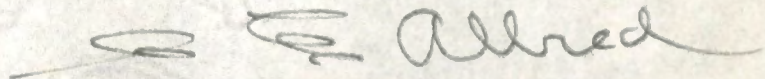


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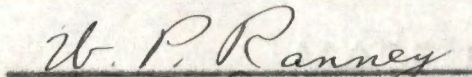
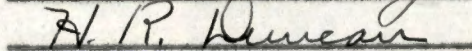
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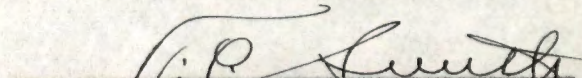
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Major Professor

We have read this thesis
and recommend its acceptance:

Accepted for the Committee


Dean of the Graduate School

**SOME FACTORS AFFECTING FARM EARNINGS IN ROANE COUNTY,
TENNESSEE**

A THESIS

Submitted to
The Committee on Graduate Study
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

by

Lincoln Gosser Kerby

August 1941

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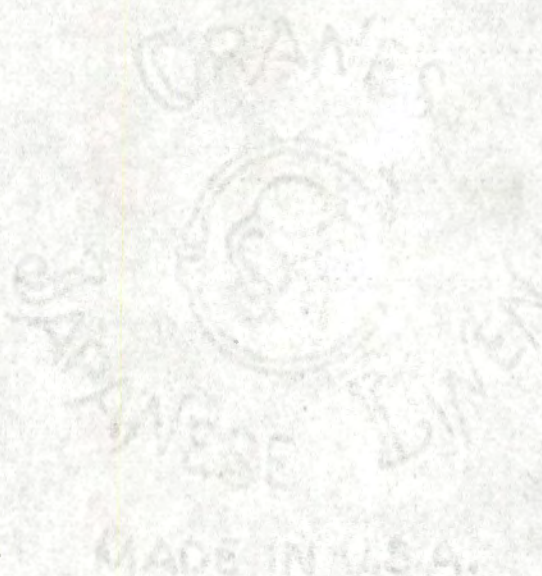
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CHAPTER I

INTRODUCTION

Importance of Problem

Due to the building of dams along the Tennessee River, considerable areas of farm land have been and will be taken out of agriculture. When the Watts Bar dam was built, 10,571 acres of land were purchased by the Tennessee Valley Authority in the 4th Civil District of Roane County alone. (1) Population pressure on the upland area will be increased, making a need for a study of adaptable practices and efficiency factors. Specialists in different fields of agriculture and county planning committees are in need of knowledge regarding the economic effects of certain farm organization and management factors under local conditions, in order to make recommendations to the farmers of this area.

The national defense program has made a need for more power. More dams are being constructed and at a faster rate to supply power which will increase the population pressure on the upland areas. National defense programs may demand that more specific recommendations be made to farmers as to adaptable practices and how to increase their efficiency.

(1) Possibility of Relocating Farmers Near Watts Bar Reservoir, Department of Agricultural Economics, Tennessee Agricultural Experiment Station, Knoxville, unpublished, 1941.

This study will be applicable to other similar areas. The area around the Fort Loudon dam is very similar to the area being studied.

Purpose of Study

The purpose of this study is to determine the relation of various factors to labor earnings among upland farms in the East Tennessee Valley, to ascertain the relation of soils to crop yields, and to make available information which will be of use in this and other similar areas.

Source and Limitations of Data

This study is based on a survey of 93 upland farms in Civil District 4, Roane County, Tennessee.

The farm management surveys were taken by field representatives of the University of Tennessee Agricultural Experiment Station and Bureau of Agricultural Economics. The sample approaches, but is not completely based on geographic position. Care was taken to get farms representative of all size groups. (2) The 1935 census showed 444 farms in District 4. One hundred of these were surveyed, of which seven were excluded because of incomplete data. The farm surveys were taken in the spring of 1940, the data covering the preceding 12 months. This year was not an abnormal year of prices and yields of farm products.

(2) Possibility of Relocating Farmers Near Watts Bar Reservoir, Department of Agricultural Economics, Tennessee Agricultural Experiment Station, Knoxville, unpublished, 1941.

Data on soils were obtained from a Soil Survey map made by the Agricultural Experiment Station, Tennessee Valley Authority, and United States Bureau of Plant Industry cooperatively. This county was one of the first counties in the State to have the soils surveyed and grouped on the basis of soil type, slope, and erosion into classes of relative agricultural productivity.

Method of Procedure

The data were collected by the survey method. The farm management surveys consisted of the following information: (a) age and tenure, (b) land use, (c) crop yields by field, (d) receipts and expenses, (e) inventories at beginning and end of year, (f) crop and livestock production, (g) other sources of income, (h) other information necessary for analysis of farm business.

In selecting the sample, alternate aerial photographs of the farms in District 4, Roane County, were taken from the local office of the Agricultural Adjustment Administration. The photographs were arranged in numerical order across District 4. Tracings of farm boundaries were made showing location of buildings, fields, woods, streams and roads. To make a complete operating unit where all the farm was not on one aerial photograph the remainder of the tracts was traced from the adjacent photograph.

To determine the land class and slope of the fields in crops farm maps were superimposed on the Soil Survey map, using landmarks, such as buildings, roads, and streams for orientation purposes. The next step

was to trace soils data onto the farm map. The crop yields were then obtained on the various land classes and slopes and comparisons made of the productivity of each.

In correlating various factors to labor earnings,⁽³⁾ the factors on the 93 farm surveys were divided into either 3 or 4 frequency distribution groups. The weighted arithmetic average of labor earnings was then tabulated for each group. Due to the small number of surveys and many different types of farms, the medians of the labor earnings were also tabulated for the different frequency distribution groups. The median is mentioned in the text only where it shows different results from the weighted arithmetic average. To verify conclusions as to the results shown by factors being divided into only 3 or 4 groups, factors were redivided into 6 to 10 frequency distribution groups. A scatter diagram was then constructed to show the labor earnings of each farm in the group.

