FEED REQUIREMENTS AND RETURNS ON MICHIGAN FARMS

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Lowell Andrew Allen

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This is to certify that the

thesis entitled

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of the requirements for

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FEED REQUIREMENTS AND RETURNS ON MICHIGAN FARMS

By

LOWELL ANDREW ALLEN

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

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EDUCATION

High School, Fowlerville, Michigan, graduated 1939, Post-graduate course 1939-40.

College, Michigan State College, 1940-1942, 1948-1949, Graduated June 1949, School of Agriculture, Bachelor of Science, Major: Dairy

COLLEGE AFFILIATIONS

Farm House Fraternity, Alpha Zeta Honorary, Men's Glee Club, Agricultural Economics Club, Dairy Club.

PRACTICAL TRAINING AND EXPERIENCE

Born and raised on a 206 acre dairy farm in Livingston County, Michigan.

Summers of 1940, 41, 42 worked at home on my father's dairy farm.

September 1941 to June 1942, September 1942 to December 1942 worked at the M.S.C. Dairy barn.

January 1943 to January 1948 was in partnership with my father on his 286 acre dairy farm.

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FEED REQUIREMENTS AND RETURNS ON MICHIGAN FARMS

Chapter I

INTRODUCTION

Need for the Study and Purposes: In organizing a farm as an efficient unit, one of the prime essentials is to have an adequate size and volume of business. Farms in central Michigan, to have an adequate size of business, should have 275 to 350 productive man work units per man.[1] To build up sufficient business to meet this requirement for man labor efficiency, farms can be successfully organized with from three to five productive man work units per tillable acre.[2] Approximately one-fourth to one-third of the productive work can be made up from growing crops. Livestock must be kept to make up the difference.

In organizing the livestock program, it is necessary to know the approximate amount of feed the various classes of livestock require per year. For this purpose, feed requirement tables have been set up by colleges and action agencies, such as the Soil Conservation Service, for the use of farm planners, students, and farmers. It has been observed that farms often will not carry as much livestock, year in and year out, as the feed tables will indicate. One of the primary purposes of this study is to compare the

[1] Hill, E. B. and Brown, L. H., PRINCIPLES OF FARM MANAGEMENT. Edwards Brothers, Inc., Ann Arbor. 31 pp.

[2] Ibid. p. 31

amount of feed actually fed on a sample of farms with the amount which would have been required if the feed tables were used as a guide. With this information, it should be possible to make feed requirement tables more accurate.

It is known there is considerable farm-to-farm variation in the efficiency with which feed is used. This could account for the fact that farms often carry less livestock than feed table requirements show. Therefore, a second purpose of this study is to determine the variation in feeding efficiency as measured by returns per dollar feed fed.

There is need for information on variation in carrying capacity of grass when used for hay and pasture and the extent to which a shift toward more grass will affect the organization of the livestock program. Also, information is needed on the affect of increasing the proportion of the crop land in grass on total feed production.

The aim of a cropping program is assumed to be to maximize total farm income and maintain soil productivity. A third purpose of the study, therefore, is to determine, within the limits of the data available, the affect that varying proportions of the farm in grass has on farm earnings. The data is inadequate for accurately determining the affect of the cropping programs on soil productivity. The assumption is that if crop yields on a farm are above average, the soil is being adequately maintained.

Objectives of the Study:

(1) To determine the kind and amount of feed fed on farms under different feeding conditions.

(2) To compare the variation between farms in pounds of feed fed.

(3) To determine the variation in returns per dollar's worth of feed fed.

(4) To determine the kind and amount of livestock kept on the farms.

(5) To determine the kind and amount of tillable pasture used on the farms by livestock.

(6) To compute the quantity and kind of feed which would have been fed to the livestock according to feed table requirements.

(7) To determine the relation between the amount of feed fed and the amount which would have been fed according to feed table requirements.

(8) To determine the returns per dollar feed fed on the following classes of livestock farms:

(a) Farms with 90 per cent or more productive livestock income from dairy cattle.

(b) Farms with 50 to 90 per cent of productive livestock income from dairy cattle. The balance of the productive livestock income made up by any single enterprise or combination of enterprises.

(c) General livestock farms; 0 to 50 per cent of productive livestock income from dairy cattle; 0 to 100 per cent of income from any single or combination of enterprises.

(9) To determine the variation in the amount of forage available per hay consuming animal unit under actual farm conditions.

Hypothesis:

(1) The amount of feed fed to farm animals shows a great deal of variation under farm feeding conditions.

(2) The returns per dollar's worth of feed fed varies considerably between farms.

(3) Farms actually will not carry as much livestock as shown by estimates based on available feed budget information.

Assumptions:

(1) The amount of feed used on the farms was assumed to be the difference between beginning inventory plus crop production, plus feed purchases, less crop sales, seed used, if any, and ending inventory.

(2) The inventories and data given are assumed to be fairly accurate, and any differences may be balanced out by the number of farms.

(3) The amount of seed used from the crop inventory to be fairly constant from year to year, and that the ending inventory has taken into consideration shrinkage of the grain with any differences balanced out among the farms.

PROCEDURE

Review of Literature: Feed tables show varying amounts of feed required. As dairying is one of the important enterprises on Michigan farms, feed requirements of cows in other states are presented (Table I).

In the state of Illinois, more concentrates and less roughage are fed because grain is cheaper. Indiana feeds about the same amount of roughage but has a larger range in the amount of concentrates fed. Generally, the recommendations call for feeding the feed which is most plentiful in the area. In the corn belt states, more grain is fed, while in the northern regions of the United States more roughages and somewhat less grain are recommended.

Sitterly of Ohio[3] presents the approximate amount of concentrates required annually per cow (Table II).

Howell of Iowa points out that returns per dollar of feed fed are closely related to profit from livestock enterprises.[4] Records kept by farmers in Illinois indicated that many dairymen had cows that might have made their owners more money if they had received more feed. It was also pointed out that many cows may have been fed too heavy in relation to their ability to produce. Dairymen who fed the heaviest did not make the highest return per dollar of feed fed[5] (Table III).

[3]Sitterly, J. H., RATES OF FEED CONSUMPTION OF LIVESTOCK. Ohio Agr. Ext. Service Bul. 308. 9 pp.

[4]Howell, H. B., FEED RETURNS - KEY TO LIVESTOCK PROFITS, Iowa Agr. Exp. Farm Science, 8 pp. 0:47

[5]Ibid. p. 8

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[5]Ibid. p. 8

Table I - THE RELATION OF THE AMOUNT OF FEED REQUIRED BY DAIRY COWS IN DIFFERENT STATES.

Dairy Cow	ILLINOIS[1]		MINNESOTA[2]		MASSACHUSETTS[3]	
	Concentrate	Dry Roughage	Concentrate	Dry Roughage	Concentrate	Dry Roughage
Under 6,000# Milk	2,138	5,000	880	6,000	2,000	5,500
6,000- 7,000# "	2,438	5,000	1,320	6,000	2,250	6,000
7,000- 8,000# "	2,712	5,000	1,860	6,000		
8,000- 9,000# "	2,923	5,000			2,500	6,500
9,000-10,000# "	3,088	5,000	2,350	6,000	2,750	7,000
10,000 and over	3,202	5,000	2,840	6,000	3,000	7,500

All concentrate figures include protein concentrate and grain.

REFERENCES

1. Planning the Farm Business. University of Illinois, Extension Service. 23 pp.
2. Planning the Farm Business. University of Minnesota, Agricultural Extension Division. 17 pp.
3. Balanced Farming. Massachusetts State College, Department of Agricultural Economics and Farm Management. 12 pp.

Table I (Cont'd.) - THE RELATION OF THE AMOUNT OF FEED REQUIRED BY DAIRY COWS IN DIFFERENT STATES

INDIANA[4]			MICHIGAN[5]			ACTUALLY FED ON 30 DAIRY FARMS		
Concentrate	Dry Roughage	Silage	Concentrate	Dry Roughage	Silage	Concentrate	Dry Roughage	Silage
1,224	3,600	5,000	1,350	4,000	5,000			
1,971	4,000	5,000				2,556	3,880	4,700
			1,834	4,000	5,000			
2,593	4,000	5,000	2,268	4,000	5,000	3,026	5,440	6,060
			2,702	4,000	5,000			
3,288	4,000	5,000				3,275	5,680	7,120

All concentrate figures include protein concentrate and grain.

REFERENCES

4. Planning the Farm Business. Purdue University, Agricultural Extension Service, Agricultural Economics. 14 pp.
5. Hill, E. B. and Brown, L. H. Principles of Farm Management. 139 pp.

Table II - GENERALIZED FEED REQUIREMENTS FOR DAIRY COWS.

The approximate amount of concentrate required annually per cow is:

(a) When average to good alfalfa or good to very good mixed alfalfa clover timothy hay is fed

Annual milk production per cow	Corn and cob meal	Ground Oats[1]	Wheat Bran	Soybean oilmeal or equivalent	Total concentrates*
	bu.	bu.	cwt.	cwt.	lbs.
Under 5,500# of 4.5% or under 7,000# of 3.5%	14	13	1.8	1.6	1,706
5,500 to 7,000# of 4.5% or 7,000 to 9,000# of 3.5%	18	16	2.5	2.2	2,206
7,000 to 8,500# of 4.5% or 9,000 to 11,000# of 3.5%	21	21	3.2	2.8	2,700
8,500 and up of 4.5% or 11,000 and up of 3.5%	25	25	3.7	3.3	3,200

*Total protein content approximately 13%

(b) When fair mixed alfalfa, clover, timothy, or average to good clover timothy hay is fed

Annual milk production per cow	Corn and cob meal	Ground Oats[1]	Wheat Bran	Soybean oilmeal or equivalent	Total concentrates*
	bu.	bu.	cwt.	cwt.	lbs.
Under 5,500# of 4.5% or under 7,000# of 3.5%	12	12	2.0	3.0	1,700
5,500 to 7,000# of 4.5% or 7,000 to 9,000# of 3.5%	16	15	2.5	3.9	2,208
7,000 to 8,500# of 4.5% or 9,000 to 11,000# of 3.5%	19	20	3.0	4.7	2,702
8,500# and up of 4.5% or 11,000# and up of 3.5%	23	23	3.5	5.5	3,200

*Total protein content approximately 16%

[1]On farms where oats are limited or not available they may be replaced by wheat, bran, and corn-and-cob meal in the ratio of 1 pound of each for each 2 pounds of oats.

Table II (Cont'd.) - GENERALIZED FEED REQUIREMENTS FOR DAIRY COWS.

(c) When good timothy with light mixture of legumes or fair mixed clover and timothy hay is fed

Annual milk production per cow	Corn and cob meal	Ground Oats[1]	Wheat Bran	Soybean oilmeal or equivalent	Total concentrates*
	bu.	bu.	cwt.	cwt.	lbs.
Under 5,500# of 4.5% or under 7,000# of 3.5%	10	13	2.1	4.0	1,706
5,500 to 7,000# of 4.5% or 7,000 to 9,000# of 3.5%	13	17	2.7	5.1	2,208
7,000 to 8,500# of 4.5% or 9,000 to 11,000# of 3.5%	16	21	3.2	6.2	2,700

*Total protein content approximately 18.5%

[1]On farms where oats are limited or not available they may be replaced by wheat, bran, and corn-and-cob meal in the ratio of 1 pound of each for each 2 pounds of oats.

