300	205,653	45.6	44.9	----
Total	2,534,402	784,716	31.0	31.4	73.4
Area 2					
Baraga	811,428	590,495	72.8	65.0	----
Houghton	2,563,929	1,487,466	58.0	56.1	----
Ontonagon	1,157,613	769,970	66.5	55.6	----
Total	4,532,970	2,847,931	62.8	57.4	76.4
Area 3					
Delta	2,494,074	1,076,146	43.1	48.2	----
Dickinson	964,807	550,392	57.0	61.7	----
Menominee	3,812,419	2,247,763	59.0	53.4	----
Total	7,271,300	3,874,301	53.3	52.6	76.4

* U. S. Census of Agriculture, 1945, Michigan, U. S. Department of Commerce, Bureau of the Census.

APPENDIX K

CALCULATING THE MOST PROFITABLE LEVEL OF GRAIN FEEDING, FOR LOW PRODUCING COWS (7000 lbs. of 3.5 % milk at ratio of concentrates fed to milk produced of 1 : 4), AND FOR MEDIUM PRODUCING COWS (10,000 lbs. of 3.5% milk at 1 : 4 ratio) *



* Cost Reduction Opportunities in Dairying in Southeastern Michigan, unpublished progress report by C. E. Hoglund and K. T. Wright, Bureau of Agricultural Economics of the U. S. D. A. in cooperation with the Agricultural Economics Dep't., Michigan State College, May 1950

Michigan State College

Exhibit 1

Farm Management Department

DAIRY COSTS AND RETURNS

For Month of _____

Name _____ Address _____ County _____

Number of cows at first of month _____ at end of month _____

COSTS

Cattle Bought

Date	Description	No.	Age	Cost
	Cows			$
	Youngstock			
	Bulls			
	Heifers freshen.			

RETURNS

Cattle Sold and Butchered

Date	Description	No.	Age	Receipt
	Cows			$
	Youngstock			
	Bulls			
	Bull fees rec'd.			
	Calf value at 5da			

Feed Bought for Cattle

Date	Kind	Amount	Cost
			$

Dairy Products Sold and Used

Date	Product	Lbs.	Test	Lbs. B.F.	Net Receipt
	Milk sold				$
	" "				
	Milk used				
	Milk fed				
	Cream sold				
	Cream used				
	Skim milk				

Miscellaneous Expenses on Cattle*

Date	Item	Cows	Youngstock	Bulls	Gen. Use
		$	$	$	$

* Enter veterinary, breeding fees, testing dues, equipment repairs and supplies, and other items against cows, bulls, or youngstock insofar as possible. Some items may be such that they cannot be divided, enter those in "General Use" column.

FEED FED DAIRY CATTLE (Both home-grown and purchased used in month)

Kind	Average price	Cows		Youngstock		Bulls	
		Amount	Value	Amount	Value	Amount	Value
Corn		lb.		lb.		lb.	
Oats		"		"		"	
Barley		"		"		"	
		"		"		"	
Grinding		"				"	
Prot. supp.		"		"		"	
Com. mix		"		"		"	
Mineral		"		"		"	
Salt		"		"		"	
Calf starter		xxx	xxx	"		xxx	xxx
Whole milk		xxx	xxx	"		xxx	xxx
Skim milk		xxx	xxx	"		xxx	xxx
		"		"		"	
Hay		"		"		"	
Silage		"		"		"	
Roots		"		"		"	
Pasture-rotation		da.		da.		da.	
-rotation		"		"		"	
TOTAL	xxx	xxx		xxx		xxx	
Bedding							

MAN LABOR ON DAIRY CATTLE (Record in minutes for a typical day)

Operation	Cows			Youngstock			Bulls		
	Farmer	Family	Hired	Farmer	Family	Hired	Farmer	Family	Hired
Milking				xxx	xxx	xxx	xxx	xxx	xxx
Feeding - hay									
- grain									
Cleaning barn									
Washing equipment				xxx	xxx	xxx	xxx	xxx	xxx
Other									
Total minutes daily									
Days in month									
Total hours in mo.									
Charge per hour *									
Total charge for mo.									