Case studies were made of farms with high and low labor earnings to determine if possible the organization and operation practices that were responsible for such variations in labor earnings.

Review of Related Material

Numerous similar farm organization studies have been made in the United States. Three similar studies have been made in Tennessee. The

(3) Labor earnings is what a farmer receives for his year's work over and above all farm expenses and interest on capital invested. It includes estimated value of house rent, and farm products consumed by the farm family.

studies were made in Overton County, Crockett County, and Type-of-Farming Area 6 in West Tennessee. A study, not quite so intensive, was made of 30 unit test demonstration farms in East Tennessee.

Studies were made by the Agricultural Experiment Station and Bureau of Agricultural Economics cooperatively of this area using the 93 farm surveys for the purpose of determining possibility of relocating those farmers nearby whose lands were flooded in the Watts Bar Reservoir area. Data were obtained as to the incomes of the Watts Bar Reservoir area farmers for the purpose of finding out what size, type and land class of farm would be necessary in the upland area, in order to provide the displaced farmers a satisfactory income. Twelve farms representing some of the major sizes and types of farms in District 4, Roane County, were reorganized, using the budget method. Incorporated in the reorganizations were the recommendations of the Roane County Planning Committee, together with the recommendations of production specialists. By the method of substitution in a farm management analysis an attempt was made to determine the effects of these recommendations if carried out.

No similar farm management analysis has been made in the State that will apply to this area or any study that will be applicable to other areas where Tennessee Valley Authority dams are constructed.

Characteristics of Farming Conditions in District 4,

Roane County

The farming conditions of District 4 are discussed in this chapter.

By knowing conditions in this district and the organization of the sample upland farms an idea can be obtained as to how well these farms represent the district. This will in turn help interpret the findings from the standpoint of applying them to the district as a whole, or to other similar areas.

Location. - Civil District No. 4, in the southwestern part of Roane County, is in the East Tennessee Valley just east of the Cumberland Plateau (Figure 1). It lies on the south bank of the Tennessee River about 48 miles west of Knoxville and 65 miles northeast of Chattanooga.

Topography. - There are two physiographic divisions in Civil District No. 4, ridge-valley area and alluvial plains.⁽⁴⁾ The ridge-valley area consists of a series of parallel alternate narrow ridges and valleys which follow a southwesterly direction. The ridges are 200 to 300 feet higher than the floor of the valley and 400 feet higher than the alluvial plains along the Tennessee River. They possess moderately steep slopes and narrow crests. The valleys are undulating to strongly rolling. The steep slopes prevent cultivation of large acreages with large machinery. The alluvial plains are relatively narrow, and appear at all elevations above the present flood plains up to 100 feet.

(4) Swann, M. E., Soil Survey of Roane County, U.S.D.A. Bureau of Plant Industry cooperating with University of Tennessee Agricultural Experiment Station and Tennessee Valley Authority, map and unpublished manuscript, 1938.