(d) The approximate amount of roughage required per cow for cows of different weight during a 200-day winter feeding period[1]

Weight of cow	Fed hay only	Fed both hay and silage (All hay she will clean up. Silage fed moderately.)		Fed both hay and silage (Hay fed moderately. All silage she will clean up.)	
		Hay	Silage	Hay	Silage
lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
800	3,600	2,700	2,600	2,000	4,600
1,000	4,500	3,400	3,200	2,500	5,700
1,200	5,400	4,000	3,800	3,000	6,800
1,400	6,300	4.700	4.500	3,500	8,000

[1]The actual quantity consumed will increase as the quality of the roughage increases. The above quantities are based on average to good quality hay.

Table III - RELATION OF DAIRY FEED COST TO OTHER FACTORS ON 42 FARMS IN 1946.[6]

Number of farms	Feed Cost	Dairy Income per cow	Dairy Income over feed cost	Feed Units per cow	Dairy Income per feed unit	Per cent feed units roughage	Number of cows
11	$191	$325	$134	196.3	$1.66	54.4	14.6
10	142	301	159	166.1	1.81	64.9	17.0
10	119	279	160	135.7	2.06	68.3	15.9
11	93	235	142	130.2	1.80	68.0	16.8

The returns per dollar feed fed for different classes of livestock in Illinois are shown in Table IV.

Table IV - FEED RETURNS 1934-46.[7]

Income per Dollar Feed Fed	Poultry	Dairy	Hogs	Beef Feeder	Beef Raiser
13 Yr. Average	$1.74	$1.62	$1.60	$1.26	$1.25

The amount of feed fed per cow in the Detroit milk shed is slightly above feed table requirements (Table V).

Table V - THE AMOUNT OF FEED FED PER COW ON 83 FARMS IN MICHIGAN, 1948.[8]

Feed fed per cow in year		Fed in Detroit Milk Shed	Feed Table Requirements
Concentrates	(lbs)	2,754	2,268
Hay	"	4,174	4,000
Silage	"	5,300	5,000
Other roughage	"	253	1,000
Pasture	(days)	160	160
Butterfat	(lbs)	299	300

[6] Ibid. p.8

[7] Ibid. p.9

[8] Hodge, Timothy, DAIRY COSTS AND RETURNS, Mich. Agr. Exp. Sta. Mimeo. A.E. 454, July 1949, 3 pp.

Source of Data: The data for this study were taken from farm account books of 100 farm account cooperators throughout type of farming areas 1, 2, 5, and 6 of Michigan, who kept records in 1949.

Primary data secured from the farm account books were: (1) Beginning inventories of feed, (2) Itemized feed purchases, (3) Crop production, (4) Crop sales, (5) Ending inventory, (6) Average number of each kind of livestock, and (7) a complete financial summary. Mail questionnaires were used where any information was lacking in the farm account books.

Secondary data were secured from feed budget estimate tables as found in Hill and Brown, "Principles of Farm Management".

The Sample: A sample of 100 farm records was selected from approximately 600 farm account books. There was no attempt made to randomize the sample, as it was not necessary for the type of information desired. The farms were better than average farms.

The sample of 100 farms were stratified according to source of productive livestock income, type of livestock organization, and divided into three groups, as follows:

(1) One group of 30 farms were called dairy farms because more than 90 per cent of the productive livestock income was from dairy. The balance of the productive livestock income was from other enterprises, such as poultry, hogs, sheep, or beef.

(2) Fifty farms were classed as dairy and livestock farms. On these farms, 50 to 90 per cent of the productive livestock income was from the dairy enterprise. The balance of the income was made up of another single enterprise or combination of enterprises. The other enterprises, mainly poultry, hogs, beef, and sheep, made up from 10 to 50 per cent of the productive livestock income.

(3) The other 20 farms were called general livestock farms. The productive livestock income ranged from 0 to 50 per cent from dairy, and from 0 to 100 per cent from any single livestock enterprise or combination of enterprises. One farm had sheep as its sole source of livestock income. Two farms received all their livestock income from the poultry enterprise. The balance of the farms had a combination of livestock enterprises.

Methods Used in Research: Records selected for the sample furnished accurate and complete information on feed purchases and amount of feed consumed on the farms. The itemized feed purchases were taken from the farm account books.

The amount of feed consumed on each farm was computed from the data. Feed consumed was the beginning inventory, plus crop production during year, and feed purchases, less crop sales of feedstuffs, grain used for seed, and the ending inventory. Returns per dollar feed fed was computed by

dividing productive livestock income on each farm by total feed value, which included a charge for pasture.

As there is no definite price established for an acre of pasture, the Michigan State College Farm Crops Department published figures on the cost of establishing an acre of various kinds of pasture. Using this as a reference, a standard was set up to rate the pasture on these farms (Table VI).

Table VI - BASIS FOR PASTURE RATING USED IN THIS STUDY

Pasture	Acres per hay consuming animal unit
Good	up to 1 acre
Medium	1 to 2 acres
Poor	2 acres and over

Table VII shows the charges used in computing the value of pasture.

Table VII - PASTURE CHARGES FOR CROP SEASON, 1949, SOUTHERN MICHIGAN (PER ACRE)

Kinds of Pasture	Grade		
	Poor	Medium	Good
Non-tillable	$1.00	$2.00	$3.00
Tillable - June grass	3.00	4.50	6.00
Timothy	4.00	6.00	8.00
Rye	5.00	7.50	10.00
Mixed Legume	6.00	9.00	12.00
Clover - Sweet and Red	7.00	10.50	14.00
Reed Canary	8.00	11.00	15.00
Alfalfa - Brome	9.00	12.00	16.00
Sudan Grass	10.00	14.00	18.00

In planning the livestock and feed program for any farm, accuracy in determining the feed supply is as important as the feed requirement data used in calculating the number of livestock that can be carried. The feed used on each farm in this study was computed on forms shown in the appendix. The inventories of feed were estimates by each farmer as to the amount of feed on hand. It is believed that any over or under estimation on the part of one farmer would be balanced out by the 100 farmers.

The value of the feed produced was computed several ways. The beginning and ending inventory price was used as shown in the farm account book. The ending inventory price was used in computing the value of crops produced, and feed purchases were included at the purchase price. This gave a value of feed which took into consideration variations in both location and quality of feed.

Methods of Analysis: Analysis of the records was made by a simple sorting procedure. The different stratification of records were sorted by returns per dollars worth of feed fed, dairy sales per cow, and acres of hay and tillable pasture per hay consuming animal unit. These causal factors were related to farm earnings, and other factors known to be related to farm earnings.

The number of records available did not allow subsorting to the extent that this procedure would be desirable. The original stratification of records by source of income left only 20 to 50 records in a group, to be sorted by

returns per dollars worth of feed fed or dairy sales per cow. It would have been desirable to have sorted by size of business, for example, had a sufficient number of records been available for this more minute breakdown.

DETERMINING THE QUANTITY OF FEED REQUIRED OR THE AMOUNT OF LIVESTOCK TO KEEP

Usually, it is not desirable to stock a farm to the limit of the feed. This particularly true in the case of roughages and pasture. When a scarcity arises, as it sometimes does, it is generally the result of unfavorable weather not restricted to one farm but to large farming areas. When such an emergency develops, as in 1934 and 1936, additional feed is usually not available locally, or if available, only at high prices. Most experienced operators plan to keep slightly less livestock than their normal feed supply will carry, particularly their roughage and pasture. Consequently, farmers have some leeway in feeding and may feed heavier, carry livestock longer, feed to heavier weights, sell surplus feed, or hold feed until another season.

Many experienced and successful feeders, especially in a feed deficit area like much of Michigan, make a practice of carrying more livestock than the normal feed crop production their own farm will support. Where such a procedure is followed, less risk is involved if the quantity of feed needed is fairly accurately known in advance and plans made for the purchase.

LIMITATIONS OF FEED REQUIREMENT DATA

Variation in Quality of Feed: One of the most significant limitations of feed requirement data is that the quality of feed grains, roughages, and pastures varies from year to year. During the same year, there will be variations between farms and areas. It is well known to livestock men that in some years a bushel of corn will produce more gain than in others. Similarly, a given quantity of leafy green hay will produce better results than hay that has been cut too late, rained on too much, or foul with weeds. In wet seasons, both pasture and hay usually contain less feed value per unit of weight than in dry seasons. Corn silage varies in its feeding value as the quantity of grain and stover varies and with the stage of maturity when placed in the silo.

Variation in Quality of Livestock: A second limitation of data on the quantity of feed required by livestock is the variation in the livestock being fed. Diseased and parasite ridden livestock make slower gains, are subject to more death loss, and in general will require more feed for a given production than healthy animals. Stunted animals, like diseased animals, are handicapped. Poorly bred animals frequently make slow and costly gains. In the case of the dairy cow, or hen, the production of milk and eggs is limited by the individual inherent capacity to produce. In other words, the same quantity and quality of feed and care given to some animals will produce proportionately more than the same feed and care given to others.

Variation in the Human Factor: A third limitation is the human factor. One man can take a given quantity of feed and livestock, and due to his skill, produce more than his neighbor. The much quoted statement, "The eye of the master fattens his cattle" is significant. The owner's interest and skill does influence the rate of gain and the quantity of feed required for a given amount of gain[9].

[9]Sitterly, J. H., RATES OF FEED CONSUMPTION BY LIVESTOCK. Agr. Ext. Serv. The Ohio State University, Columbus, Ohio. Bul. 308, 3 pp.

PRODUCTIVITY DIFFERENCES

Above reference has been made to differences in the productivity of animals from the same quantity of feed. Output per unit of input is one measure of productivity. The term efficiency is now commonly used for this measure[10]. It is apparent that some cows can use more feed and other input factors to better advantage than others,, and this also contributes to productivity. To measure this term capacity is now commonly applied. Efficiency and capacity, in fact, are referred to as the two dimensions of productivity, capacity being measured at the point of highest profit combination[11]. This is the point where the last or marginal unit of feed fed just pays for itself. That is, price equals marginal cost.

The capacities, efficiencies, and productivities are, in the end, economic. They vary with prices, which in turn vary with the supplies of the input factors available and the demand for the product. How much of any input factor is used, or how much it is economized, depends on its price[12].

[10] Black, J. D., et al, FARM MANAGEMENT, NEW YORK: MACMILLAN COMPANY, 1947. 407 pp.

[11] Ibid. 407 pp.

[12] Ibid. 407 pp.

Chapter II

COMPARISON OF THE AMOUNT OF FEED FED TO THE AMOUNT WHICH WOULD HAVE BEEN FED USING FEED TABLE REQUIREMENTS.