* See instruction sheet for suggestions in determining rate.

Exhibit 2

ANNUAL DAIRY COST SUMMARY

Name _____ Milk: Av. B.F. test ____% Production per cow _____

County _____ Butterfat: Total production _____ per cow _____

COWS: Breed _____ Av. no. _____

COSTS	Total	Per cow
Feed	$	$
Labor _____ hrs.		
Cow depreciation		
Interest on invest.		
Building use		
Equipment use		
Breeding cost _____		
Misc. Electricity		
Vet. and Med.		
Bedding		
Other		
Overhead (5%)		
Total	$	$
INCOME		
Milk sold	$	$
Milk used		
Total		
Subsidy		
Calf value		
Manure credit		
Cow appreciation		
Total	$	$
Net Return		
Return per hour		

YOUNGSTOCK: No. under 1 yr. ____ over 1 yr. ____

COSTS	Total	Per Head
Feed	$	$
Labor _____ hrs.		
Calf value		
Interest on invest.		
Building use		
Equipment use		
Breeding cost _____		
Misc: Electricity		
Vet. and Med.		
Bedding		
Other		
Overhead (5%)		
Total	$	$
INCOME		
Appreciation	$	$
Manure credit		
Total	$	$
Net Return		
Return per Hour		

BULLS: Average no.

Feed	$	$
Labor _____ hrs.		
Bull depreciation		
Interest on bull		
Building use		
Equipment use		
Misc. Bedding		
Other		
Overhead (5%)		
Total	$	$
Manure credit		
Other income _____		
Total	$	$
Net Cost for Year		
Cost per Service		

COSTS AND INCOME PER UNIT OF PRODUCT

Item	Milk (per cwt)	Butterfat (per lb.)
Costs: Feed	$	$
Labor		
Other		
Total		
Income: Milk		
Other		
Total	$	$
Net Return		

FEED AND LABOR AMOUNTS AND VALUES

FEED	COWS		BULLS		YOUNGSTOCK	
	Amount Per Head / Total	Value	Amount Per Head / Total	Value	Amount Per Head / Total	Value
Conc. mix.		$		$		$
Other grain						
Hay						
Silage						
Other rough.						
Pasture						
Milk to Y.S.						
Total						
LABOR						
Hired help						
Farmer						
Family						
Total						

CATTLE INVENTORIES, PURCHASES, SALES, AND APPRECIATION OR DEPRECIATION

Ending inventory	no.	$		no.	$		End. inv'ty.	$
Sales							Sales	
Total credits							Heifers, Bulls	
Beginning inventory							Total Cr.	
Purchases							Beg. inv'ty.	
Heifers freshening				Bulls kept			Purchases	
Total debits							Total Dr.	
Appreciation								
Depreciation								

Interest on av. investment at 5% $_____ $_____ $_____

BUILDINGS AND EQUIPMENT INVENTORIES AND CHARGES

Item	Barn	Milkhouse			Equipment
Beg. inv'ty.	$	$	$	$	$
End. inv'ty.					
Depreciation					
Interest (5%)					
Taxes, ins. (2%)					
Rep. and new					
Total cost					

Barn Usage:

Cows	____%	____%
Bulls	____%	____%
Y.S.	____%	____%

Barn use charge:

Cows	$____	$____
Bulls	$____	$____
Y.S.	$____	$____

SUPPLEMENTAL INFORMATION 1948 - 49

Upper Peninsula Dairy Study

Name _____ County _____ Date _____

Number of years farming? _____ On this farm _____ Farm account cooperator? _____

Total acres operated _____ Owned _____ Rented _____ Acres tillable _____

FARM ORGANIZATION

1. Crop	Acres	Yield	Value of sales	Hay and Pasture Kind	Acres	Yield	Time Cut	Value of Sales
Oats								
Barley								
Mixed gr.								
Idle and fallow								
Total tillable								