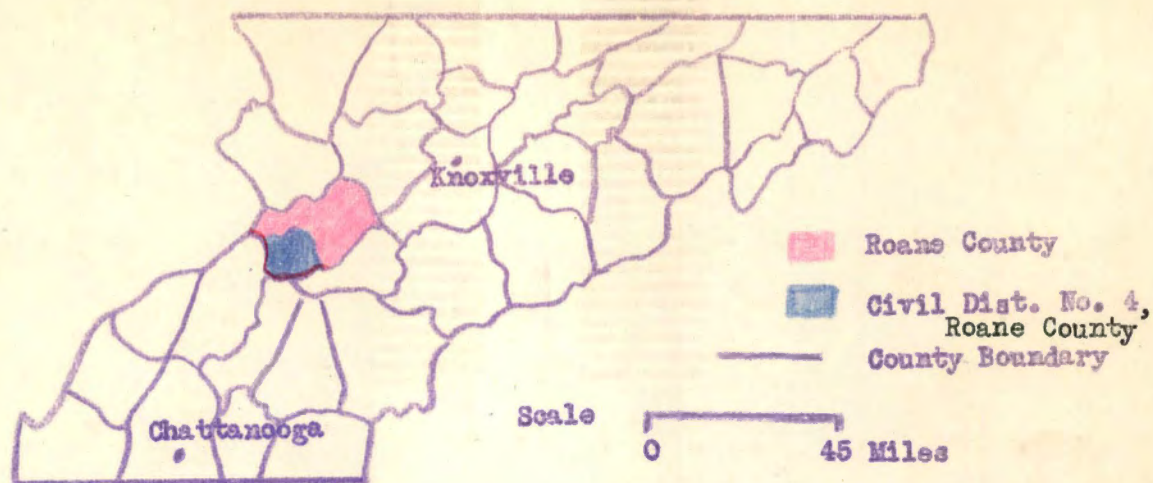


Figure 1. Location of Roane County and Civil District No. 4, in East Tennessee

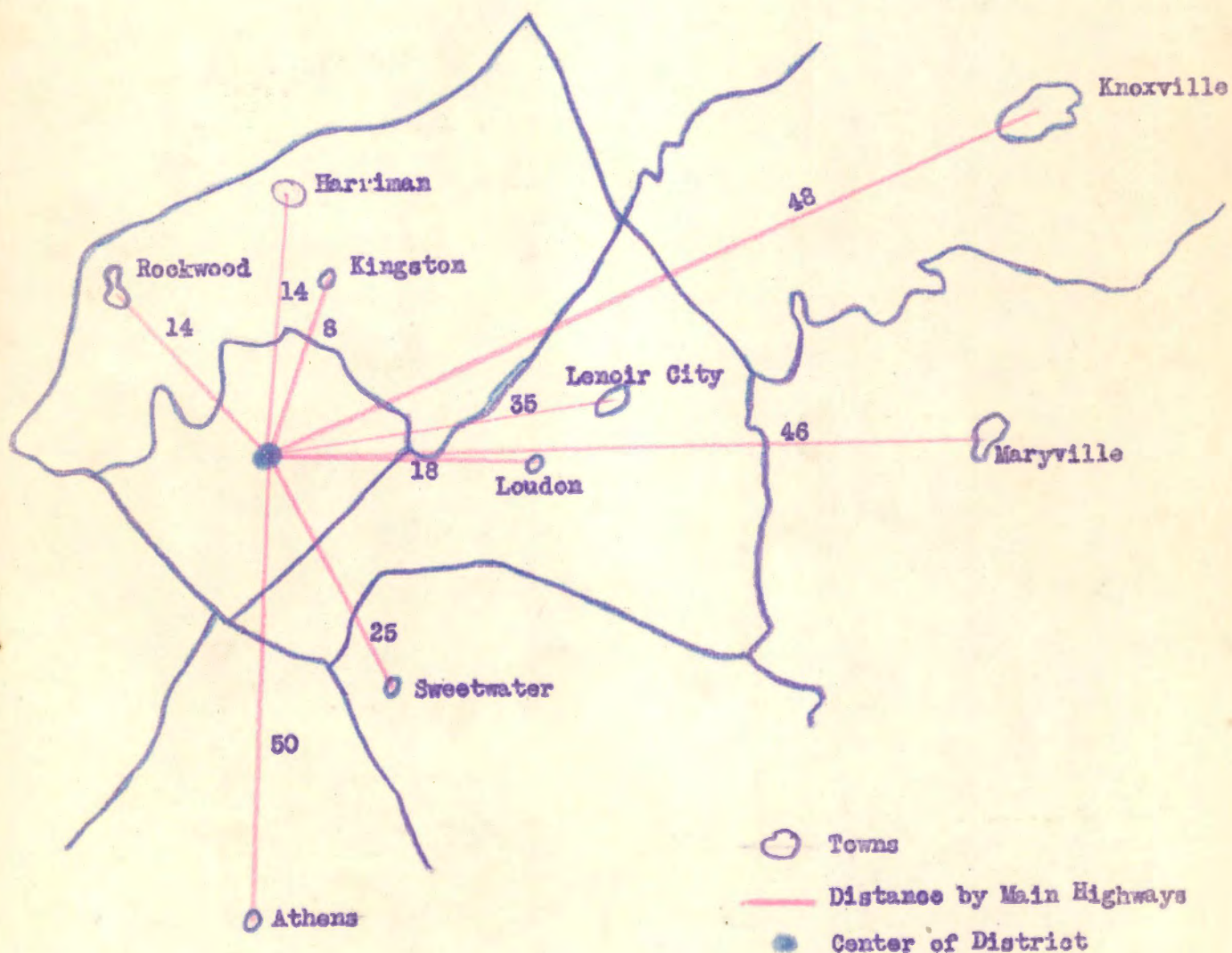


Figure 2. Miles to Some of the Markets from the Center of Civil District 4

Climate. - The climate of this area is mild, humid, and in general well suited to agriculture. The average mean annual temperature for the period 1889-1938 was 58.60° Fahrenheit.⁽⁵⁾ The mean monthly temperature ranges from a low of 38° Fahrenheit in January to a high of 78.7° Fahrenheit in July. The average frost-free period for 50 years was 192 days.

The average mean annual precipitation for the period 1889-1938 was 51.42 inches. The rainfall is well distributed throughout the year, the most falling in winter and spring months and the least in the fall months.⁽⁶⁾

Population. - In 1940 District No. 4 had a population of 3084. From 1920 to 1930 there was a decrease in population, but from 1930 to 1940 it increased. There was an increase in number of farms, from 332 in 1930 to 444 farms in 1935. The farm population in 1935 was 2751, or one person to every 22.5 acres of land in farms. Ninety-eight percent of this farm population was white.⁽⁷⁾

Tenure. - Tenants operated 43.2 percent of the farms in this area (about 2/5 of the tenants were croppers) in 1935.⁽⁸⁾ Five and

(5) U.S.D.A. Weather Bureau, data collected at Loudon, Tennessee.

(6) Ibid.

(7) United States Census.

(8) Ibid.

six tenths percent of the 444 farm operators were part owners, approximately 50 percent of the operators being full owners. The farm land rented amounted to 23,792 acres. The extent of tenancy was 8 percent more in this area than in Roane County as a whole. The county had an increase of 8.4 percent in tenancy from 1930 to 1935.

Markets and Transportation. - There are no markets of any size in this District, but five towns with from 800 to 5000 people each are located within 25 miles distance by road from the center of the district. Knoxville, a city of over 100,000 population is located 48 miles away. Figure 2 gives the distances by road to some of the principal markets of the district. Rockwood is not so dominant a trade center for the district due to a 50 cent ferry fee across the Tennessee River. On account of this toll charge many farmers traded at Sweetwater in Monroe County, even though it is farther away. Kingston and Loudon are also two important trade centers for the district. The district has no railroad mileage; however, there are many good roads to enable the farmers of this district to get their products to market.

