UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 694

Office of the Secretary

Contribution from Office of Farm Management

W. J. SPILLMAN, Chief

Washington, D. C. ▼ July 24, 1918

A STUDY OF FARM MANAGEMENT PROBLEMS IN LENAWEE COUNTY, MICHIGAN

By

H. M. DIXON, Assistant Agriculturist and

J. A. DRAKE, Agriculturist

CONTENTS

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By H. M. Dixon, *Assistant Agriculturist*, and J. A. Drake, *Agriculturist*.

CONTENTS.

OBJECT OF STUDY.

The basic data here presented were obtained in a survey of 300 owner farms and 153 tenant farms, located in Lenawee County, Mich. Later this work was supplemented by a special study of the more valuable farm practices of the region, special crops grown, and individual farms of more than ordinary merit.

The objects in view in conducting these investigations are in part as follows:[1]

(1) To obtain, through a close study, knowledge of some of the details of successful farming in an area typical of the northern edge of the corn belt.

(2) To determine the more important factors in the profitable management of the farms of this region.

[1] Acknowledgment is due Mr. E. H. Thomson, assistant chief, Office of Farm Management, for selecting the area and planning the work; to Messrs. J. I. Falconer, L. G. Conner, H. M. Doyle, J. H. Hamilton, E. L. Moffit, and D. L. Cottrill, who assisted in collecting field data; and to H. W. Hawthorne, H. F. Williams, and J. C. McDowell for assistance in the preliminary work. Thanks are also extended to the many farmers of the region who have given the information which has made this publication possible.

The preliminary and basic data for this bulletin were gathered in 1912 and cover the farm year of 1911. It was planned to follow with a similar study five years later. In view of the abnormal conditions brought about by the war it has seemed more feasible to publish the findings as based on normal conditions. The basic data presented are supplemented with additional information gathered recently.

(3) To gather information regarding some of the more valuable farm practices in vogue on the better farms of the region and to suggest ways of improving the organization and management of the less successful farms in the light of the facts thus brought out.

SUMMARY.

The agriculture of Lenawee County has passed through several important changes but at present has become well established along the lines of general or diversified farming and dairying.

General farming with a limited amount of dairying is on the average the type most easily made profitable of those so far developed in the area studied.

Specialized dairy farms apparently pay better normally than dairy and grain farms, but on the average do not pay so well as the combination of dairying and hog raising.

Dairying, with hogs and grain, usually yields a better labor income than any other combination found. The outstanding advantages of this type as compared with others are a greater diversity of income, a large percentage of receipts from the sale of live stock and live-stock products, and a comparatively small percentage of the income from the sale of crops.

The types of farming established and the general conditions which prevail make the size of the farm a very important factor bearing on the returns secured from farming in this region. There is also a direct relation between the amount of capital invested and the labor income of the operator.

The 66 owner farms studied, with 60 acres and under and averaging 45 acres in area, made an average labor income of $277; the group of 124 owner farms from 61 to 100 acres and averaging 84 acres in area, made an average labor income of $445; and the group of farms of over 160 acres, averaging 223 acres in area, made an average labor income of $1,047. This shows the influence in the size of business as measured in terms of the size of the farms.

Sixty-seven farms, with an average investment of $4,850, made an average labor income of $276; 54 farms, with an average investment of $12,813, made an average labor income of $488; and 31 farms, with an average investment of $27,124, made an average labor income of $1,139. This shows the influence of the size of business as measured by capital invested.

Crop yields and the quality of live stock kept are two very important factors in efficient farm management which show a marked effect in the profitable management of the farms of Lenawee County. The quality of dairy cows or the income per cow is especially important on farms which are devoted largely to dairying.

A study of the relative percentage of acreage devoted to the principal farm crops indicates that under normal conditions there should be an increase in the acreage of corn on the average farm of the region. The average acreage of oats, wheat, barley, and hay are well within the limits shown to be most profitable.

Lenawee County is primarily a live-stock section and on most farms a greater percentage of the income is derived from the sale of live stock and live-stock products than from the sale of crop products. However, with but few exceptions, the better organized and more profitable farms of the section continue to receive from 10 to 30 per cent of their total income from the sale of surplus crops.

Corn, oats, wheat, and hay are the principal farm crops of the region. Of the special crops, alfalfa is by far the most important.

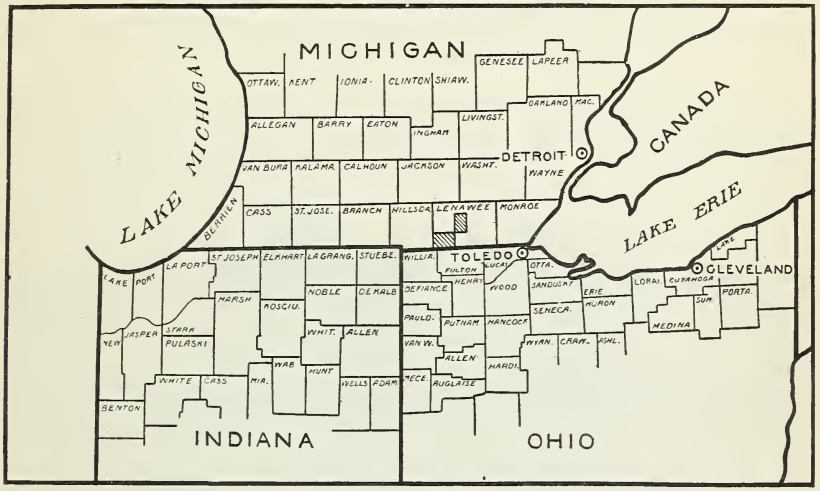

FIG. 1.—Location of the area studied (shaded portion of map).

This crop is rapidly gaining favor, and is found in small acreages on most farms of the section surveyed. Soy beans do well on all the soils of the county. This crop could be made valuable in the winter feeding of hogs and for starting feeder lambs in the fall. Cowpeas are especially suited to the sandy soils of the county.

In Lenawee County men with a capital ranging from $1,000 to $7,000 make better labor incomes by renting farms than by owning them. No tenants were found with a capital over $7,000, but up to this point the data show considerable advantage for the tenants as compared with men with an equal capital who own their farms. This is largely due to the fact that the rented farms are larger than the corresponding owner farms. The tenant with all his money used as working capital can conduct a larger business than he would be able to do if the same capital were divided between real estate and working capital.

DESCRIPTION OF AREA SURVEYED.

The area selected for this study is typical of a comparatively wide section of south central Michigan, a part of northwestern Ohio, and northeastern Indiana. It presents conditions which exist generally in that region situated on the northern edge of what is commonly known as the corn belt proper. The region in general is well developed in growing general farm crops, dairying, and the production of live stock. (Fig. 1.)

AGRICULTURAL DEVELOPMENT.

Lenawee County was one of the first counties in Michigan in which agricultural development started. The tide of immigration into this part of the State began on a large scale in 1836. From 1836 to 1860 the agricultural development of Lenawee County was rapid, and since that time it has been very satisfactory. Statistics show that there were 3,251 farms in Lenawee County in 1880, and that in 1910

FIG. 2.—Typical farm scene, Lenawee County, Mich.

this number has increased to 5,334. The county in general now has every evidence of a prosperous agricultural section. (See fig. 2.)

During the early period of development oxen were quite generally used for practically all kinds of farm work. In 1860 there were 2,247 work oxen in the county, but by 1900 oxen had been entirely displaced by horses. During this time large numbers of sheep were pastured on the cheap, partially developed land, which greatly increased the farm income and materially assisted in the process of land clearing. The sheep industry in Lenawee County appears to have reached the high-water mark in 1880, at which time there were 116,508 head of sheep on the farms of the county. The following figures taken from the United States census show the rise and decline of this industry in the county from 1860 to 1910:

Sheep.

	Number.
1860	89,929
1870	112,653
1880	116,508
1890	110,446
1900	103,369
1910	90,654

While land in general was low in price in Lenawee County, small grain, especially winter wheat, was grown on a large scale. Although wheat is still grown on a comparatively large acreage, the increased price of land has made more diversified farming a necessity. The period of the greatest wheat production in the county was between 1870 and 1890, reaching the highest mark in 1880, as is shown in the following figures taken from the United States census:

Wheat.

Year.	Bushels.	Year.	Bushels.
1860	423,843	1890	719,668
1870	685,000	1900	321,670
1880	1,251,479	1910	526,628

Two once thriving industries, tobacco growing and hop production, practically have been abandoned. In 1860 Lenawee County produced 25,602 pounds of tobacco, and in 1880 this had fallen to 6,863 pounds. Now there is no commercial production of tobacco in the county. In 1870 the hop production of Lenawee County was 16,872 pounds, and in 1890 it was 3,500 pounds. This industry has since been apparently abandoned altogether.

The principal developments have been along the lines of general and diversified agriculture. The large holdings which predominated when the county was new have been broken up into farms of medium size. There has been a gradual and almost constant increase in corn, hay, hogs, and milch cows from 1860 up to the present time. This is shown by the following figures:

Production in Lenawee County, Mich.

Year.	Corn.	Hay.	Hogs.	Milch cows.
	Bushels.	*Tons.*	*Number.*	*Number.*
1860	1,213,311	47,396	24,762	11,235
1870	964,306	68,332	25,332	15,772
1880	1,759,467	67,944	62,045	18,943
1890	1,480,124	89,442	67,421	18,943
1900	2,053,197	86,387	63,549	19,519
1910	3,053,197	117,132	77,368	25,924

These figures show at a glance the trend of agriculture in the county. It is plainly evident that developments have been in the direction of stable and conservative farming.