2. Number of other livestock: Hens. Number housed in fall _____ June 1 _____
Chicks started _____ Beef cattle _____ Litters farrowed _____
Pigs raised _____ Horses _____
Comments: _____

DAIRY CATTLE BREEDING

1. Member of A.B.A.? _____ No. of years _____ Plan to continue in ABA _____

2. Do you have a particular season when you like to have cows freshen? _____
When? _____ Why? _____

3. Has artificial breeding been more satisfactory than natural service? _____
If not, why: cost _____ inconvenience _____ changes freshening schedule _____
trouble settling cows _____ no telephone _____ mostly bull calves _____
Inseminator is; inexperienced? _____ Lazy? _____ Others _____

4. If not in ABA: Have bull on farm? _____ If no, use rental service _____
community bull _____ If own bull, Purchased from: pure bred breeder _____
neighbor _____ cattle buyer _____

5. If natural service unsatisfactory why: Too costly _____ dangerous _____
difficult to control breeding of heifers _____ takes too much time _____
others _____

6. Breeding of herd: Mixed breeding _____ Mixed breeds _____ High grades _____
chiefly purebreds _____

7. Number purebred cows in herd? _____ Purebred heifers? _____

8. Member DHIA? _____ Number years testing? _____

TURE USE & TREATMENT

End of Pasture	Acres	Pasture season*							Treatment
		Apr.	May	June	July	Aug.	Sept.	Oct.	

Extend line from beginning portion of each month pasture used to end.

THOD OF HAYING

Loose hay_____ acres; chopped_____ acres; baled_____ acres; grass silage_____

Satisfied present method?_____

Changes planned?_____

JILDINGS AND EQUIPMENT USED

Barn: Stanchion_____ Pen_____ space for_____ Cows Face in_____ Cut_____ Single row_____

Comments on barn: Satisfactory?_____ Comments_____

Changes planned?_____

Milk house: Distance to barn_____ Type of structure_____

Winter water supply: Drinking cups_____ Watertank in barn_____ Heated watertank outside_____ Unheated tank outside_____ Spring or creek_____

What additional dairy equipment do you expect to buy:_____

_____

ARKET

Kind_____ Location_____ Distance_____

Hauling: Self_____ Hired:_____ Comments:_____

_____

LABOR SUPPLY

Item	Age	Man-equiv. months worked on farm
Operator		
Wife	XX	
Son		
____		
Hired Help	XX	

Comments_____

FARM INCOME (other than dairy)