One of the principal objectives of this study was to determine the accuracy of the feed budget data commonly used in farm planning. The original hypothesis was that farms will not carry as much livestock under actual farm conditions as would be indicated by application of feed budget data to the amount of feed and livestock actually on the farm.

It is recognized that errors can arise in planning a farm business by either overestimating crop yields or underestimating feed requirements. The matter of overestimating crop yields has been eliminated in this study. In each of the following tables the total feed fed is based on actual farm disappearance. The "amount required according to feed tables" is computed by applying feed budget data to the amount of livestock actually kept.

The 100 farms were divided into three groups on the basis of the organization of livestock program. This was done to determine whether feed requirement data was more accurate on some types of farms than on others.

Each of these groups of similar type farms was sorted according to returns per dollar feed fed. The reason for this breakdown was to determine whether feed table requirements were more accurate at one level of feeding efficiency than at another.

It is recognized that there is actually considerable variation in the amount of feed fed to a given amount of livestock from one farm to another. A part of this variation results from the human factor as pointed out in Chapter I (p. 18). An additional source of variation arises from differences in the economic conditions found on different farms in the same locality. These include differences in capacity of cows and differences in the relative amount of fixed costs between farms. A third source of variation in level of feeding arises from relative differences between the price of feed and the price of milk. Such a variation could arise between two neighboring farms with different proportions of milk being sold as base. Also, it could result from difference in location with reference to feed supply and market.

In analyzing the data in this chapter an attempt has been made to test the hypothesis outlined above for the aggregate of the entire sample, for different types of farms, and for different levels of feeding efficiency.

THE AMOUNT OF FEED FED ON 100 FARMS

In the aggregate, approximately 36 per cent more grain and protein, 1 per cent more hay, and 14 per cent more silage was fed than feed budget data would indicate for the amount of livestock on these farms (Table VIII). The 20 general farms showed the greatest variation (approximately 41%) between the amount of grain and concentrates actually fed and the amount required according to feed tables. The 50 dairy and general livestock farms showed the least variation between the amount of feed actually fed and the amount required according to feed tables.

Considering the grain and concentrate per productive animal unit on all farms, 1036 pounds more were fed than feed tables indicate (Table IX). The amount of dry roughage fed was practically the same; however, 660 pounds more silage was fed per hay consuming animal unit.

Farmers probably fed grain to their livestock more heavily during 1949 than ordinarily as most feed-price ratios were favorable. This may have accounted for the fact that farmers fed more than feed budget data would indicate. It may also be significant that 1949 was a better than average crop year, especially for the corn crop.

Table VIII - ALL FARMS FEED BUDGET

Relation of the Aggregate Amount of Feed Fed to the Amount which would have been fed according to Feed Table Requirements on 100 Farms in Areas 1, 2, 5, and 6 of Michigan, 1949.

Farms	Bu. Corn	Bu. Oats	Bu. Wheat	Lbs. protein	Lbs. other grain	Lbs. Mill feed*	Tons hay	Tons silage	Acres Tillable pasture
30 Dairy farms	22,303	22,493	2,138	258,550	33,496	166,782	2135	2543	994
20 General farms	38,292	18,105	3,456	132,908	106,740	335,134	806	695	525
50 Dairy and general farms	58,703	41,282	7,255	503,077	163,336	561,695	2888	3245	1549
Total feed fed	119,298	81,880	12,849	894,535	303,572	1,063,611	5829	6483	3068
AMOUNT REQUIRED ACCORDING TO FEED TABLES									
30 Dairy farms	15,733	22,304	431	270,602			2004**	2061	1246
20 General farms	32,673	6,652	1,953	317,602			617	805	509
50 Dairy and general farms	50,991	30,571	3,950	636,620			3156	2832	1868
Total should have fed	99,397	59,527	6,334	1,224,824			5777	5697	3623

* Other roughage equivalent included at one-half the value of hay.
**May include some protein supplement.

Table IX - RELATION OF THE AMOUNT OF FEED FED PER ANIMAL UNIT COMPARED WITH FEED TABLE REQUIREMENTS ON 100 FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949

Feed	Actually Fed	Feed Table Requirements
Grain and protein concentrate per productive animal unit	3921 pounds	2885 pounds
Hay per hay consuming animal unit	4880 pounds	4840 pounds*
Silage per hay consuming animal unit	5420 pounds	4760 pounds

*Approximately 1000 pounds other roughage included at one-half value of hay or about 500 pounds of hay added to hay requirement to give total number of pounds.

AMOUNT OF FEED FED ON 30 DAIRY FARMS

General Basis of Feeding: The results of feeding a dairy cow are measured in terms of production of milk and butterfat. The output varies with the quantity of feed consumed by the cow, quality of the feed, care given the cow, and the inherited ability of the cow to convert the feed consumed into milk.

Most experienced dairymen provide their cows with all the roughage and pasture they will consume regardless of the milk production. The quantity of roughage and pasture consumed by a cow depends a large extent on the size of the cow and the quality and palatability of the roughage and pasture offered. Consequently, in determining the quantity of these two feeds required, the size of the animals must be taken into consideration as well as the quality of feed.

Concentrates, on the other hand, are usually fed in proportion to the quantity of milk produced. These are fed in varying ratios with some differentiation made on the basis of the fat content of the milk. For instance, one pound of concentrate to each three pounds of 4.5 per cent milk for the Jersey and Guernsey breed, and one pound of concentrate to each four pounds of 3.5 per cent milk for the Holstein breed. These should be only used as a standard when high quality hay and silage are provided liberally.

The protein content of a ration is adjusted to the quality of the hay and pasture available. When the palatability

and protein content of roughages are low, a concentrate ration containing more protein, around 14 to 20 per cent, is required if milk production is to be maintained. If good quality roughage is fed, a protein content of 10 to 14 per cent is required in the ration.

Many farmers do not follow any definite schedule of feeding grain to cows. Some feed the same amount to all cows in the herd, regardless of size, stage of lactation, or condition. This may be one of the reasons for inefficient use of feed on some farms.

The 30 dairy farms were divided into two groups on the basis of returns per dollar feed fed on the assumption that this factor is a measure of feeding efficiency. This procedure was followed to determine whether the feed budget data gives more accurate estimates on farms where feeding efficiency is high or where feeding efficiency is low. Grain consumption was computed per productive animal unit and roughage per hay consuming animal unit.

Low Efficiency Dairy Herds: The low efficiency farms fed 1000 pounds more grain, mill feed, and protein supplement per productive animal unit than would have been fed using feed table computations (Table X). Also, 1500 pounds more dry roughage was fed per hay consuming animal unit.

The cows on these farms may have been low producing cows and fed more than necessary according to their producing ability.

Table X - RELATION OF THE AMOUNT OF FEED FED TO THE AMOUNT WHICH WOULD HAVE BEEN FED ACCORDING TO FEED TABLE REQUIREMENTS ON 30 DAIRY FARMS* IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Method of Computation	Per Productive Animal Unit				Per Hay Consuming Animal Unit		Per cent of gross income		
	Corn bu.	Oats bu.	Lbs. protein	Lbs. grain & protein	Lbs. hay	Lbs. silage	Dairy	Other livestock	Crops & other
LOW EFFICIENCY (Returns per dollar feed fed average $1.52)									
Feed Budget	19.12	25.57	323	2244	4830	4840			
Actual feed fed	28.11	27.36	362	3252	6120	5400	73	3	24
HIGH EFFICIENCY (Returns per dollar feed fed average $2.40)									
Feed Budget	17.67	26.81	311	2187	4770	5020			
Actual feed fed	23.91	25.24	248	2693	3960	6860	72	2	26
Actual feed fed on all farms	26.15	26.37	303	2996	5000	5960	72	3	25

*90 per cent and over of productive livestock income from dairy.

The budget figures computed were based on the actual production of the dairy herds to be comparable. That is, the feed table requirements were computed at the actual production level of the herds.

High Efficiency Dairy Herds: The feed budget estimates agreed more closely with actual feed fed on this group of farms than on the low efficiency farms. These farmers fed only 500 pounds more grain, mill feed, and protein supplement per productive animal unit and about the same amount of roughage as would have been fed using feed table requirements (Table X).

This group of farms made more efficient use of the feed fed than the low efficiency group. The farms might have had better dairy cows with higher productive capacity. Milk production may have been higher on these farms in the fall of the year when the price of milk is higher and more sold at the base price. In this group of farmers there may have been some pure bred breeders who sold youngstock and cows at a premium price which would raise the returns per dollar feed fed because of a higher productive livestock income.

A greater percentage of the gross income was derived from the crop income on these farms. The high return herds averaged approximately 20 pounds more butterfat per herd than the low return dairy herds indicating their higher producing capacity.

THE AMOUNT OF FEED FED ON 50 DAIRY AND GENERAL LIVESTOCK FARMS

The 50 dairy and general livestock and 20 general farms were divided into groups on the basis of returns per dollar feed fed. The groups being various levels of feeding efficiency and returns per dollar feed fed a measure of efficiency.

These groups of farms were taken separately and the amount of feed was computed which the livestock would have required on each farm using feed budget estimates. These were then totaled for each group and compared with feed actually fed on the farms.

Low Efficiency Farms: The farms with low returns per dollar feed fed used 1200 pounds more grain, protein, and mill feed per productive animal unit than would have been fed according to feed table requirements (Table XI). Also, more hay and silage were fed per hay consuming animal unit than according to feed table requirement. It is interesting to note that more high price wheat was fed per animal unit in this group. The ration would have been cheaper if corn could have been substituted for wheat to reduce the value of feed fed and raised returns per dollar feed fed. This group of farms fed more grain and concentrate per productive animal unit than the higher efficiency farms indicating less efficient use of feed.

Medium Efficiency Farms: On this group of farms, there was not as great a difference between the amount of

feed actually fed and feed table estimates (Table XI) as there was on the low efficiency farms. Approximately 700 pounds more grain and concentrates and slightly more roughage were actually fed per animal unit than the estimates indicated.

High Efficiency Farms: The high efficiency farms fed 800 pounds more grain and protein concentrate per productive animal unit than would have been fed using feed table requirements (Table XI). The amount of feed fed was approximately the same per productive animal unit as the previous group. The amount of corn fed compared very favorably per productive animal unit on this group. However, this was the only group in which the amount of hay fed was under the feed table requirements. Where dairy cattle predominate, less feed is required per productive animal unit than where other classes of livestock make up the larger percentage of the productive livestock income.

The low efficiency group had a smaller percentage of gross income from cattle and a greater percentage from hogs and poultry (Table XII). The high efficiency group had a larger percentage of the gross income from dairy than the other two groups.

Crop yield index, and labor income increased as returns per dollar feed fed indicating the operators were better managers all around (Table XII).