Land Utilization. - In 1935 there were 61,303 acres of farm land in this district. The average size of farm was 138 acres. Cropland harvested constituted 20.3 percent of all farm land. Corn was the major crop, making up 48.1 percent of all cropland harvested. Lespedeza ranked second in total acres of harvested crops and winter wheat ranked third. There were no data available to show trends in land use in the

the district.⁽⁹⁾ Table I shows the changes in land use for Roane County the last 10 years. There was a continuous increase in the land

TABLE I. LAND USE IN ROANE COUNTY, TENNESSEE, 1930, 1935, AND 1940

Land Use	1930	1935	1940
Number of farms	1304	1834	1615
Acres in farms	169964	191179	173601
Average size of farm	130	103.7	107.5
Land used for crops	45097	47783	48249
Plowable pasture	24992	37205	32070
Woodland	77523	84649	75334
All other land	10615	6560	7102

Source: Census of Agriculture.

used for crops. From 1930-35 there was increase in the number of farms, acres of farm land and plowable pasture. In the period 1935-40 there was a slight decrease in all of these factors. The size of farm decreased 26.3 acres in the years 1930-35 and increased 3.8 acres in the following 5 years.

Livestock. - Livestock is of considerable importance in this area as much of the land is too steep for cultivation. The average farm of this area in 1935 had 1.5 horses and mules, 5.79 cattle and calves, 6.9 sheep and lambs, 3.19 swine, and 41 chickens.⁽¹⁰⁾ There are many of the

(9) U. S. Census.

(10) Number of heads of livestock of all ages, except chickens which includes all over 3 months.

farms that have no horses, swine and sheep; only 11 farms had sheep in 1935. ⁽¹¹⁾ The increase in livestock could not be obtained for this district.

From 1930 to 1935 there was an increase in numbers of livestock in Roane County, with the exception of horses. From 1935 to 1940 there was a slight decrease in all livestock with the exception of sheep, horses and mules, which increased. Table II gives the number of livestock in Roane County in 1930, 1935, and 1940.

TABLE II. LIVESTOCK IN ROANE COUNTY, TENNESSEE,
1930, 1935, AND 1940

Type of livestock	1930	1935	1940
Horses and mules, all ages	2930	2693	2920
Cattle and calves, all ages	6850	10427	8636
Cows of all kinds milked all or part of year	2781	3478	3314
Sheep and lambs of all ages	465	741	1027
Swine of all ages	3296	5057	4589
Chickens over 3 months old	54262	72840	61004

Source: Census of Agriculture

Type of Farming. - Civil District 4 is in Type-of-Farming Area 14b. The types of farms comprising the greater part of Area 14b were self-sufficient, part-time, fruit, cash-grain, and truck farms. ⁽¹²⁾

(11) U. S. Census.

(12) Luebke, B. H., and others, Types of Farming in Tennessee, Agricultural Experiment Station, Bulletin 169, Knoxville, 1941.

Corn is the most important crop in the area, leading in total acreage and value. The acreage devoted to tobacco is small, but the cash value makes it one of the principal crops. Lespedeza is important, ranking next to corn in acreage. Small grains are relatively unimportant.

A large number of the farm operators in Civil District 4 work off the farm. There was a total of 118 operators who did part-time work off the farm in 1935. Sixty-eight of these did part-time agricultural work, 43 did part-time non-agricultural work, and 7 did part-time work, the type of which was unknown. These operators worked a total of 19,603 days off the farms. (13)

(13) U. S. Census.

CHAPTER II

FARM ORGANIZATION OF SELECTED UPLAND FARMS

Age

Only 78 operators reported their ages. The age of the operators ranged from 19 to 79 years, the average being 42.4.

Tenure

Of the 93 farms studied, 57 were operated by full owners, 23 by part-owners, and 13 by renters. If the 15 croppers on these farms are classified as farm operators, to make the data comparable with the census, there would be a total of 108 farms. On the basis of this classification the proportion of each type of tenure for the group would be as follows: 52.8 percent full owners; 21.3 percent part owners; 12.0 percent renters; and 13.9 percent croppers. This would be in contrast with 51.1, 5.6, 25.2, and 18.0 percent respectively for the district as a whole.⁽¹⁾

Land Organization

Use of Farm Land. - The average size of farm was 157 acres, the range being from 14.4 acres to 775 acres. Over one half of the farms were under 125 acres (Table III).

Cropland acreage which includes acres in crops, tillable land lying idle, rotation pasture, and permanent pasture tillable was almost

(1) U. S. Census, 1935.

double the acreage used for crops. Approximately 67 acres or 42.4 percent of the total land area per farm was cropland.

TABLE III. ACREAGE AND USE OF FARM LAND, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Use of Land	Acres per Farm	Percent of Total
Farm land	157.1	100.0
Acres in crops	34.1	21.7
Tillable land lying out	13.2	8.4
Rotation pasture	7.8	5.0
Permanent pasture tillable	11.9	7.6
Permanent pasture not tillable	5.3	3.4
Woods pastured	5.7	3.6
Woods not pastured	76.1	48.4
Farmstead, waste, roads, etc.	3.0	1.9

Woodland constituted 52 percent of the total land in farms, more acreage being devoted to woods than to any other use of land (Figure 3).

There was 13.2 acres of cropland per farm lying idle in 1939.

Land Class Cleared. - Of the farms studied an average of 74.3 acres per farm, or 47.3 percent of the farm land was cleared (Table IV). None of the 93 farms had any Class I land.⁽²⁾ Over a third of the cleared land was in Class III. There were 3.1 more acres of cleared land per farm in Class III than in any other class. Class IV ranked second in acres of cleared land followed by Class V and Class II respectively.

(2) Land Class I is superior farm land. Land Class II ranks second in productivity capacity. Land Class III ranks next and Land Classes IV and V follow respectively.