Road building in general has not reached as high a plane in Lenawee County as has agriculture. The average road of the county is only fair. There is now a general awakening to this fact and a few miles of first-class road have been built. In almost all parts of the county there is an abundance of gravel suitable for road building, which should assist greatly in the construction of good roads.

Rapid progress is being made in agricultural development. The county recently employed a county agricultural agent to assist in the solution of farm problems. Farmers' organizations are well represented. Granges, gleaners, agricultural clubs, and farmers' institutes are putting forth considerable effort for the general betterment of agricultural conditions in Lenawee County.

FIG. 3.—"The soil in general is well adapted to the growing of small grains and corn."

SOILS AND TOPOGRAPHY.

Most of the soils in the area surveyed are of glacial origin and very similar in nature to those which predominate throughout south-central Michigan. Similar soil also extends over into northwestern Ohio. The surface soil generally varies from a heavy silt loam to a clay loam. The subsoil is usually a clay or clay loam, but in local areas more or less gravel and occasionally some sand occurs. Viewed from the standpoint of farm land, a general uniformity of quality prevails. As a rule, the area is gently rolling, with good natural drainage and very productive. The soil in general is well adapted to the growing of small grains and corn and gives rise to conditions which are conducive to general farming. (See fig. 3.)

In the southeastern part of the county, however, the soil conditions are very different from those just discussed, and the results of this

survey apply to this part of the county only in a general way. This section is a part of an old lake bed and naturally is very productive. The topography is very level and drainage has been difficult. Extensive systems of tile drains have been necessary in bringing most of the land under cultivation. Lying between this lake-bed section and the area surveyed more or less sandy land occurs, which corresponds generally to former shore lines. These sandy soils produce good crops during years of average rainfall.

AGRICULTURE OF THE AREA.

The agriculture of the area is general in nature. There is little tendency toward specializing on any one enterprise to the exclusion of others. General farming with reasonable amounts of live stock is the type which usually prevails. The organization of the average farm of the area includes most of the standard farm crops of the eastern half of the corn belt in fairly equal proportions, together with dairying and hog raising. In addition to the sale of live stock and stock products, considerable income is secured in this area from the sale of cash crops. Thus in this section there has been developed a well balanced and diversified agriculture.

DISTRIBUTION OF FARM CAPITAL.

In Table I is shown the distribution of capital on the owner and tenant farms covered in this study. The average investment on the owner farms in this area was nearly $12,000. Of this amount three-fifths was in land and one-fifth (22.6 per cent) in buildings. The dwellings averaged $1,311 and all other buildings $1,342 per farm. The rest of the farm investment was divided between live stock, machinery, feeds, and other supplies, of which about $1,261 was in live stock, $398 in machinery, and $393 in feeds, miscellaneous supplies, and operating cash.

TABLE I.—*Average capital and its distribution on 300 owner farms and 153 tenant farms, Lenawee County, Mich.*

	Capital per farm.						
	Owner farms.	Share-rent farms.			Cash-rent farms.		
		Total.[a]	Tenant's share.	Landlord's share.	Total.[a]	Tenant's share.	Landlord's share.
Average capital	$11,756	$14,521	$1,506	$13,015	$10,827	$1,765	$9,062
Per cent of capital invested in—							
Land	60.0	63.7	.....	17.1	61.7	.....	73.7
Dwellings	11.2	9.9	.....	11.1	13.0	.....	15.5
Other buildings	11.4	10.8	.....	12.0	8.9	.....	10.8
Live stock	10.7	9.7	59.3	4.0	10.5	64.6	.....
Machinery	3.4	2.8	25.8	.1	3.3	19.3	.....
Feed, other supplies, and cash	3.3	3.1	14.9	1.7	2.6	16.1	.....

[a] Capital of tenant farms includes both that of the tenant and the landlord.

The investment on share-rented tenant farms averaged nearly $3,000 more than on owned farms. The value of real estate per acre was practically the same on both owner and tenant farms. These share-rented farms have an average of 31 more acres per farm than the owner farms. There is no great variation in the distribution of capital on these farms from that on the owned farms. The landlord shares a part of the live-stock investment on all share-rented farms. The cows and hogs are usually shared equally, but the relative shares of each other class of live stock vary somewhat on each farm.

The cash-rented farms averaged 2 acres less in size than the owned farms, and the value of real estate per acre $5 less.

UTILIZATION OF LAND.

The area under discussion is well developed, the farms are well improved, and most of the land is utilized to good advantage. As will be seen by Table II, an average of 90.2 per cent of the total area of all the farms studied is improved land, only 2.9 per cent being woodland, and 6.9 per cent classed as other lands, which includes roads, fence rows, and waste lands in general. An average of 74.2 per cent of the total farm area of these farms is tillable, and 56.3 per cent is in crops. The table shows, further, that an average of 33.8 per cent of the total area of all the farms studied is in pasture. This acreage is made up of 10.6 per cent rotation pasture and 23.2 per cent permanent pasture, 7.2 per cent of the latter being tillable. As a rule the farms of different sizes show no material difference in these items, hence only the averages are given and these are for the entire number of farms.

TABLE II.—*Utilization of farm area on 300 owner farms and 153 tenant farms, Lenawee County, Mich.*

Average size.....acres..	112
Percentage of total farm area in:	
Tillable area	74.2
Crop area	56.3
Idle crop land	.1
Total pasture	33.8
Rotation pasture	10.6
Permanent pasture	23.2
Permanent pasture, tillable	7.2
Total improved land	90.2
Woodland	2.9
Other land	6.9

TABLE III.—*Distribution of crop area on 300 owner and 153 tenant farms, Lenawee County, Mich., as compared with 1910 census figures for entire county.*

Crops.	Percentage of total crop area.		Crops.	Percentage of total crop area.	
	453 farms surveyed.	1910 United States census data for all farms in county.		453 farms surveyed.	1910 United States census data for all farms in county.
Corn for grain	26.2	.....	Oats	17.5	20.0
Corn for silage	2.2	.....	Barley	2.0	2.7
Other corn	1.1	.....	Other grain [a]	.5	.8
Total corn	29.5	28.6	Hay	28.8	30.8
			Alfalfa	1.6	.4
Potatoes	.6	1.5	Other hay [b]	1.0	2.0
Winter wheat	14.2	8.7	Truck	.1	.9
Spring wheat	.7	.....	Fruit	3.5	2.7

Average crop area, 56 acres.

[a] Includes speltz, oats and barley, rye, buckwheat, oats and peas, peas and beans, clover and timothy seed.
[b] Millet, oats and peas, oat hay, barley, sorghum and rape.

TABLE IV.—*Yields of crops on 300 owner and 153 tenant farms, Lenawee County, Mich.*

	Corn for grain.	Corn for silage.	Potatoes.	Wheat.	Oats.	Barley.	Hay.
	Bushels.	*Tons.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Tons.*
Owner farms	54	10	85	23	40	24	1.1
Share-tenant farms	54	10	86	21	41	25	1.1
Cash-rent farms	51	.....	82	22	38	22	1.0

Table IV shows the average yield of the principal crops grown in this area on farms operated by both owners and tenants.

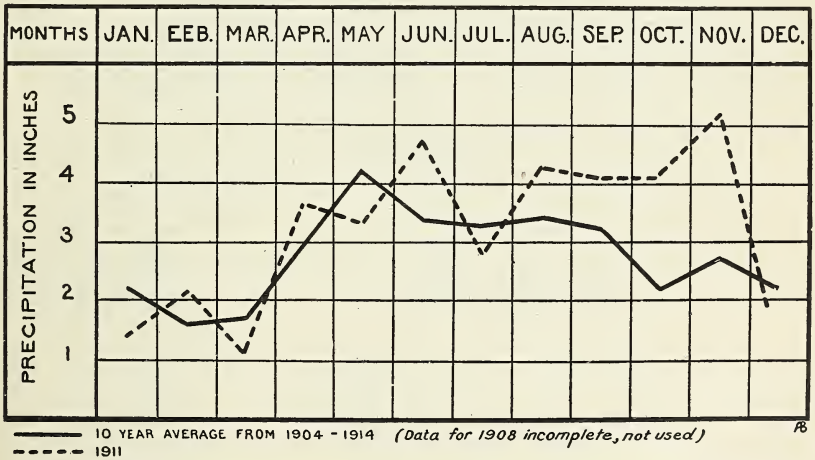

FIG. 4.—Rainfall in Lenawee County for year 1911, as compared with 10-year average (1904–1914).

A comparison of the yields received upon the owned and share-rented farms shows only a slight advantage to the share-rented farms. The cash-rented farms are producing the lowest yields.

The rainfall for the year 1911, as compared with the 10-year average (1904–1914), is shown in figure 4.

CROPS.