Table XI - RELATION OF THE AMOUNT OF FEED FED TO THE AMOUNT WHICH WOULD HAVE BEEN FED ON 50 DAIRY AND GENERAL FARMS** IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Returns per dollar feed fed		Per Productive Animal Unit								Per Hay Consuming Animal Unit	
Range	Average	Number farms	Rank	Fed	Corn bu.	Oats bu.	Wheat bu.	Lbs. Protein	Lbs. Mill Feed	Lbs. Grain*	Lbs. Hay	Lbs. Silage
		16	Low	Budget	32.14	17.39	2.76	393		2915	4640	4940
$ .45-$1.46	$1.20			Actual	43.56	29.93	5.92	316	280	4195	5660	6020
		17	Med.	Budget	31.72	18.73	2.27	405		2916	4390	4620
$1.49-$1.71	$1.58			Actual	35.39	20.93	4.39	279	379	3619	4780	4820
		17	High	Budget	30.59	20.15	2.39	378		2879	4730	4700
$1.73-$2.55	$1.99			Actual	31.50	27.62	3.45	345	358	3678	4240	5720

*Including mill feed and protein concentrate.
**Fifty to ninety per cent of the productive livestock income from dairy, the balance of the productive livestock income from any one or combination of enterprises.

Table XII - SOURCE OF GROSS INCOME ON 50 DAIRY AND GENERAL FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Returns per dollar feed fed	Per Cent of Gross Income						Crop Yield Index	Labor Income
	Dairy Cattle	Hogs	Beef	Poultry	Sheep	Crops & other		
Low	46	10		12		32	94	$1,325
Medium	53	10	3	11	1	22	95	$2,775
High	54	9	1	9	2	25	101	$4,116

AMOUNT OF FEED FED ON GENERAL LIVESTOCK FARMS

There was a greater diversification of livestock on this group of farms than on the previous two (Table XIV). Dairy cattle income made up a smaller percentage of the gross income while hogs, beef, and poultry made up a larger percentage.

More grain was fed per animal unit to these classes of livestock organization than where cattle predominate. This is shown by 69 bushels of corn being fed per productive animal unit as compared with 25 to 40 bushels on the two previous groups (Table XIII). Approximately 3000 pounds more grain, mill feed, and protein supplement were fed per productive animal unit than would have been required using feed table requirements. This is the greatest variation in feed fed found so far. Also more hay and less silage were fed per hay consuming animal unit than according to feed table requirements. It should be pointed out that a hay consuming animal unit on these farms required less than half as much roughage as on the other two groups.

Table XIII - RELATION OF THE AMOUNT OF FEED FED COMPARED TO WHAT WOULD HAVE BEEN FED ACCORDING TO FEED TABLE REQUIREMENTS ON 20 GENERAL FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Method of Computation	Number farms	Per Productive Animal Unit				Per Hay Consuming Animal Unit	
		Corn bu.	Oats bu.	Lbs. protein	Lbs. grain*	Lbs. hay	Lbs. silage
LOW RETURNS PER DOLLAR FEED FED (Average $1.06)							
Budget	10	44.75	10.44	527	3569	1860	2540
Actual feed fed	10	69.37	33.34	198	6567	2960	1620
HIGH RETURNS PER DOLLAR FEED FED (Average $1.49)							
Budget	10	54.40	10.00	454	3981	1690	2400
Actual feed fed	10	50.00	23.20	209	4397	2080	2560

*Including protein and mill feed.

Table XIV - SOURCE OF GROSS INCOME ON 20 GENERAL FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Low Return Farms	Per cent of gross income	High Return Farms	Per cent of gross income
Dairy income	15	Dairy income	19
Hog income	17	Hog income	22
Beef income	11	Beef income	10
Poultry income	26	Poultry income	13
Sheep income	8	Sheep income	4
Crop income	16	Crop income	28
Other income	7	Other income	4

CONCLUSIONS AND RECOMMENDATIONS

The data presented in this chapter would indicate farmers fed 33 to 41 per cent more grain and concentrates per productive animal unit than feed budget estimates indicate. This does not necessarily mean that feed tables are this inaccurate, and should be increased by 30 to 40 per cent, but gives an approximate indication of the amount of feed actually fed. In another study carried on by the Department of Agricultural Economics in cooperation with the Michigan Milk Producers Association in the Detroit Milk Shed Study, farmers fed 20 to 25 per cent more grain per cow than the feed budget estimates indicate at the same production level[13]. The average farmer fed 20 to 40 per cent more grain and concentrates per animal unit than feed budget estimates indicate. The quantity of grain fed showed the greatest variation from farm to farm.

The quantity of hay fed was about the same while 14 per cent more silage was fed per hay consuming animal unit than feed budget estimates would indicate. This would indicate the roughage estimates are much more accurate than the grain portion of the feed recommendations. The quantity of roughage fed per hay consuming animal unit compares favorably with roughage consumption in other studies.

Since feed-price ratios were favorable in 1949, farmers fed grain and roughage heavily to take advantage of

[13]Hodge, Timothy, DAIRY COSTS AND RETURNS, Agr. Exp. Station, Ag. Econ. 454, p. 3.

the favorable feed-price ratio, and was one of the reasons why more feed was fed than feed budget estimates would indicate. It would be desirable to make a study of this kind another year when the feed-price ratios were not as favorable.

The low efficiency farms fed the greatest amount of grain and concentrates per productive animal unit. The feed budget estimates compare much better with the high efficiency farms. This would indicate the feed budget estimates are too conservative for the average farmer. For example, the dairy section of the feed budget estimates was based upon Dairy Herd Improvement Association records, which were probably on cows of above average producing ability and farmers who were efficient feeders. Maybe the feed tables are a bit optimistic on what the average farmer can do with a certain quantity of grain.

As a recommendation, the feed budget tables should be increased with the amount an average farmer would feed. The grain portion of the feed tables shows the greatest variation. The figures found in this study indicated farmers fed 36 per cent more grain and protein supplement per animal unit than the feed budget estimates indicated. However, this figure includes all grain shrinkage totals since there was no accurate method of determining the amount of shrinkage of grain in this study. Loss of grain from rats and mice is also included in the feed consumed figure. In addition to the favorable feed price ratio

during 1949, there was a large supply of feed on hand per animal unit. In years when the feed supply is plentiful per animal unit, there is a faster feed disappearance on farms than normal. Most small grain yields were fairly accurate but the corn yields on some farms may have been optimistic.

In view of these limitations of the data, the grain portion of the feed tables should be increased 15 to 25 per cent. As silage can be partially substituted for hay, the quantity of roughage in the feed budget estimates is satisfactory for all practical purposes. If the feed budget tables were increased, they would be more in line with the feeding efficiency on the average farm.

As stated before, in using the present feed budget estimates in farm planning, more livestock is put on the farms than they will carry under actual feeding conditions. In having the extra livestock load, a farmer might run short on feed and have to buy a considerable amount of feed. This could disrupt a farmers plans if he had to buy a large quantity of feed not previously planned on. Buying feed is advisable to enlarge the size of business on a small farm for a more efficient unit. If the grain portion of the present feed tables were increased, there would be less chance of overestimating the amount of livestock a farm will carry.

The Michigan feed budget table gives feed requirements for each 50 pound butterfat interval from 200 to 350 pounds

of butterfat production per cow. It would be helpful if another interval was added for feed requirements on cows producing 400 pounds of butterfat. Several commercial herds included in this study were in this high producing class.

The high efficiency farmers have received the most attention in the past. The data in this study indicates some effort is needed both in research and extension work on the low efficiency group of farms to improve the efficiency with which feed is used on these farms.

Chapter III

LIVESTOCK EFFICIENCY

General: In planning farms, the first steps are to plan the cropping program and fit the livestock to the feed and labor available. The next step is to estimate gross income. Such an estimate can be made with a reasonable degree of accuracy by multiplying the value of feed by the returns per dollar feed fed, as an estimate of livestock income. Crop income is added to the productive livestock income to give an estimate of gross income. Since livestock programs vary it is desirable to have a standard for returns per dollar feed fed for different classes of livestock programs.

One of the purposes of this study was to determine the returns per dollar feed fed by different classes of livestock organization. These were dairy farms, dairy and general livestock farms, and general livestock farms. The average return per dollar feed fed on these farms could be used as a standard to estimate gross income.

Known variations in feeding efficiency (returns per dollar feed fed) on certain types of farms would give the approximate range in the gross which could be expected. The three classes of farms were divided into groups by returns per dollar feed fed as a measure of feeding efficiency. Labor income and farm analysis factors were computed for each of these sub-groups to determine the relation to labor income. The average returns per dollar feed fed (feeding

efficiency) on these sub-groups could be used as a standard to show the approximate variation in estimate of gross income.

What would be the relation of feeding efficiency (returns per dollar feed fed) to labor income and other farm analysis factors?

Livestock efficiency used in this chapter is measured by the ratio of output (dollar return) to value of input (dollar's worth of feed). In other words, returns per dollar feed fed (feeding efficiency) is to be a measure of livestock efficiency in this chapter.

Dairy Farms: The high efficiency farms returned $2.40 in productive livestock income for every dollar feed fed compared with $1.52 per dollar feed fed on the low efficiency farms (Table XV). It is interesting to note the crop yield index was the same on both groups of farms. In spite of the fact the low efficiency group had a larger size of business, the high efficiency group with high returns per dollar feed fed and higher sales per cow had the largest labor income.

Dairy and General Livestock Farms: The low efficiency farms had the most tillable acres but lowest crop yield index, lowest productive livestock income, smallest size of business, and lowest labor income (Table XVI). Apparently, on farms where there is low livestock efficiency, other farm analysis factors also seem to be low.

Even though the medium efficiency group had the largest size business and productive livestock income, the returns per dollar feed fed, crop yield index, and labor

Table XV - RELATION BETWEEN FEEDING EFFICIENCY AND LABOR INCOME AND OTHER FACTORS ON 30 DAIRY FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Item	Returns Per Dollar Feed Fed		
	$.67-$1.86	$1.93-$3.36	All farms
Number of Farms	15	15	30
Returns Per Dollar Feed Fed (ave)	$ 1.52	$ 2.40	$ 1.88
Tillable Acres	164	158	161
Productive Man Work Units	602	549	595
Crop Yield Index	101	101	101
Productive Livestock Income	$ 7,596	$ 8,248	$ 7,922
Gross Income	$ 9,935	$ 11,194	$ 10,564
Number of Cows	19.4	18.7	19.0
Dairy Sales Per Cow	$ 318	$ 348	$ 332
Productive Man Work Units Per Man	337	315	326
Pounds of Grain Per Productive Animal Unit	3252	2693	2996
Labor Income	$ 1,598	$ 4,056	$ 2,827
Per cent of Gross Income From			
Dairy	73	72	72
Crops	18	22	20
Other	9	6	8

Table XVI - RELATIONSHIP BETWEEN FEEDING EFFICIENCY AND LABOR INCOME AND OTHER FACTORS ON 50 DAIRY AND GENERAL FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Item	Returns per Dollar Feed Fed			
	$.45-$1.46	$1.49-$1.71	$1.73-$2.55	All Farms
Number of Farms	16	17	17	50
Returns per Dollar Feed Fed (ave.)	$1.20	$1.58	$1.99	$1.60
Tillable Acres	174	171	154	166
Gross Income	$7,649	$12,105	$11,950	$10,615
Productive Man Work Units	506	668	581	586
Crop Yield Index	94	95	101	96
Productive Livestock Income	$5,255	$9,425	$8,897	$7,911
Number of Cows	11.5	17.4	15.4	14.9
Dairy Sales per Cow	$225	$314	$329	$297
Productive Man Work Units per Man	320	377	352	351
Pounds of grain per productive animal unit	4,195	3,619	3,678	3,867
Labor Income	$1,325	$2,775	$4,116	$2,767
Per cent of Income From:				
Dairy	46	53	54	52
Hogs	10	10	9	10
Poultry	12	11	9	10
Crops	28	16	21	20
Other	4	10	7	8

income were about average which shows a high relationship between returns per dollar feed fed and labor income.