Item	Amount	%
Poultry	$	%
Crop		
Forest		
Work off farm		

1. Name _____ No. _____ County _____ Area _____

2. Kind of Market _____ Location _____ Distance _____ mi.

3. Total lbs. ..... Milk _____ B.F. _____ Test _____ %

4. Total lbs. of 4% Equivalent - Milk _____

5. Total lbs. from May-Sept. ..... Milk _____ B.F. _____ Test _____ %

6. Total lbs. of 4% equivalent - Milk from May-Sept. _____ 7. lbs. B.F. from Oct.-Apr. _____

8. Percentage of total production-Milk produced from May-Sept. _____ B.F. _____

9. Average No. cows, for year _____ 10. Average No. cows, May-Sept. _____

10½. Average No. cows, Oct.-Apr. _____

11. lbs. 4% milk per cow, for year ..... _____ 12. May-Sept. _____ %

13. Lbs. B.F. per cow, for year ..... _____ 14. May-Sept. _____ %

15. Total receipts for milk, for year ..... $ _____ 16. May-Sept. $ _____ %

17. Average price received per cwt. for yr. $ _____ (15 ÷ 4) x 100 18. May-Sept. $ _____ (16 ÷ 6) x 100

19. Average price received per lb. B.F., for yr. $ _____ 15 ÷ 3(B.F.) 20. May-Sept. $ _____ 16 ÷ 5(B.F.)

21. Receipts per cow for milk, for year $ _____ 15 ÷ 9 22. May Sept. $ _____ 16 ÷ 10

23. Total feed costs, for year ..... $ _____ 24. May-Sept. $ _____

25. Feed costs per lb. B.F., for year $ _____ 23 ÷ 3(B.F.) 26. May-Sept. $ _____ 24 ÷ 5(B.F.)

27. Feed costs per cow, for year $ _____ 23 ÷ 9 28. May-Sept. $ _____ 24 ÷ 10

29. Return over feed, for year $ _____ 15 - 23 30. May-Sept. $ _____ 16 - 24

31. Return over feed per cow, for year $ _____ 29 ÷ 9 32. May-Sept. $ _____ 30 ÷ 10

33. Return per dollar feed fed, for year $ _____ 15 ÷ 23 34. May-Sept. $ _____ 16 ÷ 24

35. Total labor costs, for year ..... $ _____ 36. May-Sept. $ _____

37. Labor costs per lb. B.F., for year $ _____ 35 ÷ 3(B.F.) 38. May-Sept. $ _____ 36 ÷ 5(B.F.)

39. Labor costs per cow, for year $ _____ 35 ÷ 9 40. May-Sept. $ _____ 36 ÷ 10

41. Breeding cost, total for cows & Y.S. ..... $ _____ per cow & heifer over 1 yr. $ _____

42. Net return from herd $ _____

43. Labor & Mgt. return from cows $ _____ from Y.S. $ _____

44. Labor & Mgt. return from herd $ _____ Per cow $ _____ 44 ÷ 9

45. Hours labor on cows _____ per cow _____ Av. No. Heifers under 1 yr. _____

46. Hours labor on Y.S. _____ on bull _____ Av. No. Heifers over 1 yr. _____

47. Hours labor on herd _____ per cow _____ Av. No. Bulls _____

48. Concentrates fed, total lbs. _____ per cow _____ ratio _____ 4 ÷ 48

49. Concentrates fed, May-Sept. lbs. _____ per cow _____ ratio _____ 6 ÷ 49

50. Concentrates fed, Oct.-Apr. lbs. _____ per cow _____ ratio _____ (7 ÷ 50) x 25

51. Hay fed to cows, total lbs. _____ per cow _____

52. Silage fed to cows, total lbs. _____ per cow _____

53. Potatoes fed to cows, total lbs. _____ per cow _____

54. Total acres operated _____ Tillable _____ Wild pasture _____

	yield		yield
Acres	small grain	Acres	alfalfa hay
"	corn silage	"	clover "
"	corn	"	timothy "
"	potatoes	"	mixed legume & grass
"	flax	"	other crops
"	fallow	"	tillable

% T.A. in hay & pasture _____

55. Acres hay crops used for pasture _____ 56. Days on rotation pasture _____

57. Total days pasture _____ 58. Value placed on pasture $ _____ per cow $ _____

59. Fertilizer used this year on hay & pasture? _____ at time of seeding? _____
kind? _____ kind? _____
rate? _____ rate? _____

60. No. cows freshening during year? _____ % of Av. No. _____

61. No. cows freshening Aug.-Dec., incl. _____ % of total no freshening _____

63. Member DHIA now? _____ previously? _____ how long? _____

64. Type barn? _____ space for? _____ satisfied? _____ changes planned? _____

65. Have milk house? _____ distance from barn? _____ ft.

66. Have drinking cups? _____ tank in barn? _____ heated tank outside? _____

67. Months operator labor? _____ months family labor? _____ months hired labor? _____

68. Average No. men? _____ Age of operator? _____

69. Poultry & egg income $ _____ Other crop income $ _____
Potato income _____ Forest income _____
Flax " _____ Work off farm _____
Total _____

70. Member ABA? _____ Use AB entirely? _____ Bull entirely? _____ Both? _____

71. Is AB satisfactory? _____ If not, why not? _____