Hay and corn lead all other crops in area, the former on the average covering a slightly greater acreage than the latter. On the entire number of farms studied hay crops occupy an average of 31.5 per cent and corn 29.5 per cent of the total crop area. The oats crop is third in importance, occupying 17.5 per cent of the total crop area, with

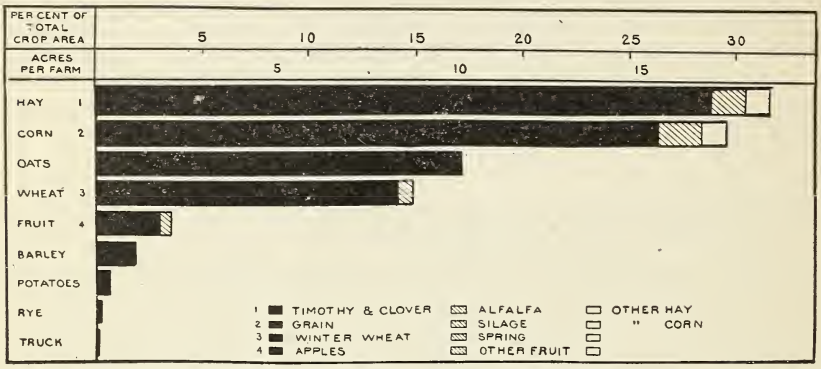

FIG. 5.—Acreage of the more important crops, 300 owned and 153 tenant farms, Lenawee County, Mich.

wheat fourth, occupying 14.9 per cent. A number of other crops are grown, but none is of great importance. Table III shows the distribution of the various farm crops on 300 owner farms and 153 tenant farms in Lenawee County. It likewise shows the same data as gathered on all farms of the county in the census of 1910. It will be observed that in a general way the data correspond very closely. Figure 5 shows graphically the percentage of the total crop area which each crop occupies and the average per farm on these same farms.

TABLE V.—*Distribution of live stock on 300 owner and 153 tenant farms, Lenawee County, Mich.*

Class of live stock.	Average number per farm.	Average animal units per farm.	Per cent of total animal units.	Class of live stock.	Average number per farm.	Average animal units per farm.	Per cent of total animal units.
Cows	8.4	8.4	38.7	Horses[a]	3.4	3.4	15.7
Young stock	2.6	1.3	6.0	Sheep	12.5	1.8	8.3
Bulls	.4	.4	1.8	Feeding sheep	4.7	.7	3.2
Beef stock and feeding steers	.3	.3	1.4	Brood sows	2.3	.5	2.3
Colts	.6	.3	1.4	Other hogs	17.0	3.4	15.7
				Poultry	115.0	1.2	5.5

[a] Work horses averaged 3.3 per farm and are included in this table.

LIVE STOCK.

Dairy cows are the most important kind of live stock on the average farm of this immediate section Hogs are second in importance and horses third. Table V shows the average number of the different kinds

of live stock and their equivalent in terms of animal units[1] per farm. The relative importance of each class of live stock expressed in percentage of total animal units is also shown in the last column of this table.

On these farms there was an average of 8 cows per farm, which constituted 38.7 per cent of the total animal units kept. Brood sows averaged over 2 per farm and other hogs 17, all kinds together constituting 18 per cent of the total animal units. Horses constituted over 15 per cent. Sheep made up an average of 11.5 per cent and young stock of the dairy herd 6 per cent. It is worthy of note that poultry averaged 115 head per farm, or 5.5 per cent of the total animal units.

SOURCES OF INCOME.

Further light on the general character of the agriculture of the region is gained by a study of the sources of income. Taking an average of 300 owner and 153 tenant farms which were studied dairy products constitute the largest source of income. Hogs ranked second, and wheat third, with the income from poultry ranking a close fourth. Table VI gives in detail the proportion derived from the different sources on all farms studied. Figure 6 shows graphically the relative importance of these different sources of income. Less than one-fifth of the farm receipts are from the sale of crops. Sales of crops were practically the same on owner and tenant farms.

TABLE VI.—*Average per cent of total farm receipts from different sources, 300 owner and 153 tenant farms, Lenawee County, Mich.*

Sources of income.	Per cent of total receipts.	Sources of income.	Per cent of total receipts.
Dairy products	31.8	Corn	1.3
Dairy cattle	5.4	Potatoes	.6
Beef cattle and feeding steers	.7	Wheat	7.9
Horses	.3	Oats	3.8
Colts	2.0	Barley	.7
Sheep	3.6	Other grain	.1
Feeding sheep	1.9	Hay	3.6
Hogs	15.4	Seeds	.2
Poultry	6.9	Truck	.4
		Fruit	.9
Total live stock	68.0	Miscellaneous[a]	3.5
		Feed and supplies[b]	9.0

[a] Labor, lumber or wood sold, etc. [b] Increase inventory.

A study of Table VI shows that dairy products brought nearly one-third (31.8 per cent) of the total receipts of the 453 farms studied. Hogs stood second in importance, receipts from hog sales averaging 15.4 per cent of the total. Wheat brought 7.9 per cent, and it is worthy of note that the sale of poultry and poultry products accounted

[1] An animal unit is a mature horse or cow or as many smaller animals as require the feed of a horse or cow, namely, 2 head of young cattle, 5 hogs, 7 sheep, or 100 hens.

for 6.9 per cent, almost as much as the receipts derived from sale of wheat. The table shows further that on the average only small quantities of oats and hay are sold, the oat crop bringing only 3.8 per cent of the total receipts, and the sale of hay only 3.6 per cent. Since hay occupied 31.5 per cent of the total crop area on these farms (see Table III) and the oats crop 17.5 per cent, it is evident that the greater part of these crops are consumed as feed on the average farm of the area.

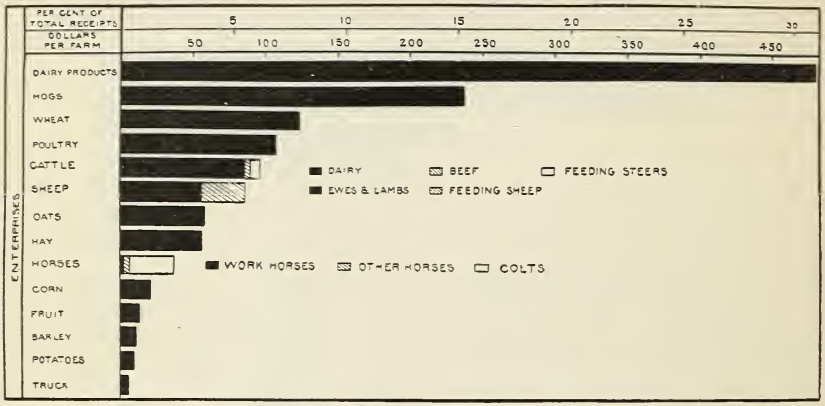

FIG. 6.—Sources and amount of receipts, 300 owned and 153 tenant farms, Lenawee County, Mich.

FACTORS OF ORGANIZATION AND MANAGEMENT.

There are a number of factors which enter materially into the successful organization and management of farms. Some of these factors are of greater importance than others, some may be disregarded without serious consequence; but as a rule the profit derived from farming depends very largely upon the extent to which certain essential features of organization and management have been adopted and adhered to.

One of the first of these factors to be considered is the type of farming, with reference to local soil, climatic, and market conditions. Of the different types which suit these conditions, selection should be made not only in view of the greatest profits but also to suit the individual likes and dislikes of the operator.

Another important factor is the size of the farm business which it is possible to develop on a given area. A large volume of business may be done on a small farm while only a small business may be conducted on a large farm if poorly managed. Without reasonable size of business there is little opportunity for a satisfactory profit in farming. How this factor affects the farming operations of Lenawee County will be discussed in detail later.

"Quality" is a general term given to a number of essential factors which affect the farm business from the standpoint of production. Quality used in this sense is exemplified in the yield of crops and the

producing capacity of live stock. In regard to crops, maximum yields are sometimes expensive and not desirable, but under the conditions that prevail in this area, unless the soil produces fair yield without the use of expensive fertilizers, there is little basis for profitable farming. On farms where live stock are kept this live stock must be of good quality and efficiently handled. On farms where dairying is an important enterprise the quality of the cows, as measured by the amount of milk produced per cow, is one of the most important factors of success. How these important items influence the returns on the farms studied in this area will be shown later.

TYPE OF FARMING.

The farms studied in Lenawee County fall under four fairly distinct classes or types, according to predominating enterprise or combination of enterprises on which the general organization is founded.

FIG. 7.—Scene on Lenawee County farm on which dairying is combined with grain farming.

On this basis were found farms devoted principally to dairying, hogs, and grain; dairying and hog raising; dairying alone; and dairying and wheat production. In each of these classes, however, dairying is of considerable importance (see fig. 7). It is interesting to note that, even with this very general classification, a study of the data gathered shows there is a distinct relation between the type of farming and labor income. For this study 213 of the owner-farms were selected which conform most naturally to this classification. The results of this arrangement of data are given in Table VII.

TABLE VII.—*Relation of type of farming to amount of capital used and labor income on farms operated by owners, Lenawee County, Mich.*

Type of farming.	Number of farms.	Average investment.	Average labor income.
Dairying, hogs, and grain	114	$12,897	$626
Dairying and hogs	54	10,974	433
Dairying	28	12,640	378
Dairying and grain	17	12,522	278

Since the capital invested averages about the same for each of these groups of farms, the influence of the size of business as measured by capital is practically eliminated. It is therefore fair to conclude that the difference in labor income is largely, if not altogether, due to the type of farming. The farms operated with dairying, grain, and hogs as the leading enterprises returned their operators the largest incomes. After taking out 5 per cent on the investment, these farms had an average labor income of $626 clear of all expenses. On the same basis the dairy and hog farms made an average labor income of $433. The 28 farms classed strictly as dairy farms made an average labor income of $378. The lowest average labor income was made by the combination dairy and grain farms, namely, $278. The figures given in this table are representative of normal conditions, but dairy and grain farming, especially with grain production predominating, would show decidedly different results during the abnormally high prices of 1916–17.