Again, the high efficiency group which averaged $1.99 return per dollar feed fed had the highest labor income, which was three times as large as the low efficiency group. The high labor income was due to a combination of factors, namely high returns per dollar feed fed, high productive livestock income, high crop income, and high crop yields.

General Farms: The labor income of the high efficiency farms was $2,394 more than the low efficiency group (Table XVII). The primary factors which helped to make a high labor income were higher returns per dollar feed fed, larger size of business, and higher crop yield index. These general farms returned $1.25 for each dollar feed cost, while the dairy and general farms returned $1.60, and dairy farms $1.88 per dollar feed cost.

Dairy Sales Per Cow on Dairy and General Livestock Farms: Dairy sales per cow increase as returns per dollar feed fed increase (Table XVI). High dairy sales combined with large size of business and crop yield index apparently maximize labor income. The low returns per dollar feed fed are closely associated with low dairy sales per cow.

The low dairy sales per cow, small dairy herds, low crop yield index, and small size of business on the low efficiency farms were the major causes of the low labor income. The dairy sales per cow on the high efficiency farms were $106 more than on the low efficiency farms.

Table XVII - RELATION OF RETURNS PER DOLLAR FEED FED TO FARM EARNINGS AND OTHER FACTORS ON 20 GENERAL FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Returns per dollar feed cost		Number farms	Rank	Productive man work units	Tillable acres	Productive animal units	Crop yield index	Labor income
Range	Average							
$ .87-$1.27	$1.06	10	Low	425	149	293	99	$ 518
$1.31-$1.82	$1.49	10	High	480	128	360	110	$2,912
All farms	$1.25	20		452	138	326	104	$1,715

The high dairy sales per cow, high returns per dollar feed fed, high crop yields, and high crop income were the major factors accounting for the high labor income on the high efficiency farms.

Dairy Sales Per Cow On Dairy Farms: On farms where the dairy herd is the main livestock enterprise, the returns per dollar feed fed also have an effect on dairy sales per cow (Table XV).

The 15 high efficiency farms averaged $ .88 more returns per dollar feed fed than the low farms. High returns per dollar feed fed, high dairy sales per cow, and higher crop income were the major factors which accounted for the higher labor income.

A high labor income seems to be associated with high returns per dollar feed fed, high dairy sales per cow, high crop yields, and large size of business.

It should be pointed out that dairy sales per cow increase as returns per dollar feed fed. It would be difficult to say which was cause and effect. Each factor is closely associated with the other, and where returns per dollar feed fed are high, dairy sales per cow are high, or vice versa.

RELATION OF AMOUNT OF FEED FED TO DAIRY SALES PER COW

Farmers with high production and sales per cow feed their cattle well (Table XVIII). The three average dairy sales per cow figures represent approximately the average butterfat production per cow because fat sold roughly for one dollar per pound as fluid milk during 1949.

Dairy Sales Per Cow: High dairy sales per cow are related to high labor income (Table XVIII). Many factors seem to follow along in about the same proportion as the increased sales per cow indicating that a good dairyman also is a good manager with reference to other aspects of his business. Productive livestock income increased with total feed cost. Labor income increased with dairy cattle income, which increased with number of cows. The farms with high sales per cow had large size of business from large herds, high crop yield index, high return per dollar feed fed, and $1000 above average labor income of all farms.

The farms with lowest dairy sales had fewer cows, lowest crop yield index, and smallest size of business, which is reflected in the lower labor income.

Farms with high returns per dollar feed fed have the highest labor income even though size of business is smaller than on the other groups. When crop yield, size of business, dairy sales per cow, and returns per dollar feed fed are all high, the labor income is usually high also.

Conclusions: Livestock efficiency, which is measured in returns per dollar feed fed, and on farms with high

Table XVIII - RELATION OF DAIRY SALES PER COW TO ALL FACTORS ON 30 DAIRY FARMS* IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Items	Dairy Sales per Cow			
	$100-$295	$296-$360	$361-$492	All farms
Average Dairy Sales per Cow	$ 250.00	$ 320.00	$ 403.00	$ 332.00
Number of farms	10	10	10	30
Hay consuming animal units - all farms	226.42	298.26	311.28	836.06
Productive animal units - all farms	223.32	309.64	320.00	852.98
Bu. corn fed per productive animal unit	22.32	28.65	26.40	26.15
Bu. oats fed per productive animal unit	28.67	22.91	28.11	26.37
Lbs. mill feed fed per productive animal unit	22	266	249	196
Lbs. protein fed per productive animal unit	153	226	483	303
Lbs. all concentrates " " "	2556	3026	3275	2996
Lbs. hay per hay consuming animal unit	3880	5440	5680	5100
Lbs. silage " " " "	4700	6060	7120	6080
Productive man work units	493	610	624	576
Productive livestock income	$4,973.00	$7,932.00	$10,861.00	$7,922.00
Tillable acres	154	154	173	161
Productive days work per tillable acre	3.2	4.0	3.6	3.7
Crop yield index	92	99	113	101
Crop income	$2,436.00	$1,746.00	$ 2,321.00	$2,167.00
Number of men	1.6	1.6	2.0	1.73
Number of cows	15.8	19.7	21.7	19.05
Total feed cost	$2,853.00	$4,730.00	$ 5,155.00	$4,246.00
Returns per dollar feed cost	$ 1.73	$ 1.71	$ 2.11	$ 1.88
Tillable acres per productive animal unit	6.91	4.97	5.42	5.64
Dairy cattle income	$4,801.00	$7,578.00	$10,580.00	$7,653.00
Labor income	$2,152.00	$2,460.00	$ 3,870.00	$2,827.00

*Ninety per cent and over of productive livestock income derived from dairy.

returns per dollar feed fed, large size of business, high crop yields, and high dairy sales per cow are associated with high labor income.

Where farms are grouped by returns per dollar feed fed, crop yield index, dairy sales per cow, and labor income all increase as returns per dollar feed fed increase. A farm operator who has high returns per dollar feed fed (livestock efficiency), generally has high efficiency in all other factors, or phases of his business.

The dairy farms in this study returned $1.88 for each dollar feed fed, while dairy and general livestock farms returned $1.60, and general farms $1.25 for each dollar feed fed.

In farm planning these figures can be used as a standard in estimating the gross income on a farm when the value of crops is known. An approximate variation of $1.52 to $2.40 times the feed value on a dairy farm plus crop sales would give the estimated variation in gross income. On dairy and general livestock farms a variation of $1.20 to $2.00 times the feed value plus crop sales would give the estimated variation in gross income on these farms. A variation on general livestock farms of $1.06 to $1.49 times the feed value plus crop sales would give the estimated variation in gross income.

The figures in the above paragraph were the 1949 returns per dollar feed fed. The figures may vary in years when the feed-price ratios are not as favorable, and there is a more limited supply of feed per animal unit.

RETURNS PER DOLLAR FEED COST IN THE FUTURE

What will happen to returns per dollar feed fed under changing prices? In 1949, most feed price ratios were generally favorable. Farmers apparently fed their livestock well to take advantage of the favorable ratios. Feed was relatively cheap in comparison with the price of livestock and livestock products. With government price support programs coming in more and more, along with crop quotas and increasing livestock numbers, feed prices will probably remain at their present level or move higher in the future. Livestock prices and products, including dairy probably will drop lower in the years ahead. With feed prices remaining relatively high and productive livestock income falling off from its 1949 level, high feeding efficiency will become increasingly important. Returns per dollar feed cost will probably be lower as productive livestock income goes down with feed prices remaining fairly high.

Chapter IV

HAY AND TILLABLE PASTURE PRODUCTION AND REQUIREMENTS

In foregoing chapters, an analysis has been made of variations in pounds of grain and roughage, and variations in returns per dollar of feed fed. In this chapter, an attempt is made to analyze the variations and causes for variations in the number of acres devoted to the production of hay and pasture.

Only 98 of the 100 farms were included in this portion of the study because two farms were devoted entirely to poultry production and had no hay consuming livestock. These 98 farms were sorted into six groups according to the number of acres in hay and pasture per hay consuming animal unit. Pertinent factors assumed to be associated with the profitableness of farm operation were averaged for each group (Table XIX).

Forage Required Per Hay Consuming Animal Unit: The farms required an average of 2.7 acres of hay and tillable pasture to feed a hay consuming animal unit during 1949 (Table XIX). The averages of the six groups of farms ranged from 1.4 acres of hay and tillable pasture per hay consuming livestock on the high yield group to 4.8 acres on the low yield group. There was an extreme range from .4 of an acre on the low farm to 7.6 acres per hay consuming animal unit on the high farm. On the farms with high acreages of forage per hay consuming unit, the farms did not carry as much livestock per tillable acre because the yields of hay and

Table XIX - RELATION OF TILLABLE ACRES OF HAY AND PASTURE PER HAY CONSUMING ANIMAL UNIT TO THE PERCENTAGE OF FARMS IN FORAGE AND OTHER FACTORS ON 98 FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Items	Acres of Hay and Tillable Pasture Per Hay Consuming Animal Unit						
	.4-1.6	1.7-2.2	2.3-2.6	2.7-3.3	3.4-3.98	4.01-7.6	All farms
Number farms	17	16	16	16	16	17	98
Average no. of H.C.A.U.	27.5	25.6	25.2	32.8	19.3	16.2	24.4
Number of H.C.A.U.	467.5	409.5	403.7	525.2	309.0	275.4	2,390.2
Number P.A.U.	592.5	484.0	501.4	689.0	430.2	433.5	3,130.5
Average Prod. animal units	34.85	30.25	31.34	43.06	26.89	25.50	31.94
Average tillable acres	124	152	163	215	157	166	162
Acres hay per H.C.A.U.	.8	1.0	1.3	1.5	1.9	2.4	1.4
Acres tillable pasture per H.C.A.U.	.6	.9	1.0	1.4	1.8	2.5	1.3
Acres tillable hay & pasture per H.C.A.U.	1.4	1.9	2.4	2.9	3.6	4.8	2.7
Acres tillable hay & pasture per P.A.U.	1.1	1.6	1.9	2.2	2.6	3.1	2.0
Non-till. pasture per H.C.A.U.	.3	.8	1.6	.6	.6	.8	.8
Per cent tillable acres hay & pasture	30.3	32.4	36.7	44.5	44.7	47.0	40.0
Per cent tillable land in row crops	36	26	23	22	18	19	23