TABLE IV. AVERAGE ACREAGE OF CLEARED LAND PER FARM BY LAND CLASS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Land Class	Acres per Farm	Percent of Total
All classes	74.3	100.0
I	0	-
II	12.8	17.2
III	26.9	36.2
IV	18.8	25.3
V	15.8	21.3

Use of Crop Acreage. - These farms averaged 34.1 acres in crops. Of this acreage 2.2 acres were double cropped, thus making a total of 36.3 crop acres per farm. Corn, small grains, and hays accounted for 93 percent of the crop acres⁽³⁾ (Table V). Corn was the principal crop constituting 13.0 acres per farm or 38 percent of the total crop acreage. Lespedeza was grown on 8.2 acres per farm. It ranked second among all crops, having a larger acreage than all other hays combined. Hays of all kinds constituted 46.1 percent of all crop acres, while hay and corn combined constituted 84.1 percent of the total. Wheat ranked third with only 2.6 acres per farm, but had almost 4 times as many acres as all the other small grain crops combined. These three principal crops (corn, lespedeza, and wheat) when measured on an area basis were also the principal crops in the District according to the 1935 census; however, the

(3) Crop acres include double cropped acreage.

TABLE V. USE OF CROP ACRES, 93 UPLAND FARMS, CIVIL
DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Use	Acres per Farm	Percent of Acres in Crops
Acres used for crops	34.1	100.0
Double cropped	2.2	6.5
Crop acres	36.3	106.5
Corn	13.0	38.0
Small grains: Oats	0.4	
Wheat	2.6	
Barley	.1	
Rye	.1	
Total	3.2	9.3
Hays: Alfalfa	0.4	
Lespedeza	8.2	
Red top & lespedeza	1.7	
Other mixed legumes and/or grass hays	1.4	
Cowpeas and/or soy- beans	1.6	
Other hays	2.4	
Total	15.7	46.1
Tobacco	.5	1.6
Irish and sweet potatoes	.3	.9
Sorghum for syrup	.2	.5
Tree fruits	1.0	2.8
Strawberries	.1	.5
Garden and truck crops	.8	2.4
Others	1.5	4.4

corn acreage on these farms was about 10 percent less than was reported for the district five years earlier. This difference in corn acreage may represent either a bias in sampling or a shift away from corn, probably the latter.

There was .4 of an acre of alfalfa per farm. The 1935 census did not report any alfalfa for Civil District 4. The increase in alfalfa has been largely a result of agricultural programs such as the Farm Security Administration, Agricultural Adjustment Administration, and the Agricultural Extension Service through its test demonstration farms.

Tree fruits occupied one acre per farm or 2.8 percent of all crop acres on the farms studied. One and six tenths percent of the crop acres or 0.5 of an acre per farm was in tobacco. Garden and truck crops occupied 0.8 acre or 2.4 percent of the total crop acres.

Crop Yields. - Yields per acre of most important crops on the 93 upland farms for 1939 were below those of the State for the same year and also for the 10-year average 1928-1937 (Table VI). Rye, burley tobacco, and alfalfa were the only crops yielding more per acre than the State average. Tobacco on the sample farms in 1939 yielded 1067 pounds per acre or 107 pounds above the State average for the same year, and 215 pounds above the State average for the 10-year period 1928-1937. State yields for 1939 were slightly above the 10-year average except for corn, sweet potatoes, and sorghum syrup.

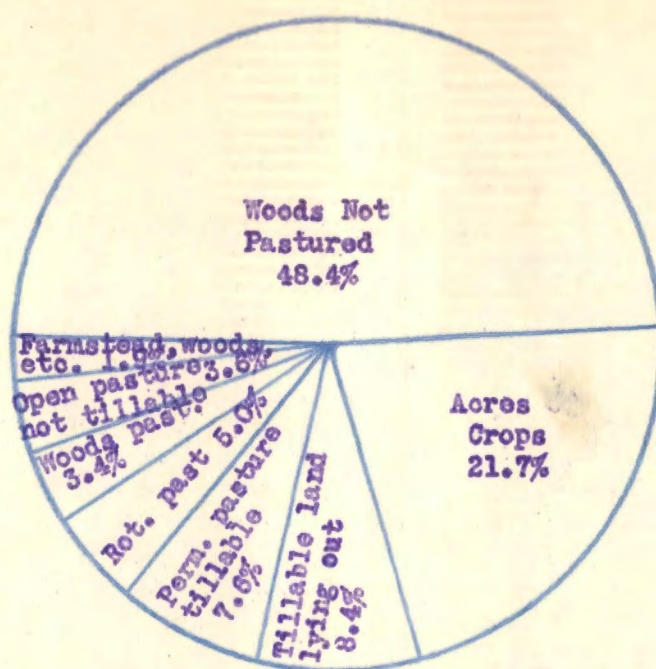


Figure 3. Use of Farm Land on 93 Upland Farms, Roane County, Tennessee, 1939
Source: Table III.