The farms classified under the heading "Dairying, hogs, and grain" are practically of the type ordinarily classed as general, or diversified. Besides having the three more important enterprises, these farms have a greater use for small enterprises than the more specialized farms, thereby enabling them to use capital and labor to better effect. This type is most prevalent in this section, and the figures given confirm the apparent belief of the farmers of the region that the general farm, with a limited amount of dairying, is under normal conditions the most profitable type of farm organization so far developed there. Diversity is an important factor which helps to make these general farms profitable and comparatively certain of income. This is brought about not only through the larger number of sources from which the income is derived, but by reason of the fact that this type is less subject to fluctuations from year to year than the specialized type.

There are comparatively few farms in this area which may be classed as dairy and grain farms. Specialized dairy farms are slightly more numerous than dairy and grain farms and under normal grain prices have a slightly higher average labor income.

An idea of the organization of the farms of these different types may be gained from a study of the source from which income is derived. Table VIII shows the average percentage of receipts derived from the different sources for each of the different types or classes.

TABLE VIII.—*Source of income and percentage of income from each source, 213 owner farms of different types, Lenawee County, Mich.*

	Sources of income on farms following each given type of farming.			
	Dairying, hogs, and grain.	Dairying and hogs.	Dairy.	Dairying and grain.
Number of farms	114	54	28	17
Per cent of income from—				
Dairy products	25.4	37.3	49.8	39.7
Dairy cattle	4.6	6.7	8.2	4.3
Beef cattle and feeding steers	.5	.....	.....	.....
Horses	.2	.7	.6	1.0
Colts	1.8	2.1	2.2	1.2
Ewes and lambs	4.7	2.2	1.2	1.1
Feeding sheep	3.5	.1	.....	.....
Hogs	14.0	25.3	8.2	9.4
Poultry	7.1	7.2	6.6	5.4
Total live stock	61.8	81.6	76.8	62.1
Corn	2.2	.8	.1	2.0
Potatoes	1.5	.3	.....	.2
Wheat	10.5	4.0	4.6	18.8
Oats	5.0	1.7	1.5	8.7
Barley	.6	.1	.5	3.7
Other grain	.4	.3	.2	.....
Hay	.46	1.0	2.6	.8
Truck	.7	.1	.2	.....
Fruit	.8	.6	.1	.1
Feed and supplies	8.3	7.3	10.0	3.2
Total crops and feed	34.6	16.2	19.8	37.5
Miscellaneous [a]	3.6	2.2	3.4	.4

[a] Includes man and team labor, machine work, sale of lumber, sale of sirup and sugar, rent of buildings, and cider making.

It will be seen that the farms classed as "dairy, hogs, and grain" derive only about one-fourth (25.4 per cent) of their incomes from the sale of dairy products; 14 per cent from the sale of hogs; and 10.5 per cent from the sale of wheat. The minor sources of income are as follows: Poultry, 7.1 per cent; oats, 5 per cent; dairy cattle, 4.5 per cent; hay, 4.6 per cent; ewes and lambs, 4.7 per cent; and feeding sheep, 3.5 per cent. It will be noted that these farms show distinctly a wider diversity in their sources of income than any of the other classes.

The dairy and hog farms receive 37.3 per cent of the total receipts from the sale of dairy products and 25.3 per cent from hogs, and the dairy and grain farms an average of 39.7 per cent of the total receipts from the sale of dairy products, and 18.8 per cent from the sale of wheat.

Looking in a general way at the organization of the farms of the area studied and the types of farming established, some important features are brought out in regard to the relative amounts of crops

and live stock sold. In some sections and under some conditions it is best to sell practically all crops, while in others it is better and more profitable to derive the greater part or almost all the income from live stock. The size of farm undoubtedly has some bearing upon this phase of the farm business. (See Table IX.)

TABLE IX.—*Relation of per cent of total receipts from live stock to profits on 300 owner farms, Lenawee County, Mich.*

Per cent receipts from live stock.	Number of farms.	Acres per farm.	Crop index.	Receipts per productive animal unit.[a]	Average labor income.
Under 50	47	94	104	$51	$504
50 to 59	41	105	107	56	535
60 to 69	57	120	100	63	666
70 to 79	75	110	102	63	432
80 to 89	49	95	98	68	430
90 and over	31	86	92	62	237
All owner farms	300	104	100	61	481

[a] Includes all live stock on the farm excepting work stock.

Of the 300 owner farms studied the greater number received relatively a large proportion of their receipts from live stock, so that the variation in this respect is very wide. The farms which received 50 per cent and less of their income from live stock show slightly lower average labor incomes than those that received from 50 to 70 per cent of their income from this source. In this, however, it must be borne in mind that the farms receiving 50 per cent and less are comparatively smaller. In this connection it is difficult to draw any hard and fast conclusions, but it seems quite worthy of note that the most prosperous of the owner farms of the area studied are getting from 50 to 70 per cent of their income from the sale of live stock and stock products. In special cases and with farms of peculiarly radical departures in organization it is quite probable that the percentage of receipts from live stock may well be higher than normally found.

A similar condition arises in the study of the relative per cent of total receipts received from the sale of crops, as shown in Table X.

TABLE X.—*Relation of per cent of total receipts from crops to profits on 300 owner farms, Lenawee County, Mich.*

Per cent receipts from crops.	Number of farms.	Acres per farm.	Crop index.	Receipts per animal unit.	Average labor income.
None	46	91	96	60	$276
Under 10	64	93	99	66	455
10 to 19	66	110	102	65	636
20 to 29	66	117	104	61	569
30 to 39	30	108	103	54	503
40 to 49	16	111	106	54	324
50 and over	12	83	101	39	231
All owner farms	300	104	100	61	481

The farms which show the higher labor incomes are making from 10 to 40 per cent of their total income from the sale of crops, and it will be noted also that most of the farms in the list fall between these limits. Here, again, there is a direct relation between labor income and size of farm. Yields, too, as indicated by crop index, are somewhat higher on the more profitable farms. It is interesting to observe, however, that on the farms where more than 40 or from 40 to 50 per cent of the income is derived from the sale of crops, even with the average size of farms remaining about the same and the yield of crops slightly better, the average labor income falls off materially. The results given in both Tables IX and X can at best only serve as a very general guide in the organization of the farms of different types and sizes under average conditions, which exist normally in the area surveyed and in nearby sections.

SPECIAL FARMS.

In this region, as in most others, an occasional farm is found which departs widely from the type which investigations show to be that best adapted to the average conditions of the area, and yet is a pronounced success.

An example of this was found in a farm located on the heavier type of soil in Lenawee County on which alfalfa is easily grown. About 40 per cent of the crop area was in corn, 10 per cent in a nurse crop for alfalfa, and 50 per cent in alfalfa. In the winter season a large number of western lambs were fed. From a financial standpoint the results on this farm are decidedly satisfactory.

The management of such a farm, however, requires considerable skill and business ability. One of the principal difficulties arises from the fact that the labor is unequally distributed throughout the year. When alfalfa occupies the place in a farm system that it does in this instance it is necessary to provide a separate equipment in teams and implements and a separate group of men to take care of the alfalfa. Hence the equipment and crews needed during the summer months on such a farm are about double those demanded by the system which the farmers here have worked out by experience. Only about one half of the labor required can be given employment throughout the year. The other half is needed only in the summer and from the nature of the case must be temporary labor, which is usually unsatisfactory. If some means could be devised to give profitable winter employment to the surplus labor needed during the summer season, this system would work without any special difficulties other than those attending the fluctuation in the price of productive live stock to which the crop products are fed. To be successful with such a system, however, the farmer must be an expert

buyer and seller and must have a thorough knowledge of the feeding qualities of livestock.

Another rather extreme instance was found in a large farm with land which for the most part is sandy. The farmers of the county have generally failed with alfalfa on sandy soils, but practically the whole of this farm is in alfalfa, there being no other crop. The owner feeds practically all the alfalfa to western lambs, buying the necessary grain to feed with it. This farm is usually very profitable, but it must be borne in mind that the owner is distinctly an expert in buying and selling lambs. Furthermore, his system enables him to utilize to excellent advantage second-grade alfalfa hay which would otherwise be unsalable. It may be noted also that on this farm there was a considerable area of alfalfa several years old with a compact bluegrass sod covering the field and yet making very satisfactory yield of hay. There is little question, however, that if the average farmer on sandy lands in Lenawee County were to attempt this same kind of farming he would fail; first, because of the admitted difficulty of growing alfalfa on sandy land; second, because of the lack of the expert knowledge required to make a success in the feeding of sheep.

These two farms merely illustrate the fact that the man who is distinctly above the average in ability and training in some special line is not limited by conditions which the average farmer may find insurmountable.

POULTRY.

There were no specialized poultry farms encountered in the area surveyed. However, the income from poultry on the farms studied was 6.9 per cent of the total income (Table VI) and only 1 per cent less than the income from the wheat sold. The data show that the farms receiving a small per cent of their total incomes from poultry made higher labor incomes than those which kept no poultry, and higher also than the farms which kept more. This merely means that on the average farm of the section it pays to keep from 100 to 200 hens, or about as many poultry in the aggregate as can be kept mainly on the farm wastes. When the number gets beyond this, poultry raising will not as a rule be profitable unless the farmer has the skill of a professional poultryman.

SIZE OF FARM BUSINESS.