Table XIX (Cont'd.) - RELATION OF TILLABLE ACRES OF HAY AND PASTURE PER HAY CONSUMING ANIMAL UNIT TO THE PERCENTAGE OF FARMS IN FORAGE AND OTHER FACTORS ON 98 FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Items	Acres of Hay and Tillable Pasture Per Hay Consuming Animal Unit						
	.4-1.6	1.7-2.2	2.3-2.6	2.7-3.3	3.4-3.98	4.01-7.6	All farms
Per cent tillable land in small grain	34	37	38	33	35	29	34
Average no. dairy cows	14.5	17.1	16.4	18.0	11.4	10.7	14.6
Number heifers	12.5	16.9	16.7	15.1	9.8	9.1	13.3
Average no. sows	1.4	1.1	1.7	2.8	2.1	2.4	1.9
Pigs raised to 200 lbs.	23	16	27	46	28	34	29
Number beef cows and steers	7.9	.3	.4	5.7	1.1	.5	2.6
Number hens & pullets raised	267	245	119	391	234	225	251
Dairy cattle income	$ 5,567.00	$ 7,841.00	$ 6,152.00	$ 6,001.00	$ 4,034.00	$3,317.00	$ 5,464.00
Hog income	$ 640.00	$ 521.00	$ 784.00	$ 1,451.00	$ 1,024.00	$1,168.00	$ 931.00
Beef income	$ 912.00	$ 51.00	$ 11.00	$ 632.00	$ 88.00	--	$ 286.00
Poultry "	$ 971.00	$ 745.00	$ 473.00	$ 1,463.00	$ 764.00	$ 651.00	$ 844.00
Sheep "	$ 79.00	$ 33.00	$ 159.00	$ 508.00	$ 274.00	$ 138.00	$ 197.00
P.M.W.U.	570	584	565	715	491	464	564
Number men	1.7	1.8	1.7	2.0	1.6	1.4	1.7
Gross income	$10,718.00	$12,243.00	$10,177.00	$13,342.00	$ 8,846.00	$7,640.00	$10,466.00
Prod. livestock income per farm	$ 8,174.00	$ 9,193.00	$ 7,643.00	$10,052.00	$ 6,337.00	$5,274.00	$ 7,757.00
Feed value	$ 5,015.00	$ 4,759.00	$ 4,554.00	$ 6,716.00	$ 4,110.00	$4,077.00	$ 4,865.00
Prod. livestock income over feed cost	$ 3,159.00	$ 4,434.00	$ 3,089.00	$ 3,336.00	$ 2,227.00	$1,197.00	$ 2,792.00

Table XIX (Cont'd.) - RELATION OF TILLABLE ACRES OF HAY AND PASTURE PER HAY CONSUMING ANIMAL UNIT TO THE PERCENTAGE OF FARMS IN FORAGE AND OTHER FACTORS ON 98 FARMS IN AREAS 1, 2, 5, and 6 OF MICHIGAN, 1949.

Items	Acres of Hay and Tillable Pasture Per Hay Consuming Animal Unit						
	.4-1.6	1.7-2.2	2.3-2.6	2.7-3.3	3.4-3.98	4.01-7.6	All farms
Returns per dollar feed cost	$ 1.63	$ 1.93	$ 1.68	$ 1.50	$ 1.55	$ 1.29	$ 1.60
Dairy sales per cow	$ 315.00	$ 345.00	$ 310.00	$ 293.00	$ 289.00	$ 253.00	$ 304.00
Crop yield index	112	112	98	99	83	88	100
Crop income	$ 2,254.00	$ 2,608.00	$ 2,111.00	$ 2,678.00	$1,590.00	$1,965.00	$2,199.00
Tillable acres per P.A.U.	3.57	5.02	5.21	4.98	5.83	6.50	5.09
Productive Man Work Units per tillable acre	4.6	3.8	3.5	3.3	3.1	2.8	3.5
Labor income	$2,967.00	$ 3,344.00	$ 3,139.00	$ 3,064.00	$1,897.00	$1,313.00	$2,611.00

carrying capacity of the pasture were low along with the yields of other crops. In other words these farms were not understocked in proportion to their carrying capacity.

The acres of hay and tillable pasture needed per hay consuming animal unit increased as percentage of the land in forage increased (Table XIX). Farms with a low number of acres of hay and tillable pasture per hay consuming animal unit have a smaller percentage of the total land in forage. Low acreages of hay and tillable pasture per hay consuming animal unit are associated with high crop yields (Table XIX). With low crop yields, acreage of forage per hay consuming animal unit increased, and also percentage of the land in forage increased.

Proportion of Land in Forage: Currently there is considerable interest in grassland farming. Authorities disagree regarding the proportion of land which can be profitably devoted to forage crops. One important segment of the problem is how long can the yield and quality of a forage crop be maintained without being broken up and reseeded.

There are some hazards which should not be overlooked in devoting a large percentage of the tillable land to forage crops. Some present day recommendations suggest that farmers can operate profitably with 75 per cent or more of the farm devoted to these crops. The evidence from this study indicates that there is a limit to the proportion of a farm which can profitably be devoted to hay and pasture. As the proportion of the land devoted to hay and pasture

increases, yields of hay and pasture decrease. Some of the decrease noted in this study may be due to lower inherent productivity of the land. It appears evident, however, that a major portion of the decrease is due to hay and pasture seedings being left too long so that the high quality legume portion of the seeding kills out. When this is done, both the yields and the quality of the forage become low.

Another factor which suggests the inadvisability of devoting too large of a proportion of a farm to forage production is weather risk. Both winter killing and drouth contribute to this risk. The greater diversity which is possible with a program which includes a substantial portion of row crops and small grain appears to be less risky on high and medium quality land. On low quality, light or rolling land, it is necessary to keep a larger proportion of the land in forage crops to reduce erosion. There is evidence in this and other Farm Management studies that farms with medium to good quality land have higher incomes over a period of years if no more than 40 to 50 per cent of the land is kept in forage crops. As one examines individual farm records included in this study, it is evident that farms with an excessive acreage devoted to forage crops tend to have some tillable fields of June grass and other low quality forage crops.

These data indicate that as farmers shift their cropping program to more forage, it is at the expense of the higher valued row crops. This leads to less total

dollars worth of feed from a given acreage. The usual assumption is that such a shift will increase the yields of other crops grown, but the opposite is indicated by the data in this study.

Kind of Livestock and Income: On the 98 farms, 77 per cent of the livestock was hay consuming, while 23 per cent was either hogs or poultry. Dairy cattle made up the majority of the livestock on these farms.

When the acres of hay and tillable pasture per hay consuming animal unit and percentage of the farm in forage increased on the farms in this study, productive livestock income decreased. There were two reasons. First, with low crop yields less feed was available, and second, dairy sales per cow decreased.

Relation of Amount of Forage to Labor Income: There was a direct relationship between the proportion of tillable land in forage and labor income. Farms with over 40 per cent of the tillable land in forage had lower earnings than those with less than 40 per cent. Possibly the root of the evil is in having a large percentage of the farm in forage with low crop yields, thereby requiring more acres to feed one hay consuming animal. Thus, fewer cows can be fed from a given number of acres.

The evidence of this study shows the size of dairy herd decreased as amount of hay and tillable pasture increased, and this is indirectly reflected in size of business as measured by the number of man work units. Another factor brought out is that as the amount of forage per hay consuming

animal unit increased, the intensity per acre decreased.

Forage Yields: Hay and pasture yields largely determine the amount of livestock a farm will carry. In this study, farmers fed approximately 2.4 tons per hay consuming animal unit. The high yield group grew this hay on .9 of an acre while the low yield group required 2.1 acres to grow 2.4 tons of hay. The yield was 2.8 tons per acre on the high yield group compared with 1.1 tons per acre on the low yield group.

As an example, on a farm with 200 tillable acres with 40 per cent of the land in forage, the amount of livestock the farm will carry depends upon whether it takes 1.4 acres of hay and tillable pasture per hay consuming animal unit or 4.8 acres. Using the 1.4 acres of forage per hay consuming animal unit, the farm could carry 58 hay consuming animal units. With 4.8 acres of hay and pasture per unit, the farm would only carry approximately 17 animal units. This is over a 300 per cent difference in the amount of hay consuming livestock a farm will carry. Using the average figure on all farms of 2.7 acres of hay and tillable pasture per hay consuming animal unit, the farm would carry 30 hay consuming animal units.

Summary: In this study, no information was available as to type, quality, and class of land on these farms. The type and quality of the land undoubtedly had some influence upon the high acres of hay and tillable pasture per hay consuming animal unit. If the type and quality of land had been known, the farms would have been sorted using land as

the causal factor. The labor income and crop yields generally decrease, and acres of hay and tillable pasture per hay consuming animal unit increase with lower quality land. High crop yields are associated with the better classes of land. A farmer with poor quality land and low crop yields can only compensate for the low crop yields by having more acres of each crop to feed a given amount of livestock.

The low producing sods and lower quality land were the major reasons for high acres of hay and tillable pasture per hay consuming animal unit. Sod needs plowing down or breaking up occasionally to give the soil needed organic matter and to reseed the forage. To maintain good grass, some land must be reseeded every year. If a certain portion is not seeded every year and fertilized well, and a seeding happens to fail in the year a crop is seeded, the farm may have a low labor income for several years as the forage will be very poor on a portion of the farm.

In planning the livestock program for a farm capable of producing 10 per cent above average crop yields, one should be able to carry a hay consuming animal unit on two acres of hay and tillable pasture. If a farm had 10 per cent below average crop yields, three acres of hay and tillable pasture per hay consuming animal unit would be required.

Chapter V

SUMMARY

Many problems arise in farm planning. One of the important problems is the fitting of the quantity of livestock to the feed and labor available. When using present feed budget estimates, more livestock is put on the farm than the farms will carry under actual feeding conditions.

On the 100 farms included in this study farmers feed approximately 36 per cent more grain and protein concentrate per productive animal unit than feed budget estimates indicated. There were 3921 pounds of grain and protein concentrate actually fed per animal unit compared with 2885 pounds using feed budget estimates. Grain fed showed the greatest variation with from 33 to 41 per cent variation by classes of livestock organization set-up.

The amount of hay fed per hay consuming animal unit was about the same, or 4880 pounds compared with 4840 pounds per hay consuming animal unit using feed budget estimates. The amount of silage fed per hay consuming animal unit was slightly more, or 5420 pounds actually fed per hay consuming animal unit compared with 4760 pounds using feed budget estimates. Therefore, farmers kept approximately 25 per cent less livestock on the given amount of feed than feed budget requirements indicated that they should be able to keep.

On the farms with high feeding efficiency, as measured in returns per dollar feed fed, the amount of feed

fed compared more favorably with the feed budget estimates than on the farms with low feeding efficiency.

One reason why farmers fed grain more heavily in 1949 than feed budget estimates would indicate was the favorable feed-price ratios. Since feed was cheap relative to livestock and livestock products, farmers probably tended to feed more liberally.