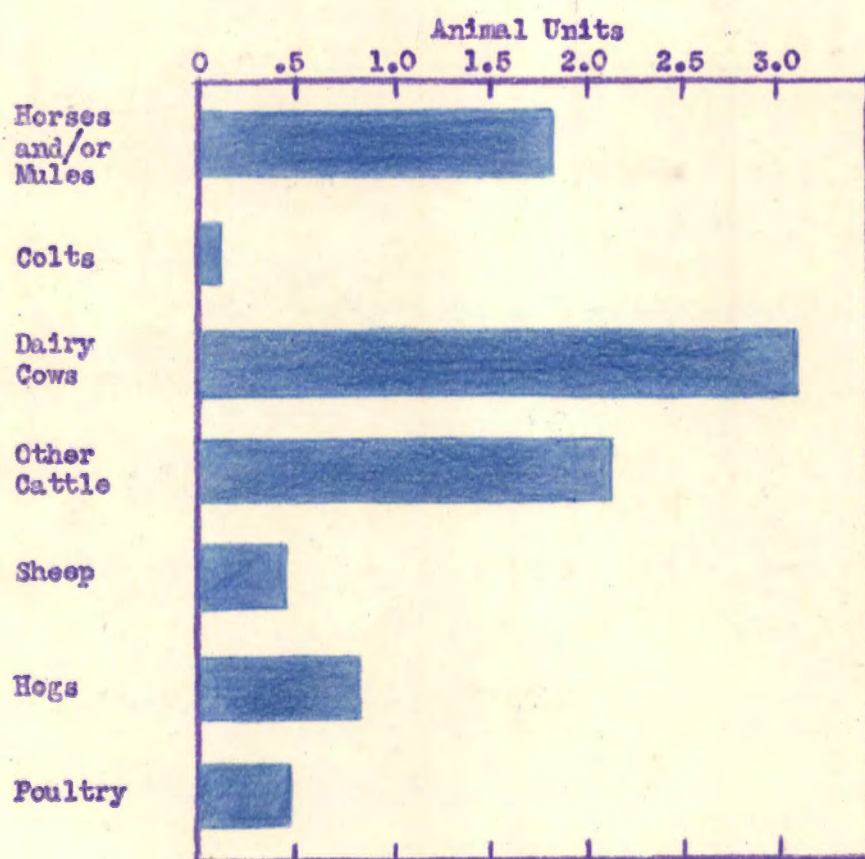


Figure 4. Average Number of Animal Units of Livestock per Farm, 93 Upland Farms, Roane County, Tennessee, 1939
Source: Table VII.

TABLE VI. YIELDS OF IMPORTANT CROPS, 93 UPLAND FARMS,
CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939,
COMPARED WITH TENNESSEE

	Tennessee State Yields per Acre		93 Upland Farms, Civil District 4, Roane County, 1939 Yield per Acre
	10-Year Ave. 1928-1937	1939	
Corn (bushels)	20.9	20	19.9
Oats (bushels)	15.7	17	14.6
Wheat (bushels)	10.9	11.5	8.0
Barley (bushels)	17.6	17.5	15.0
Rye (bushels)	6.8	7	8.6
Tobacco (pounds)	352	960	1067
All tame hays (tons)	.89	1.0	.85
Alfalfa	1.61	1.7	2.4
Lespedeza	.95	1.02	.77
Irish potatoes (bu.)	69	71	66.8
Sweet potatoes (bu.)	90	79	71.4
Sorghum for syrup (gal.)	54	48	26

Sources: State Yields, Agricultural Marketing Service, Division of Agricultural Statistics. (Mr. S. T. Marsh, Biology Building, University of Tennessee. For 93 farms - this study.)

Livestock Organization

The sample farms had 8.9 total animal units⁽⁴⁾ per farm (Table VII). Horses and mules constituted over 1/5 of the total animal units. Sixteen percent of the 93 farms had no horses or mules. There were 7.1 productive animal units per farm. Over 3/7 of these were dairy

(4) An animal unit represents the equivalent of one mature horse or cow. In this study 2 colts, 2 heifers, 4 calves, 1 bull, 1 steer, 7 ewes or bucks, 14 lambs, 5 hogs, 10 pigs, or 100 chickens represent 1 animal unit.

cows. Other cattle (beef cows, heifers, bulls, steers, calves) ranked next in importance (Figure 4). Although chickens were few when measured in terms of number of productive animal units, they were the only livestock kept on all of the farms.

TABLE VII. NUMBER OF LIVESTOCK, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Type	Percent of Farms With Each Kind	Average Number of Animal Units per Farm (All Farms)
Total animal units	100.0	8.9
Horses and/or mules	8.4	1.8
Productive animal units	100	7.1
Colts	8	.1
Dairy cows	86	3.1
All other cattle	87	2.2
Sheep of all kinds	4	.4
All hogs	89	.8
Chickens and other poultry	100	.5

Man Labor

The 93 upland farms in 1939 averaged 1.36 man equivalents per farm. (5) Twenty-four of the farms had a man equivalent of .67 or lower.

(5) Man equivalent is the average number of men working on the farm for a year. Man equivalent as calculated in this report equals months of operator labor, plus months of family labor, plus months of paid labor, plus cropper labor. (Hired labor was calculated at \$15 per month while cropper labor was figured in terms of man work units on croppers' crops, 20 man work units equaling one month.) The total number of months was divided by twelve to convert it to a yearly basis.

The largest number of man equivalents on any farm was 3.66. Number of acres in crops per man equivalent was 25, which is a rather heavy concentration of man labor for the type of farming practiced.

The farms averaged 184.6 productive man work units per farm,⁽⁶⁾ ranging from 7.9 to 747.6. The amount of productive work was very low on some of the farms because of small size and part-time farms. Part-time work and lack of machinery also caused the amount of work accomplished per man to be low. The farms averaged only 135.3 productive man work units per man.⁽⁷⁾ The largest number of productive man work units per man obtained on any farm was 396.

Horse Labor

There were only 5 tractors on the 93 upland farms, horses and mules furnishing most of the power. Incidentally none of the farms were completely mechanized. No horses or mules were reported on 16 of the farms; power in most of the cases was obtained by use of a neighbor's team or tractor, in exchange for either cash or hand labor. There was an average of 1.8 horses and mules for all farms, producing an average of 70.7 productive horse work units per horse.⁽⁸⁾

(6) A productive man work unit is the average amount of work accomplished by one man in ten hours. Productive man work unit per farm is figured by multiplying the acres of different crops by the average number of ten hour days of labor they require per acre, and the number of each different kind of livestock by the average number of ten hour days they require and adding the products.

(7) Productive man work units per man equals the total productive man work units divided by the man equivalents on the farm.