The size of business conducted is as a rule a very important factor in determining the income of the average farm. Unless there is a reasonably large volume of business, there is not sufficient foundation for a satisfactory income. A large business when properly conducted gives opportunity for getting large returns, and in a similar manner, if inefficiently conducted, a large business affords an opportunity

for suffering correspondingly large losses. This holds true in farming quite as well as in other lines of enterprise.

There are a number of ways of measuring the size of a farm business. When the type of farming is quite uniform, and the region well developed, and when there is little variation in the quality of the soil, the size of business may be accurately measured by the total area of the farm. Other methods of measuring the size of farm business are by capital invested and labor requirements.

SIZE OF FARM.

In most sections similar to Lenawee County, where the general type of farming prevails, there is a strikingly direct relation between the size of the farm and the net returns. Larger acreages up to certain limits permit a better utilization of labor and machinery. With the types of farming thus far developed in this area, a large acreage devoted to a general type of farming, with adequate machinery, and with a reasonable profit per acre, usually brings in a greater income for the owner or operator than a small farm handled more intensively and with relatively greater expense for hired labor.

TABLE XI.—*Relation of size of farm to income on 300 owner and 153 tenant farms, Lenawee County, Mich.*

Size of farm.	Working owners.				Tenants renting for cash.				Tenants renting on share.			
	Number of farms.	Average size of farm.	Average farm income.	Average labor income.	Number of farms.	Average size of farm.	Average farm income.	Average labor income.	Number of farms.	Average size farm.	Average farm income.	Average labor income.
		Acres.				*Acres.*				*Acres.*		
60 acres and less	66	45	$540	$277	7	38	$500	$456	4	37	$278	$249
61 to 100 acres..	124	84	922	445	14	86	730	648	35	84	526	474
101 to 160 acres.	72	129	1,172	434	8	131	728	614	57	133	630	553
Over 160 acres..	38	223	2,272	1,047	4	216	1,214	1,078	24	230	889	777
All farms.	300	104	1,069	481	33	102	739	651	120	125	640	564

Table XI shows the influence of the size of farm on labor income for both owner farms and tenant farms studied. The average farm income of the 300 working owners advances rapidly and uniformly as the farms increase in size, likewise the average labor income increases rapidly until the farms reach 100 acres in size, remains about constant for the next higher size-group and again increases rapidly in the group of farms above 160 acres in size. The 66 farms of 60 acres and less, and an average of 45 acres each, made clear of expenses an average farm income of $540, and after deducting 5 per cent interest on the investment made an average labor income of $277. The 124 farms in the size-group of 61 to 100 acres, and an average of 84 acres in size made an average farm income of $922 and an average

labor income of $445. The 72 farms, 101 to 160 acres, averaging 129 acres, made an average farm income of $1,172 and an average labor income of $434; and the 38 farms over 160 acres, averaging 223 acres in size, made an average farm income of $2,272 and an average labor income of $1,047. The table also shows that the average farm and labor incomes of the cash and share tenants increase with the size of farms in about the same proportions.

The figures in Table XI show beyond question that under the conditions which exist in the area covered in Lenawee County and with the types of farming established, there is a decided increase in net returns and a general advantage in operation as the size of farm increases, at least up to the limit reached in this table. This fact presents for the consideration of each farmer in the region the problem of whether his farm business, as measured by the size of his farm, is of sufficient magnitude to permit him to earn a reasonable and adequate income. If not, it is well for him to consider ways and means of increasing the size of the farm or of getting the equivalent of an enlarged farm area. Naturally one of the first ways to suggest itself is to buy more land, if possible. If this is out of the question, similar results may be secured by renting additional land. If it is impossible to purchase or rent more land, then the nearest equivalent to an enlarged area is to increase materially the yields on the land already owned and operated, and in addition, improve the quality, and possibly increase the quantity, of the live stock kept. In enlarging a farm business in this manner care must always be exercised to see that the expense of increasing the yields and improving the live stock is not too great.

The large farms in this section on the average are yielding the greatest labor incomes for their owners and operators, but large farms in general require good management also. Ordinarily the man with small capital should first buy a farm of moderate size, but occasionally men who are good managers find it easier to pay for a big farm than a smaller one.

CAPITAL INVESTED.

As a rule there is a tendency to buy land before sufficient capital has been accumulated. To be limited in capital not only limits the acreage of the farm, but often hinders greatly the proper operation of the farm in general. Too often the purchaser fails to take this into account. While it is not advisable to carry too heavy an obligation, generally it is better to secure sufficient capital on a reasonable farm-loan basis than to operate too small a farm or be hampered by lack of operating capital. On the average, in Lenawee County, there is a direct relation between the capital invested and the labor income received.

TABLE XII.—*Relation of capital to labor income on 300 owner farms, Lenawee County, Mich.*

Capital.	Number of farms.	Average size of farms.	Average capital.	Average labor income.
		Acres.		
$7,000 and less	67	50	$4,850	$276
$7,001 to $11,000	109	83	9,033	386
$11,001 to $15,000	54	109	12,813	488
$15,001 to $20,000	39	154	17,550	569
Over $20,000	31	220	27,124	1,139
All farms	300	104	11,756	481

By a study of Table XII it will be seen that with but few exceptions, labor income keeps pace with the increase in capital in the different groups. Throughout the table there is an almost constant increase in the average labor income as the average investment increases. Beginning with the first group of 67 farms with $7,000 and less in capital, and an average investment of $4,850, the average labor income is $276 per farm; whereas, in the last group of 31 farms, with an average investment of $27,124, the average labor income is $1,139 per farm. This table emphasizes the importance of size of the farm business as measured by the capital invested.

EXPENSES.

It is to be expected that as the size of the farm increases the expenses must accordingly become greater. While this is true, the operating expenses and the expense of upkeep and repairs are normally less per acre on a large farm than on a small one. Here, again, the size of business becomes a factor in efficient and profitable management.

TABLE XIII.—*Relation of size of farm to annual cost of buildings, fences, and machinery per farm and per acre on 300 owner-farms, Lenawee County, Mich.*

	All farms.	Farms with each specified acreage.			
		60 acres and less.	61 to 100 acres.	101 to 160 acres.	Over 160 acres.
Number of farms	300	66	124	72	38
Annual cost per farm:					
Buildings	$143.00	$99.00	$128.00	$164.00	$226.00
Fences	19.00	14.00	16.00	25.00	27.00
Implements and machinery	26.00	14.00	23.00	32.00	50.00
Total	188.00	127.00	167.00	221.00	303.00
Annual cost per acre	1.81	2.85	1.99	1.71	1.36

Table XIII shows the relation of size of farm to expenses, including interest, general repairs, cost of farm buildings and machinery, and cost and repairs of fences on 300 owner-farms. It will be seen that the annual cost of buildings, fences, implements, and machinery per

farm increases, and for all these items combined the annual cost per acre decreases, as the farms become larger. On the 66 farms of 60 acres and under in area, the annual cost per farm was $127 and the total annual cost per acre was $2.85; on the 124 farms of 61 to 100 acres in area, the annual cost per farm was $167 and the annual cost per acre was $1.99; on the 72 farms of 101 to 160 acres in area, the annual cost per farm was $221 and the annual cost per acre was $1.71; and on the 38 farms of 160 acres and over in area the annual cost per farm was $303 and the total annual cost per acre was $1.36.

QUALITY OF FARM BUSINESS.

Quality, as shown in the yield of crops and the income per animal unit, and especially the income per cow, exerts a great influence on the income derived from the farms of Lenawee County. From these standpoints there are marked differences in the farms surveyed. While the crop yields on the average are good, there are numerous farms on which the yields of practically all crops are much below the average, and other farms on which the crop yields are far above the average. There is a great variation also in income per animal unit and the income per cow. This makes it possible to show the contrast in labor income as affected by these factors.

CROPS AND LIVE STOCK.

In studying the data secured from a survey of this nature it is not an easy matter to separate entirely the two important factors of crop yields and income per animal unit; hence it is necessary to present the two together. Table XIV shows the combined effect of crop yields and live stock on the 300 owner-farms, but the arrangement of the figures makes it possible to study the influence of each independently of the other.

TABLE XIV.—*Relation of receipts per animal unit and yield of crops to labor income 300 owner farms, Lenawee County, Mich.*

Receipts per animal unit.[a]	Farms with crops yielding below the average for all farms studied (less than 100 crop index).				Farms with crops yielding above the average for all farms studied (more than 100 crop index.)			
	Number of farms.	Average size of farm.	Average number of animal units.	Average labor income.	Number of farms.	Average size of farm.	Average number of animal units.	Average labor income.
		Acres.				*Acres.*		
$40 and less	33	92	13	−$100	14	102	21	$192
$41 to $60	51	96	15	226	{ 47 (46)	120 (108)	21	{ 523 (509)
$61 to $80	61	105	16	482	56	107	18	718
Over $80	11	94	15	829	27	100	18	1,117
All farms	156	98	15	300	144	110	20	678

[a] Animal unit defined on page 14.