The livestock found on the 100 farms in this study was 77 per cent hay consuming livestock and 23 per cent hogs and poultry. The 100 farms were divided into three groups by classes of livestock organization. The 30 dairy farms returned $1.88 for each dollar's worth of feed fed. The second group of 50 dairy and general livestock farms returned $1.60 for each dollar's worth of feed fed, and the 20 general livestock farms returned $1.25 for each dollar's worth of feed fed.

The average returns per dollar feed fed can be used as a standard for estimating livestock income in farm planning, by multiplying returns per dollar feed fed times the value of feed crops grown plus feed purchases. Livestock income plus crop sales gives an approximate estimate of gross income.

The variations in returns per dollar feed fed ranged from $1.52 for the average return on the low feeding efficiency farms to $2.40 for the average returns per dollar feed fed on the high feeding efficiency dairy farms. On the dairy and general livestock farms the low efficiency farms averaged $1.20 per dollar feed fed. The medium

efficiency group averaged $1.58 per dollar feed fed; while the high efficiency group averaged $1.99 return per dollar feed fed. The 20 general livestock farms returned an average of $1.06 per dollar's worth of feed fed on the low efficiency farms and $1.49 on the high efficiency farms.

Farms with high returns per dollar feed fed, high crop yields, and large size of business had the highest labor incomes.

The farms in this study averaged 2.7 acres of hay and tillable pasture per hay consuming animal unit. This consisted of 1.4 acres of hay and 1.3 acres of tillable pasture per hay consuming animal unit. The one-sixth of the farms with the highest yielding hay and pasture averaged 1.4 acres of hay and tillable pasture per hay consuming animal unit, while the low yield group averaged 4.8 acres hay and tillable pasture per hay consuming animal unit.

Farms with high yields of hay and pastures had the lowest percentage of the tillable land in forage. As the acres of hay and tillable pasture per hay consuming animal unit increased, the percentage of the farm in forage increased. With increased percentage of the farm in forage dairy sales per cow decrease, and with fewer cows there was a decrease in productive livestock income.

Farms with less than 40 per cent of the tillable land in forage had higher labor incomes than those with over 40 per cent of the tillable land in forage.

Hay and pasture yields largely determine how heavily a farm can be stocked. In this study farmers fed approximately

2.4 tons of hay per hay consuming animal unit. The high yield group grew this on .9 of an acre while the low yield group required 2.1 acres to grow 2.4 tons of hay. The yield was 2.8 tons per acre on the high yield group compared with 1.1 tons per acre on the low yield group.

In farm planning, farms with 10 per cent better than average crop yields should carry a hay consuming animal unit on two acres of hay and tillable pasture. On a farm with 10 per cent below average crop yields three acres of hay and tillable pasture should carry a hay consuming animal unit.

APPENDIX

EXPLANATION OF FACTORS USED

Animal Unit[14] is the amount of livestock equivalent to a mature cow and is based primarily on the amount of feed consumed.

Beginning Inventory is the amount of feed the farmers had on hand January or February 1st, depending on when the farmer's account year began.

Crop Income[14] is the crop sales plus or minus any increase or decrease in inventory.

Crop Production is the amount of hay, silage, and grain raised on the farm during the year.

Crop Sales, used on computing feed consumed, was only the sale of those crops which were fed to livestock.

Crop Yield Index[14] - The percentage of combined crop yields on an individual farm are of the average yields of the same crops on all farms in the type of farming area considered.

Ending Inventory was the amount of feed on hand at the end of the farm accounting year which ended December 31 or January 31 of each year.

Enterprise[14] - A farm enterprise is an income-producing branch of a farm business, such as a crop or class of livestock.

Farm Organization[14] - The form which the farm business takes with respect to the size of business; kinds and

[14]Hill, E. B. and Brown, L. H., PRINCIPLES OF FARM MANAGEMENT. Edwards Brothers, Ann Arbor, Mich. 201 pp.

acreages of crops; kinds and amounts of livestock; kinds and amounts of power, machinery, and labor.

Feed Purchases is the amount of hay, grain, mill feed, or protein supplement purchased to feed on the farm.

Feed To Account For on the farms was the beginning inventory plus crop production, plus feed purchases. Feed accounted for was crop sales, plus own seed used on farm, if any, plus feed on the ending inventory. Feed consumed on the farms was taken to be the feed to account for less the feed accounted for. Or, in other words, beginning inventory, plus crop production, plus feed purchases, less crop sales of crops fed, seed used, and ending inventory.

Hay Consuming Animal Unit is the amount of livestock equivalent to a mature cow which consumes hay as a portion of its ration. This includes horses, all kinds of cattle, and sheep.

Labor Income[15] - The financial return to the operator as pay for his labor and management. It is computed by deducting from the "Net Farm Income" a charge for interest (usually five per cent) on the total investment.

Net Decrease[15] - A net decrease occurs in an account when the sum of the beginning inventory plus the purchases exceeds the sum of the ending inventory plus the sales.

Net Farm Income[15] represents the amount of money the farmer has earned as pay for his own labor and management, and for his capital investment. It is computed by subtracting the unpaid family labor other than the operator's from the

[15] Ibid. p. 200

"return for family labor (operator's and unpaid family labor) and capital".

Net Increase[16] - A net increase occurs in a livestock account when the sum of the beginning of the year inventory plus the purchases is less than the sum of the end of year inventory plus the sales. A net increase in "crops" occurs when the crop sales plus the end of year inventory exceeds the beginning inventory of feed crops and supplies.

Productive Animal Unit[16] includes animal units from all livestock except horses.

Productive Livestock Income[16] is computed by adding milk sales and egg sales to the sum of the livestock net increase, and subtracting any livestock net decrease.

Productive Man Work Unit[16] - The average amount of productive work that will be done by a man working at average labor efficiency in a ten-hour day. Productive work implies work on crops, livestock, and other income activities, such as labor off the farm.

Tillable Acres[16] - Acres of improved land which is suitable for inclusion in a crop rotation.

[16] Ibid. p. 201

COMPUTATION OF LIVESTOCK FACTORS

(1) Average Number of Cows - Add the number of months each cow was on the farm and divide the sum by 12. When the numbers by months are unknown, take the average of the number of cows at the beginning and at the end of the year.

(2) Average Number of Sows - The sum of the number of sows available for farrowing before July 1st and the number of sows available for farrowing the last half of the year. Divide the total by 2 to obtain the average.

(3) Number of Ewes - The number of ewes at lambing time plus the number of yearling ewes that had lambs.

(4) Average Number of Hens - Compute the average number of hens for each month of the year. Divide the sum of the average numbers for each month by 12.

(5) Animal Units - An animal unit is considered to be an amount of livestock equal to one cow, bull, steer, or horse two years old or over. It is based primarily on the amount of feed consumed. All animal units except work horses are called productive animal units. To determine the number of productive animal units on a farm, either miltiply the average number of animals on the farm by the conversion factors listed in column 2 or divide by the factors in column 1 and add the results to obtain the total (Table XX).

Table XX - FACTORS FOR COMPUTING PRODUCTIVE ANIMAL UNITS[17]

Kind of Livestock	(1) Number per Unit	(2) Conversion Factor
Cows	1	1.00
Heifers over one year	2	0.50
Calves under one year	4	0.25
Bulls or steers	1	1.00
Feeding cattle	2	0.50
Stallions	1	1.00
Colts	2	0.50
Ewes or bucks	7	0.14
Lambs raised or fattened	20	0.05
Brood sows or boars	2.5	0.40
Hogs raised to 200 pounds	5	0.20
Hens or ducks	100	0.01
Pullets raised	250	0.004
Turkeys or geese	33	0.03
Turkeys raised	83	0.012

[17]Hill, E. B. and Brown, L. H. PRINCIPLES OF FARM MANAGEMENT. Edwards Brothers, Ann Arbor, Mich. 145 pp.

Name _____ Farm No. _____

County _____ Area _____

FARM EXPENSES

Feed Expense			Crop Expense			Custom Expense			Auto Expense	
Item	Amt.	Val.	Item	Amt.	Val.	Item	Amt.	Val.	Item	$
Corn			Seed			Combining			Minor Repairs	
Oats			Fert.			Silo Filling			Gas, Oil Grease, Antifreeze	
Protein Supp.			Lime & Marl			Baling			Tires	
Minerals & Salt			Spray Mat. Binder twine			Chopping			License	
Mill Feeds			Containers & Cert.			Threshing			Ins.	
Grinding						Shelling			Depr.	
Hay						All other				
Straw										
Pasture										
Rent										
Other										

Truck Expense		Tractor Expense		Machinery Expense		Improvements Expense		Livestock Expense		Miscellaneous Expense	
Item	$	Item	$	Item	$	Item	$	Item	$	Item	$
Minor Rep.		Minor Rep.		Minor Rep.		Repairs		Vet.& Med.		Tel.	
Gas, Oil Grease Anti-freeze		Gas, Oil Grease Anti-freeze		Ins.		Ins.		Disinf. & Spray		Elect.	
Tires		Tires		Depr.		Depr.		Shearg. & Wl. Twn.		Misc.	
License		Depr.		Other		Other		Brooder Fuel			
Ins.								Ins.			
Depr.								D.H.I.A. Fees			
								A.B.A. Fees			

	Other roughage tons	Tillable Pasture acres
	1.0	2
	.5	1
	.5	1-2
	.5	1-2
	.5	1-2
	.5	½-1
	-	-
	.5	1-2
	1.0	½-1
	.5	-
	-	-
	-	-
	-	-
	-	-
	-	.2
	-	.2
	-	.2
	-	.1
	-	-
	-	.1
	-	-
	.1	.2
	-	.1
	-	-
	-	.5
	-	.5
	-	-

...ns of silage
...ement for hogs.
...value:

37	Feed Purchases				
38	Livestock Expense				
39	Crop Expenses				
40	Hired Labor (Months)				
41	Taxes				
42	Miscellaneous Expenses				
43	Total				
44	Receipts less Expenses				
45	Family Labor Board				
46	Net Farm Income				
47	Operator's Labor (Age)				
48	Return from Investment and Management				
49	Rate Earned on Investment		%		%
50	Interest on Investment			XXXXXXXXXXXX	
51	Labor Income			XXXXXXXXXXXX	

OPERATOR'S SHARE	
Rec. less Exp.	
Oper. &Fam. Labor	
Return from I. & M.	
Rate Earned	%
Interest	
Labor Income	

1	Total acres	14	Total investment per acre
2	Tillable acres	15	Value of real estate per acre
3	Productive animal units	16	Value of all land per acre
4	Total P. M. W. U.	17	Value of tillable land per acre
5	Gross income	18	Expense per $100 income
6	Total expense	19	Expense per tillable acre
7	Number of men	20	Years for gross to = investment
8	P. M. W. U. per man	21	Tillable acres per man
9	Crop acres per man (Tractor yes no)	22	Days per tillable acre
10	Crop acres per horse (No. horses)	23	
11	Total man labor charge	24	
12	Man labor charge per tillable acre	25	
13	Improvement investment per A. U.	26	

Unpaid Family Labor, Months and Value

Book Checked in by Copied by Checked by

LIVESTOCK	BEG. INVENTORY NO.	BEG. INVENTORY VALUE	END. INVENTORY NO.	END. INVENTORY VALUE	PURCHASES NO.	PURCHASES VALUE	SALES NO.	SALES VALUE	NET INCREASE	NET DECREASE	BREED	AV. NO.	A. U.	P. M. W. U.	L. L.'s SHARE
HORSES, Work															
Other															
BEEF, Cows															
Feeders and others															
DAIRY, Cows															
Heifers (over 1 yr.)															
Bulls (over 1 yr.)															
Calves (under 1 yr.)															
HOGS, Sows															
Boars															
Others															
SHEEP, Ewes															
Other															

LIVESTOCK FACTORS

Horse ages (beg. of year)

Number of foals

Calves born — Pounds beef produced

Calves born — Pounds milk produced

Prod. sold — Lbs. — per cow

Dairy sales, total — per cow

Litters farrowed: S F Total

Pigs farrowed — Weaned — per litter

Hog income per litter

Lambs born — Raised — per 100 ewes

Pounds wool produced — Pounds gain on lambs

Sheep income per ewe

KIND OF LEASE:	LAND	IMPROVED ACRES	IMPROVED PRICE	IMPROVED VALUE	WOODS ACRES	WOODS PRICE	WOODS VALUE	OTHER UNIMPROVED ACRES	OTHER UNIMPROVED PRICE	OTHER UNIMPROVED VALUE	TOTAL ACRES	TOTAL VALUE
Cash $	Owned											
Crop share	Rented											
Livestock share	Total											
Relation to landlord												

Operator.....