(8) Productive horse work units per horse equals the average number of ten hour days of horse labor required for crops and productive livestock divided by the number of workstock.

Farm Investment

The investment per farm was \$2,979, which is much lower than the average investment for Roane County reported in the 1940 census (Table VIII). The investment on these farms ranged from \$335 to \$18,160.

TABLE VIII. DISTRIBUTION OF FARM CAPITAL, 93 UPLAND FARMS,
CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

	Investment per Farm	Percent of Total
Total investment	\$2,979	100.0
Total real estate	2,168	72.7
Livestock	478	16.1
Machinery and equipment	177	6.9
Feed and supplies	79	2.7
Cash to run farm	77	2.6

Total investment per acre of farm land was approximately \$19, which is low due to over one half of the farm being in woods. (9) The investment per acre in crops was \$87. Approximately 27 percent of the total investment was in operating capital. Twenty-four percent of the investment (feed and supplies and cash to farm not included) was in livestock and machinery compared with approximately 17 percent for Tennessee in 1930. (10)

(9) When the operator estimated the value of the investment in real estate he may have failed to include rented land if there were a few acres located apart from the main tract. If the operators missed the few acres of rented land this would cause investment per acre to be a little lower than what it actually should be.

(10) U. S. Census.

Figure 6. Percentage Distribution of Gross Receipts, 93 Upland
Farms, Roane County, Tennessee,
1939

Source: Table IX.

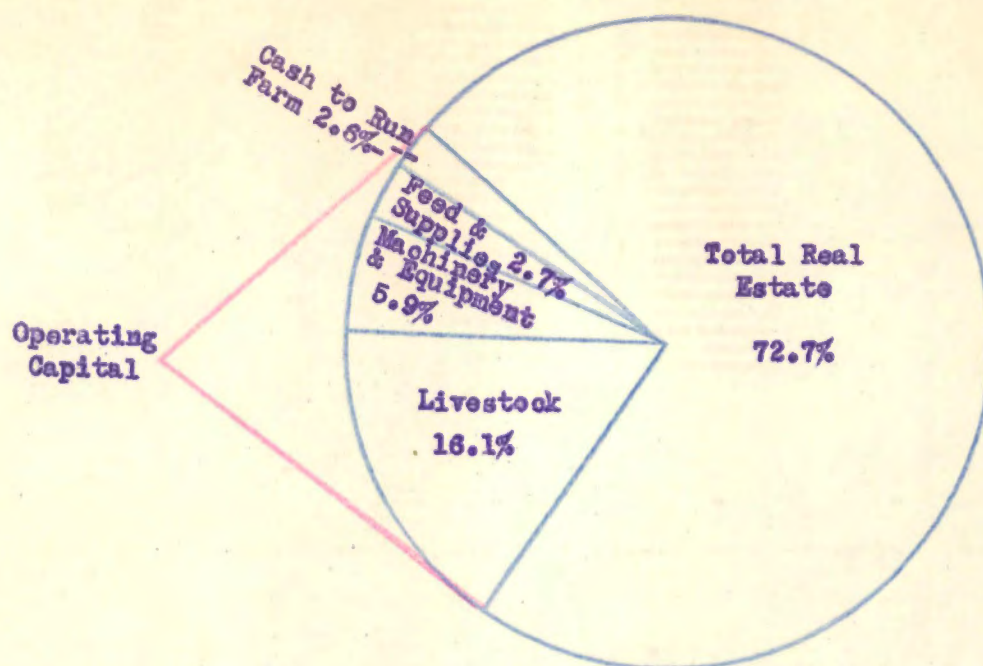


Figure 5. Percentage Distribution of Farm Capital, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table VIII.

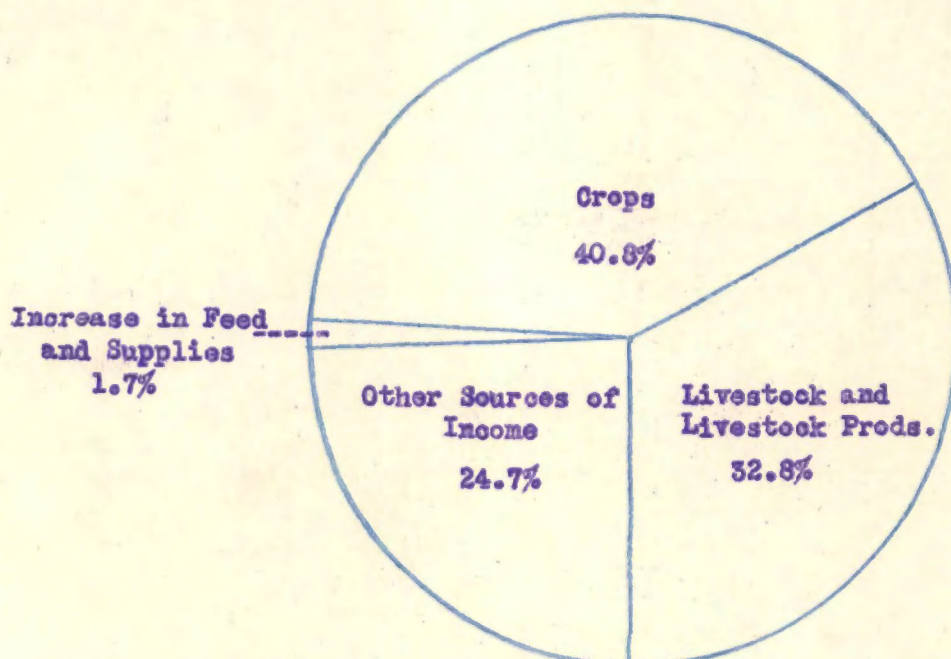


Figure 6. Percentage Distribution of Gross Receipts, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table IX.