The 300 farms are divided into two groups on the basis of crop yields and into four groups on the basis of the receipts per animal unit. The first division on the crop basis includes all farms which have a crop index rating below 100, i. e., the farms that are making yields below the average of all the farms studied for that year; the second division includes all farms with a crop index rating above 100. The farms making $40 and less per animal unit and with crop yields below the average, lacked $100 per farm (minus $100 labor income) of paying all expenses and 5 per cent interest upon investment, while those of the same quality of live stock but with crop yields above the average made an average labor income of $192. Thus the difference in crop yields in the groups making $40 and less per animal unit, made a difference of $292 in the average labor income for each farm. In the next group of farms, those making from $41 to $60 per animal unit, the difference in the average labor income per farm was $297, in favor of those with good crops. The average size of the farms is greater in the latter case, (120 as compared with 96 acres.) This was due to the fact that the largest farm of the survey, one of 675 acres, fell in this class. With this farm omitted, the figures shown in the table in parentheses would have been the result; the average size would have been but 108 acres and the average labor income only slightly less, or $509. In the group of farms making from $61 to $80 per animal unit, the average acreage is practically the same and the average labor income of the farms with crop yields below the average is $482, as compared with $718 for those with crop yields above the average. With the average acreage about the same in the group receiving over $80 per animal unit, there is a difference in average labor income of $288 in favor of those farms having the better crop yields. Taking all farms, with an average difference of but 12 acres and 5 animal units per farm, there is average difference of $378 in labor income in favor of the farms with crop yields above the average.

The influence of good live stock on the average labor income of the 300 owner-farms studied may be seen first in the farms having poor crop yields, (less than 100 crop index) or which were below average of the area in crop yield, and those that were above the average in crop yield for that year (above 100 crop index). When the receipts increase from $40 and under per animal unit to over $80 per animal unit there is a gradual increase in the average labor income from minus $100 to plus $829 in the farms below the average in yield; while in the farms with crop yields better than the average there is an increase in the average income per farm from $192 to $1,117. Further study of the data presented shows that the size of farm and several important factors other than the two on which this tabulation is based, are practically the same for the different groups; hence it seems fair to conclude that quality as expressed in crop yield and

income per animal unit are important factors which materially influence the incomes derived from the farms of this section.

INCOME PER COW.

On farms devoted largely to dairying, perhaps there is no other one factor of such great importance and none with so direct a bearing on labor income as the income per cow. In practically all of the studies of this character which have been made, this fact stands out with great prominence. In the survey of Chester County, Pennsylvania, for instance, the income per cow was shown definitely to be one of the more important factors of success on the dairy farms of that section. A table showing the figures in this connection are given in United States Department of Agriculture Bulletin No. 341, page 77. In a similar manner, also, the data gathered in the study of Lenawee County, Michigan, show that labor income on dairy farms of that section bears a direct relation to income per cow.

TABLE XV.—*Relation of receipts per cow to labor income, 212 owner-farms, Lenawee County, Mich.*

Receipts per cow.	Having 5 or more cows.				
	Number of farms.	Average of number of cows.	Average size of farms.	Average receipts per cow.	Average labor income.
$40 and less	38	8	113	$29	$245
$41 to $50	37	9	104	46	361
$51 to $60	35	10	132	56	401
$61 to $70	37	9	105	65	542
$71 to $90	41	11	133	79	915
Over $90	24	10	113	105	1,053
All farms	212	9	117	61	564

In Table XV is shown the relation of receipts per cow to labor income on the owner-farms covered in this study. The 38 farms with average receipts of $29 per cow made an average labor income of $245 per farm; the 37 farms with receipts ranging from $40 to $50 and averaging $46 per cow made an average labor income of $361; the 35 farms with average receipts of $56 per cow made an average labor income of $401; the 37 farms with average receipts of $65 per cow made an average labor income of $542; the 41 farms having average receipts of $79 per cow made an average labor income of $915; while the 24 farms with average receipts of $105 per cow made an average labor income of $1,053. Throughout this table the figures show a constant increase in the average labor income when the average receipts per cow increase. There was only a small variation in the different groups of the number of cows per farm.

This analysis suggests a very profitable line of improvement for farms of Lenawee County on which dairying is carried on to a greater or less extent. With one-fourth of the dairy farms in this area reporting returns of less than $50 per cow, the importance of keeping individual records for each cow and of eliminating the unprofitable becomes evident. It further suggest the possibilities for increasing the income by breeding up and systematically improving the entire dairy herd. The production per cow is one of the very essential factors in making dairying profitable.

CROPPING SYSTEMS.

Another factor of profitable farm management is the choice of a cropping system and the proper distribution of the crop area among the different crops. As previously stated, and as shown in Table III, on 300 owner and 153 tenant farms, corn occupies an average of 29.5 per cent of the total crop area of each farm; oats 17.5 per cent; wheat 14.9 per cent; barley 2 per cent; and hay 31.3 per cent. The tabulation of the data gathered on 300 owner-farms shows that in general on the more profitable of these farms corn occupies from 30 to 50 per cent of the total crop area, or an average of about 40 per cent; oats 1 to 20, or an average of about 10 per cent; wheat from 10 to 30, or an average of about 20 per cent; barley, roughly, from 1 to 10 per cent, and hay from 20 to 30 per cent. These results are significant. Consider, in the first place, their bearing on the corn crop.

Since 1880 the corn crop in Lenawee County has more than doubled in acreage. In spite of this and in spite of the fact that it is still increasing in acreage, the indications are that corn on the average farm has not yet reached the acreage it might well occupy. There is every indication that on the average farm the acreage of corn should be increased until this crop occupies anywhere from 30 to 50 per cent of the total crop area, according to the needs of the farm for feed, and distance necessary to haul in marketing the surplus of the crop. It is a significant fact in this connection that each year from 75 to 100 cars of corn are distributed to the farms of Lenawee County from Adrian alone. A material increase in the acreage of corn on the average farm seems indicated as one step toward placing these farms on a more profitable basis.

A further comparison of the figures presented shows that the total crop acreage devoted to oats (17.5 per cent) puts this crop well toward the upper limit of the acreage which it should occupy. As a source of cash income, the oat crop is relatively unimportant, but in this section oats are so valuable as a farm feed that it is still very important that a good acreage be devoted to this crop. The oat crop in many instances also is used as a means of getting a stand of clover.

The average crop acreage devoted to wheat (14.2 per cent) puts this crop a little below the average of the total crop acreage of the more profitable farms. Wheat is an important cash crop, and while at normal prices it is not always highly profitable from an acre basis, it is nevertheless essential to a well-balanced and diversified farm system in this region, especially on the heavier types of soil. Like the oat crop, wheat is of value to the farm system in that it affords a good means of getting a stand of clover and timothy for meadow and pasture. Under the conditions found normally in Lenawee County the combined acreage of wheat and oats should about equal that of the acreage of hay in the rotation.

Barley holds a minor position from the standpoint of the area as a whole and is of little consequence as a cash crop. The figures show, however, that barley is still important as a feed crop and is much in favor with some farmers.

The average acreage of hay (31.7 per cent) puts that crop well up toward the limit to which this crop may well be grown under the conditions now existing here. In any diversified farming region there are two important factors which tend to keep the acreage of hay from fluctuating materially. These are market prices, and the returns it is possible to get from feeding hay to live stock. Conditions which would materially affect either or both of these factors for a considerable period of time would cause a change in the acreage which should be devoted to the hay crop, but under the present conditions hay on the average farm of the region seems to have found its proper status.

CROP ROTATIONS.

There are several cropping systems in vogue in Lenawee County. Fixed rotations are the rule rather than the exception in this section. Some of these rotations do not meet present conditions, however, as well as might be desired, in that they do not provide for sufficient acreages of the more profitable crops.

The greater number of the farms studied follow a five-year rotation. The most popular rotation of this class is (1) corn, (2) oats, (3) wheat, (4 and 5) grass two years. The five-year rotation next in importance is as follows: (1) corn, (2) oats (or wheat or barley), (3, 4, and 5) grass three years. One encountered still less frequently is (1) corn, (2) corn, (3) oats, (4) wheat, (5) grass. This rotation is very desirable as it allows for two fields of corn rather than one, furnishes oats enough for feed, and perhaps a small surplus for sale, enough wheat for a substantial cash crop, and hay enough for the average farm. In many instances it might be well to extend this rotation into one of six years' duration by allowing the grass to remain two years before plowing it up. Where it is not desirable to

grow wheat, this rotation might well be conducted as follows: (1) corn, (2) corn, (3) oats, (4 and 5) grass two years.

The principal six-year rotation encountered on the farms studied is (1) corn, (2) oats, (3) wheat, (4, 5 and 6) grass three years. A rotation encountered less frequently, but better suited to the conditions of the area, is (1) corn, (2) corn, (3) oats, (4) wheat, (5 and 6) grass two years. A modification of this system was found as follows: (1) corn, (2) corn, (3) oats, (4) wheat and barley, (5 and 6) grass two years. In this case wheat and barley of the fourth year occupy jointly the same field in whatever proportion the operator desires to meet the needs of his farm. The acreage of barley grown is usually governed by the need of this crop as feed for hogs, or in some instances, for dairy cows.

After the five and six year rotations, four-year rotations were most numerous, the most common of these being (1) corn, (2) oats, (or wheat or barley), (3 and 4) grass two years. After this in order of popularity, comes the following: (1) corn, (2) oats, (3) wheat, (4) grass. A very desirable four-year rotation, found less frequently, is (1) corn, (2) corn, (3) oats or wheat, (4) grass. In this rotation barley might be allowed to share a part of the oats or wheat field if this crop is needed on the farm.

The addition of alfalfa to the average cropping system of the section is very desirable generally, and since alfalfa can be depended upon to produce hay for several years, it is the custom to set apart a certain field of the farm for this crop, outside of the regular rotation. A rotation well adapted to the condition in the area and which is shown by the data collected to be a very profitable arrangement of crops on the average farm, is as follows:

First year	Corn.
Second year	Corn.
Third year	Oats and barley.
Fourth year	Wheat.
Fifth year	Hay.
Five years or more on a separate field	Alfalfa.