Address.....

Twp..... Sec.....

Soil.....

Landlord.....

INVESTMENTS	TOTAL FARM	LANDLORD'S	TOTAL FARM	LANDLORD'S
	$	$	$	$
1 Orchard				
2 Land				
3 Farm Improvements (less house $)				
4 Machinery and Equipment				
5 Horses				
6 Beef Cattle				
7 Dairy Cattle				
8 Hogs				
9 Sheep				
10 Poultry				
11 Feed and Crops				
12 Total				
13 RECEIPTS	RECEIPTS AND NET INCREASES		CASH RECEIPTS	
14 Orchard				
15 Horses				
16 Beef Cattle				
17 Dairy Cattle				
18 Dairy Sales				
19 Hogs				
20 Sheep and Wool				
21 Poultry				
22 Egg Sales				
23 Crop Sales + Crop Summary Balance				
24 Labor Off Farm (P.M.W.U.)				
25 Woodland Products (P.M.W.U.)				
26 Miscellaneous (P.M.W.U.)				
27 Machinery and Farm Improvements				
28 Custom Work Per Til. A.				
29 Total				
30 EXPENSES	EXPENSES AND NET DECREASES		CASH EXPENSES	
31 Orchard				
32 Farm Improvements				
33 Machinery and Equipment				
34 Horses				
35 Custom Work				
36				

FINANCIAL SUMMARY

POULTRY

MO.	MILK (Lbs.)	TEST	B. F. (Lbs.)	NET AMOUNT	EGGS LAID	NO. HENS	EGGS PER HEN
Jan.				$			
Feb.							
Mar.							
Apr.							
May							
June							
July							
Aug.							
Sept.							
Oct.							
Nov.							
Dec.							
Total							

FARM PRODUCTS USED

KIND	AMOUNT	VALUE
Wood, cds.		
Milk, qts.		
Cream, pts.		
Butter, lbs.		
Eggs, doz.		
Poultry, lbs.		
Beef, lbs.		
Pork, lbs.		
Mutton, lbs.		
Honey, lbs.		
Potatoes, bu.		
Other Veg.		
Fruit		
Canned Pro.		
Total	XXXXXXXX	

Operator's family: No. over 16 yrs. Under 16 yrs. Mos. board to others

Is son at home? What is the arrangement?

Real estate mortgage $ Chattel mortgage $ Notes $ Accounts $

MACHINERY, POWER, AND FARM IMPROVEMENTS

KIND	MAKE AND YEAR	SIZE	YEAR BOUGHT	ORIGINAL COST	INVENTORY BEG. OF YR.	INVENTORY END. OF YR.	SALES, TRADE-INS	OPERATING EXPENSE
Truck								
Auto								
Tractor								
All machinery and equipment								
Farm improvements								
Orchard								

New machinery bought ,

New farm improvements

EFFICIENCY FACTORS

...s of livestock	Corn bu.	Oats bu.	Wheat bu.	Protein** supp. lbs.	Hay* tons	Silage* tons	Other roughage tons	Tillable Pasture acres
...ses:								
...rk horse (2 yrs. and over)	10	45	-	-	1.5	-	1.0	2
...lts under 2 yrs. (average)	5	16	-	-	1.0	-	.5	1
...ttle:								
...iry cow (200 lbs. B.F.)	10	20	-	150	2.0	2.5	.5	1-2
...iry cow (250 lbs. B.F.)	14	25	-	250	2.0	2.5	.5	1-2
...iry cow (300 lbs. B.F.)	18	30	-	300	2.0	2.5	.5	1-2
...iry cow (350 lbs. B.F.)	22	35	-	350	2.0	2.5	.5	1-2
...iry heifer, 2nd. yr.	2	3	-	50	1.0	1.5	.5	½-1
...iry heifer, 1st. yr.	5	10	-	100	1.0	.5	-	-
...ull	5	10	-	250	1.0	2.0	.5	-
...eef cow	1	1	-	30	.5	1.5	1.0	1-2
...eef heifer, 2nd. yr.	5	8	-	-	.5	1.5	.5	½-1
...eef heifer, 1st. yr.	4	4	-	-	.5	.5	-	-
...r. cattle (100 lbs. to gain)								
...alf	8.5	-	-	75	.1	.2	-	-
Yearling	10	-	-	88	.1	.3	-	-
Two-year-old	12	-	-	100	.2	.5	-	-
...gs:								
...w and 1-litter to weaning	20	3	3	35	-	-	-	.2
...w and 2-litters to weaning	25	5	5	125	-	-	-	.2
...ar	20	5	-	35	-	-	-	.2
...ring pig (30-200 lbs.)	12	-	-	50	-	-	-	.1
...ll pig (30-200 lbs.)	14	-	-	75	-	-	-	-
...r. pig (100 to 200 lbs.)								
Feeding on pasture	7	-	-	30	-	-	-	.1
Winter feeding	8	-	-	45	-	-	-	-
...ep:								
...e or Ram	1	1	-	-	.2	-	.1	.2
...lding lamb to 90 lbs.	.5	1	-	20	.02	-	-	.1
...eder lamb (fdg. period)	2	1	-	15	.06	-	-	-
...ltry:								
...00 hens	60	26	30	2,000	-	-	-	.5
...00 pullets to 6 months	20	10	10	800	-	-	-	.5
...00 broilers to 3 months	8	5	3	200	-	-	-	-

...ixed hay may be substituted for silage at the rate of 1 ton for each 3 tons of silage ...r dairy cattle.

**One gallon of skimmed milk may be substituted for 1 pound of protein supplement for hogs.

...y of poor quality requires an increase in protein supplement.

...e following number of bushels of different feed crops are equal in feeding value:

10 bushels corn	13 bushels barley	21 bushels oats
9 bushels wheat	11 bushels rye	21 bushels spelt

Michigan State College
Farm Crops
PASTURE COSTS

Cow-days of pasture per acre

	May	June	July	Aug.	Sept.	Oct.	Total
June grass (good-permanent)	15	30			2	3	50
Alfalfa-brome (average-3 yrs.)	15	30	30	30		15	120
2nd-yr. Sweet clover (average)	15	30	30	15			90
2nd-yr. Red Clover-Timothy (average)	15	30	20	15	15		95
Junegrass-white clover (permanent)	15	30	15	15	10	5	90
Reed Canary grass (average-10 yrs.)	20	40	40	40	40	20	200
Sudan Grass (average)			30	45	30	10	115
Oats (average)		40	20				

Costs per acre per year

	Int.& Taxes	Fert.& Lime	Seed-bed Prepar.	Seed	Maint-enance	Total	Cost/ cow-day
Junegrass (good-permanent)	1.25	1.00	---	-	1.00	3.25	6.5¢
Alfalfa-brome (average-3 yrs.)	2.50	4.25	1.50	1.65	0.50	10.40	8.7¢
2nd yr. Sweet clover (average)	2.50	4.25	1.50	2.75	0.50	11.50	12.8¢
2nd yr. Red clover-timothy (average)	2.50	4.25	1.50	5.00	0.50	13.75	14.5¢
Junegrass-white clover (permanent)	1.25	2.50	--	--	1.50	5.25	5.8¢
Reed C nary grass (average-10 yrs.)	1.25	4.00	1.15	0.25	1.00	7.65	3.8¢
Sudan grass (average)	2.50	7.00	5.50	3.75	0.50	19.25	16.7¢
Oats (average)	2.50	2.00	3.50	1.50	0.50	10.00	16.6¢

Prepared by:
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R. W. Bell

September, 1947

Class of livestock	Number of animals	Grain			Corn equivalent bu.	Silage tons	Hay tons	Other rhge. tons	Pro. Supp. lbs.	Till. Past. acres
		Corn bu.	Oats bu.	Wheat bu.						
Cattle:										
Dairy cow (200 lbs.B.F.)										
Dairy cow (250 lbs.B.F.)										
Dairy cow (300 lbs.B.F.)										
Dairy cow (350 lbs.B.F.)										
Dairy heifer, 2nd yr. .										
Dairy heifer, 1st yr. .										
Bull										
Beef cow										
Beef heifer, 2nd yr. .										
Beef heifer, 1st yr. .										
Fdr.cattle(100 lbs.gain)										
Calf										
Yearling										
Two-year old										
Hogs:										
Sow and 1-litter to weaning										
Sow and 2-litters to weaning										
Boar										
Spring pig(30-200 lbs.)										
Fall pig (30-200 lbs.)										
Fdr. pig (100-200 lbs.)										
Feeding on pasture .										
Winter feeding . . .										
Sheep:										
Ewe or ram										
Suckling lamb to 90 lbs.										
Feeder lamb(fdg.period)										
Poultry:										
100 hens										
100 pullets to 6 months										
100 broilers to 3 mos.										
Horses:										
Work horse (2 yrs. & over)										
TOTAL REQUIREMENTS										

Summary of Feed Requirements and Production

	Acres
Feed requirements	
Other requirements	
Total requirements	
Total produced	
To be purchased	
For sale (or carry over). . . .	
Tillable pasture	
Alfalfa-brome	
Clover	
June grass	

Name _____ Farm Number _____

County _____ Area _____

GRAIN AND SE

Item	Corn		Oats		Wheat		Oth
	Amount	Value	Amount	Value	Amount	Value	Amount
Beginning inventory							
Produced during year							
Feed purchased							
Total to account for							
Sold during year							
Used for seed on this farm . .							
Shrinkage							
Ending inventory							
Total accounted for							
Total consumed							
Tons/Bu./Hay consuming animal unit							
Lbs./Hay consuming animal unit							
Tons/Bu./Productive animal unit . .							
Lbs./Productive animal unit . .							

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