This rotation permits approximately 40 per cent of the rotation area to be in corn, which is the percentage indicated as most desirable in general in this section. Oats and barley together occupy about 20 per cent of the rotation area. These two crops, occupying the same field together, may be varied in acreage to suit the conditions of the individual farm. The wheat crop occupies about 20 per cent of the rotation area. Since this rotation provides for only 20 per cent of hay, whatever more is needed is supplied by the alfalfa crop. If this arrangement produces a surplus of hay, some of the grass of the fifth year may well be pastured or plowed under to improve the soil.

CASH CROPS.

In running a farm it is not always an easy matter to determine whether crops should be sold or not and, if sold, to what extent. On most farms there is generally more or less shifting in practice as regards the selling and the feeding of certain crops. This is especially noticeable in the relation between the price of corn and the price of hogs. If the price of hogs is high and that of corn relatively low, the greater part of the corn crop is fed, but if the opposite is true farmers in general are apt to sell off most of their hogs in rather poor condition and sell most of their corn crop as grain. Following the market in this manner is doubtless very often carried to extremes, and those who stick to the feeding of live stock continuously usually make more money in the long run than those who shift their practice in this respect from year to year. Nevertheless, the moderate selling of crops as a part of a general and diversified system of farming should not be discouraged.

Table VIII, page 15, under "Type of farming," indicates that of the 300 owner-farms studied in Lenawee County those receiving from 10 to even 40 per cent of their total receipts from the sale of crops were the more profitable. Tables were also constructed in this connection with a view to bringing out the most profitable percentage of total receipts from the sale of crops, and these indicate that under normal conditions and with the types of farming thus far developed here the greatest profit is derived when not more than 10 per cent of total receipts is derived from the sale of any one of the general farm crops. The only exception to this is in the case of wheat, which apparently may run as high as 20 per cent of the total crop acreage, and which might be increased considerably in case of high prices of wheat, such as during 1916–17.

SPECIAL CROPS.

There are several new crops which are either entering rapidly into the farming systems of the area or are beginning to attract attention. Of these the one of greatest importance and value to the section is alfalfa. There are two other crops which should be considered in connection with the agriculture of the county, though in only a limited way. These crops are soy beans and cowpeas.

ALFALFA.

Alfalfa is of comparatively recent introduction in this section, but already it has gained prominence on many of the best farms. Conditions in general are favorable for further developments, and more extensive seeding of this crop is taking place each year. There is not much tendency toward specializing on alfalfa to the extent of making it the most important enterprise of the farm. The indications

are that this crop is gradually assuming a permanent place in the cropping systems of the section and as a rule it is not assuming undue prominence or interfering with the proper handling of the remainder of the farm crops. (See fig. 8.)

A reasonable acreage of alfalfa is very desirable on most farms of this section, but too great an acreage is not easily managed. One of the most important factors in determining a desirable acreage of alfalfa on a given farm is the labor schedule. The records taken in this area show that the average dates of harvesting the first cutting

FIG. 8.—A good stand of alfalfa, Lenawee County, Mich.

of alfalfa is from June 4 to 11. The early and more critical stages of the cultivation of corn come at the same time. As the acreage of alfalfa is increased the interference with the proper cultivation of the corn crop increases. Thus the corn crop becomes very largely the determining factor as to how great the acreage of alfalfa shall be. If the acreage in alfalfa is increased beyond moderate proportions, it will become advisable to reduce the acreage of corn accordingly, or means must be devised for securing extra labor to take care of the work at the time of the first cutting. It is the first cutting that is the greatest factor in this connection, as there is but little conflict in the labor of other crops when the second and third cuttings of alfalfa are done. On only two of the farms studied has alfalfa been made the dominating feature of the farm system. These have been discussed at some length on page 17 under "Special farms."

On the whole, conditions are favorable to a much greater extension of the acreage of alfalfa in the area, especially on the heavier soil types. However, a number of details should receive closer attention. In a large number of fields the effects of poor drainage were clearly evident. There were numerous spots where the alfalfa had been winterkilled. These occurred alike on hill slopes and in depressions where the drainage was naturally poor or where seepage has kept the soil constantly saturated with an excess of water. A thorough system of tile drainage will prevent winterkilling to a very great extent, if not almost entirely. If it is not convenient to give the entire alfalfa field a thorough drainage system, it is at least highly desirable to drain the parts of the fields where the crop has been killed out. This should be done before existing fields are reseeded, or tile may be put in the parts of the field which have been killed out and these may be reseeded without molesting the stand in the remainder of the field.

The results which have been obtained with alfalfa in this area have been secured almost entirely without the use of lime or artificial inoculation. There is no doubt that both would be of considerable assistance in starting new fields and that they would add materially to the production of hay after the crop is well established. On farms where it has been difficult to get a stand of alfalfa, and especially on the sandy types of soil, it would be well to apply from one to three tons of ground limestone or marl per acre and work it well into the surface while preparing the seed bed. This general treatment has proven very effective on sandy lands in general in northern Indiana and southern Michigan.[1]

In most cases the seed either should be inoculated with artificial culture, or with sweet clover soil or soil from another alfalfa field scattered over the surface and harrowed in shortly before sowing the seed. (For full details see Farmers' Bulletin 704.)

Considering the fact that alfalfa, in general, is doing well in nearly all parts of the area surveyed, and that it has been established with little effort other than preparing the ground thoroughly and sowing the seed, it would seem that in this section this crop promises well for the future. A little more attention to details would go far toward insuring success. Tile drainage, lime, and artificial inoculation are the essential factors of success which are being neglected most. More attention should be paid to those factors, together with careful consideration of the most desirable acreage to meet the demands of the individual farm and at the same time not to interfere with the labor schedule of the farm in general and with the cultivation of the corn crop in particular.

[1] United States Department of Agriculture Farmers' Bulletin 716, entitled, "Management of Sandy-land Farms in Northern Indiana and Southern Michigan."

SOY BEANS.

Apparently the soy bean crop has no special importance in the agriculture of the area, except in the more sandy sections or on lands where clover is grown with considerable difficulty. The area surveyed is made up principally of the heavier types of land, and the results of these investigations apply more especially to the heavy land conditions of Lenawee County and counties to the north, west, and southwest where these same conditions prevail. In these sections clover is grown with a high degree of success and alfalfa is very successfully grown on the farms where reasonable effort has been made. This leaves little to be expected from the growing of soy beans and really permits little demand for the crop in the agriculture of the section. The principal uses to which soy beans can be put in this section are that of a crop to be plowed under in a systematic plan of soil improvement, an extra crop to be grown for winter feed for hogs, and a catch crop sown in the corn at the last cultivation and pastured down by lambs during the first part of the feeding season. Soy beans may also be used to some extent as an emergency crop to supply hog pasture, but it apparently has no place of importance as a regular part of the cropping systems of the section.

COWPEAS.

As compared to soy beans, cowpeas as a farm crop are even less adapted to the agriculture of the area covered by this farm management study. The only place here where cowpeas can serve a purpose of any consequence is in the sandy sections. On the more sandy areas this crop can be grown to good advantage, and, together with soy beans, may to a great extent be used as a substitute for clover. Under these conditions cowpeas may be made valuable as a crop to be plowed under in the improvement of the soil. Another use which it may serve on these sandy areas is that of cow pasture—a practice which is carried out in other parts of southern Michigan. Aside from a few such general uses, this crop should not be considered in the area surveyed, especially not as a part of a regular and fixed rotation.

OWNER AND TENANT FARMS COMPARED.

Tenancy, though not abnormally developed, is nevertheless an important feature of the agriculture of Lenawee County. Of the 564 farm records taken, 300 were of owners, 90 were of owners who rented land additional and 16 of owners, generally of advanced years, who had curtailed their farm operations and were renting out a part of their land. There were 158 strictly tenant farms, 33 of which were cash rented, 120 half-share rented, and 5 one-third share rented. In all there were two and one-half times as many owner-farms as there were tenant farms. This probably represents about the true proportion of owners and tenants for the region as a whole, since the farms

were visited and the records taken without discrimination in the area studied.

TABLE XVI.—*Average area, capital, receipts, expenses, and profits of owner-farms as compared with tenant farms, Lenawee County, Mich.*

	Owner-farms.			Tenant-farms.					
				Tenant.			Landlord.		
	Owner.	Owner renting additional land.	Part of land rented out.	Cash rent basis.	One-half share rent basis.	One-third share rent basis.	Cash rent basis.	One-half share rent basis.	One-third share rent basis.
Number of farms	300	90	16	33	120	5	33	120	5
Average area, acres	104	120	92	102	135	159	.....	.....	.....
Average capital	$11,756	$9,692	$9,090	$1,765	$1,506	$582	$9,061	$13,015	$16,406
Average receipts	$1,578	$1,718	$1,111	$1,362	$966	$861	$279	$859	$1,577
Average expenses	$510	$764	$385	$623	$326	$485	$30	$129	$507
Average farm income	$1,068	$954	$726	$739	$640	$376	$249	$730	$1,079
Per cent on investment	5.8	5.9	4.9	20.3	16.1	.....	2.7	5.6	6.5
Interest on investment at 5 per cent	$587	$485	$454	$88	$75	$29	.....	.....	.....
Average labor income	$481	$469	$272	$651	$564	$347	.....	.....	.....

It will be observed in Table XVI that the average size of the 300 owner-farms was 104 acres, the owner with additional rented land 120, and the owners with part of the land rented out 92; whereas the cash tenant farms were 102, one-half share 135, and one-third share 159 acres, respectively. Here it will be noted that the principal group of tenant farms, those rented on the half-share plan, are on the average considerably larger than the owner-farms, and that the small number of farms rented for one-third share average still larger. This last-named class is of rather peculiar type, since the owner, in addition to working on the farm himself, generally furnishes all equipment and most of the live stock, giving one-third of the farm income and a credit of one-third of the increase in live stock to the renter for his labor. Only five such farms were found in the four townships studied.

The 300 strictly owner-farms had an average capital of $11,756, the 90 owners with additional rented land, $9,692, and the 16 owners with part of the land rented out had an average capital of $9,090. On the 33 cash-tenant farms the tenants had an average investment of $1,765, and their respective landlords had an average investment of $9,061; the 120 half-share tenants had an average investment of $1,506, and their landlords had an average capital of $13,015; and the five one-third share tenants had the very low average capital of $582, whereas their landlords had an average investment of $16,406.

In regard to farm income, which is the gross receipts minus expenses, the tenants compare favorably with the landlords but fall slightly lower than the 300 owners and the 90 owners with additional

rented land. The average farm income of the 300 owners was $1,068; that of the 90 owners with additional rented land, $954; and that of the 16 owners with a part of their land rented out was $726. The average farm income of the 33 cash tenants was $739, and that of their landlords, $249; the average farm income of the 120 one-half share tenants was $640, and that of their respective landlords was $730; whereas the average farm income of the five one-third share tenants was $376, and that of their landlords, $1,070. It should be observed in this connection that the landlords' farm income on the one-third share farms ($1,070) includes pay for whatever work the landlord himself has done on the farm, and taking into account the difference in capital, the landlord's income naturally should be somewhat higher by this plan of operation than that of the tenant.

After subtracting the average estimated values of the labor of owners and of tenants from the farm income, the owners have left as interest on their investment 5.8 per cent; the owners with additional rented land, 5.9 per cent; the owners with part of their land rented out, 4.9 per cent. The average per cent on the small investments of the tenants run much higher. The cash tenants made an average of 20.3 per cent, and the one-half share tenants made an average of 16.1 per cent. It must be remembered, however, that these men were limited in the investment that could be handled economically in the form of working capital. The percentage returns must, therefore, be much higher than that for the entire capital of the farm if these men are to receive a fair return for their labor. The 33 landlords renting their farms for cash received an average of 2.7 per cent, and the 5 landlords renting on the one-third share plan received an average of 6.5 per cent on their respective investments. It would seem that the per cent received by the cash-renting landlords (2.7) is rather low, but some consideration should be given to the certainty of income under this plan.

It will be seen that the average labor income on the owner-farms was $481; of the owners with additional rented land, $469; and of the owners with part of the land rented out was $272; while that of the cash tenants was $651; of the 120 half-share tenants, $564; and of the one-third tenants, $347.

Tenants naturally look forward to the time when they shall be owners and gain that coveted feeling of independence which comes with the ownership of land. Conditions vary greatly in different sections with respect to tenancy, and it is not always an easy matter to say when and under what circumstances the tenant should become an owner. Generally there is a decided inclination, however, to ignore the possibilities of renting and to hasten unduly into ownership. It is highly advisable to make sure that sufficient capital is

available, so that this change may be made without assuming too great a financial obligation. Neglect to do this often results in hardship and sometimes in financial difficulties which are hard to overcome. When to give up renting and become an owner, whether a man with small capital should buy a small farm or rent one of greater acreage until he has accumulated sufficient capital to acquire a farm of suitable size, are often serious questions. The data gathered in this connection in Lenawee County show what is actually taking place in that region.

TABLE XVII.—*Relation of tenure, with a given amount of capital, to income, Lenawee County, Mich.*

Operator's capital.	Number of farms.		Acres of land per farm.		Average farm income.		Average labor income.	
	Working owners.	Tenants.	Working owners.	Tenants.	Working owners.	Tenants.	Working owners.	Tenants.
$1,000 or less	.....	35	.....	81	.....	$413	.....	$376
$1,001 to $2,000	4	88	29	126	$296	622	$210	548
$2,001 to $3,000	5	23	38	182	375	971	244	852
$3,001 to $5,000	24	5	42	231	392	1,266	187	1,094
$5,001 to $7,000	34	2	61	183	655	1,648	351	1,366
$7,001 to $9,000	55	.....	77	.....	689	.....	289	.....
$9,001 to $11,000	54	.....	89	.....	989	.....	485	.....
$11,001 to $14,000	42	.....	104	.....	1,143	.....	525	.....
$14,001 to $17,000	27	.....	130	.....	1,185	.....	420	.....
$17,001 to $25,000	42	.....	171	.....	1,670	.....	667	.....
Over $25,000	13	.....	282	.....	3,427	.....	1,728	.....
All farms	3,000	153	104	128	1,069	661	481	583

Table XVII shows that of all the farms surveyed there were no owners operating with $1,000 or less capital. There were 35 operated by tenants each of whom had not more than $1,000 at his disposal. The average area of the farms operated by these tenants was 81 acres, and the farm income averaged $413 per farm. Allowing 5 per cent interest on the capital, the average tenant made a labor income of $376. This shows that, in general, it is possible in this section to rent and manage a farm of fairly good acreage when a capital approximating $1,000 has been accumulated, and that in addition to making a reasonable rate of interest on this capital it is possible to realize a labor income slightly above the wage of a hired hand, which in this region averages about $360 per year.

There were only four owner-farms which were operated with capital of from $1,001 to $2,000, whereas there were 88 tenant farms in the same class. It will be noted that there is a material increase in the number of tenants whose capital falls between these limits as compared with those having $1,000 or less. It should be observed also that the average acreage of the owner-farms is very small, only 29 acres, while that of the tenant farms is 126 acres. The owners in this class made an average total farm income of $296, while the renter made a farm income of $622. After taking out 5 per cent interest

on the investment in each case the owners are left an average labor income of $210, the renters $548. This shows that under current conditions it is still much more desirable to rent than to buy until the capital available for investment has reached $2,000 or more.

In the third class, the operator having capital ranging from $2,001 to $3,000, there were 5 owners and 23 tenants. The average area of the owner-farms was still small, being only 38 acres, whereas the average area of the farms operated by renters was 182 acres. A comparison of incomes shows still greater differences. The owners made an average total farm income of $375, as compared with $971 made by the tenants, and an average labor income of $244 as compared with $852 made by the tenants.

In the fourth division, those having investments of $3,001 to $5,000, there are only 5 tenants as compared with 24 owners, and in the next class, with investments of $5,001 to $7,000, only 2 renters were found, as compared with 34 owners. No renters were found with an operating capital of more than $7,000.

The average farm income for five tenants in the group with investments of from $3,001 to $5,000 was $1,266, and that of the two tenants in the group with investments from $5,001 to $7,000 was $1,648. It will be noted that the average farm income of the owners does not approach these amounts until the group is reached in which the owners have investments ranging from $17,001 to $25,000, and farms average 171 acres in area, or approximately the area of the larger rented farms.

Farm management surveys have, in general, shown that just as soon as the tenant farmers have accumulated sufficient capital to enable them to make a first payment on a farm of sufficient size to permit a satisfactory standard of living, the great majority of them pass over into the owner class. In Table XVII it is seen that when the average tenant in the region here studied has saved about $5,000, thus becoming able to possess a farm which will produce a farm income of about $400, he prefers to become an owner, despite the fact that as a tenant he could have an income practically three times as great. In this area no farmer remained a tenant after he had accumulated more than $7,000 capital.

There are two general reasons for this. In the first place, the adequate utilization by the tenant of a large operating capital requires a very large area of land, in many cases necessitating a magnitude of business that is beyond the managerial ability of the average individual. The table indicates, however, that the man of exceptional ability who can manage a large property with a high degree of efficiency could continue to do better financially as a tenant than as an owner, because of the greatly increased acreage which his capital would enable him to utilize.

Perhaps more important considerations that influence farmers to become owners as soon as it is possible to do so on a satisfactory basis are those relating to the very numerous advantages arising from ownership. The sense of security and independence which ownership gives is a valuable consideration. The feeling of satisfaction in owning a home is undoubtedly one of the factors that influence many farmers to buy land. Finally, the greater independence of the owner as compared with the tenant who is in the nature of things more or less subject to dictation from the farm owner, and the fact that the owner is never under the necessity of moving from one farm to another because of disagreements with his landlord, seem to justify whatever financial sacrifice may be necessary in changing from the status of tenant to that of owner.

From the standpoint of the public welfare, it is fortunate that the tendencies just mentioned prevail so generally. As a rule, tenant farmers are not a permanent part of the local citizenship, and are not so much interested as owners in the maintenance of schools, churches, and roads.

The figures of the table, however, indicate quite clearly that in this section it is a mistake for the young man with small capital to attempt to become an owner before his accumulated capital renders it possible for him to make a satisfactory first payment on a farm of considerable size. Even where the first payment required is only a small proportion of the total value of the farm, interest on deferred payments consumes so large a proportion of the farm income that unless the business is one of considerable magnitude there is not enough left to permit a satisfactory standard of living. It is, however, desirable that the tenant, when he has accumulated sufficient capital to become an owner on a proper basis, should purchase a farm.

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