Livestock investment averaging \$473 on these farms was \$145 greater than all the other operating capital (Figure 5).

Gross Receipts

These farms had gross receipts of \$637 per farm (Table IX). Crop sales were the greatest source of income amounting to 2/5 of the total. Livestock and livestock products, with receipts of \$209 per

TABLE IX. SOURCES OF GROSS RECEIPTS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Source	Receipts per Farm	Percent of Total
Total gross receipts	\$637	100.0
Crops	260	40.8
Net increase in livestock and livestock products *	209	32.8
Increase in feed and supplies *	11	1.7
Other sources of income	157	24.7
Labor	\$59	
Hired machines	20	
Forest products	36	
Agricultural conservation payments	22	
Other	20	

* Does not include decreases in supplies and decreases in livestock on farms.

(11) farm, lacked \$51 of being as great as crop sales. Receipts from other sources were 24.7 percent of the total (Figure 6).

(11) Includes net increases of livestock but not decreases.

Many of the farmers must have not depended on crops or livestock for their cash income as a large percent came from other sources. Receipts from other sources were \$157 per farm and varied from none to \$1748 (Table IX). Labor performed off the farm was the greatest item in this category, being 64 percent larger than any other source (Figure 7). Forest products ranked second in value of receipts from other sources, followed in turn by Agricultural Conservation Payments, machine work, and all other sources. (12)

Expenses

Total expenses per farm were \$375 (Table X). Current expenses accounted for almost 2/3 of the total (Figure 8). Unpaid family labor and depreciation were about equal. Together they constituted almost 2/7 of the total expenses. There was a decrease of \$17 in feed and supplies; however, as was shown earlier there was also an increase of \$11. Thus there was a net decrease on the 93 upland farms. There was

TABLE X. DISTRIBUTION OF EXPENSES, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Expenses	Amount per Farm	Percent of Total
Total expenses	\$375	100.0
Current expenses	248	66.1
Unpaid family labor	54	14.4
Decrease in livestock and livestock products	4	1.1
Depreciation	52	13.9
Decrease of feed and supply	17	4.5

(12) All other sources includes income from bees and honey, sweet potato plants, veterinary work and pensions.

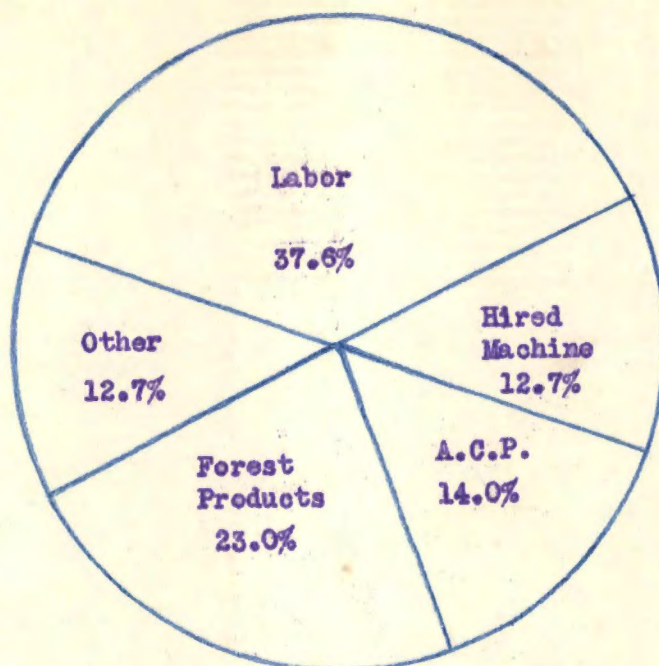


Figure 7. Percentage Distribution of Other Sources of Income, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table IX.

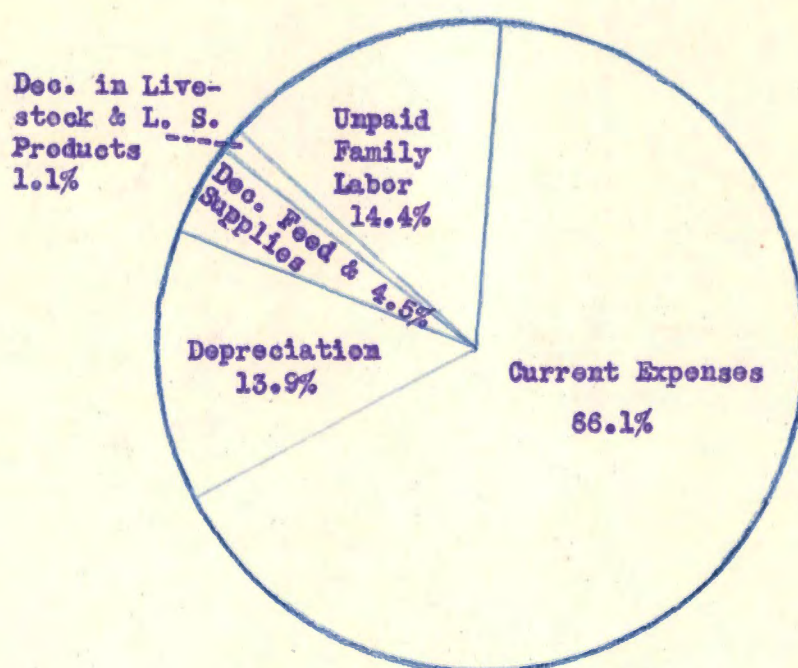


Figure 8. Percentage Distribution of Expenses, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table X.

a decrease of livestock and livestock products on some of the farms, but this amounted to very little compared to the increase found on the remainder of the farms.

Financial Statement

Cash farm income in 1939 for the State was slightly below that of 1938 and of 1940, and 13 percent below 1937.⁽¹³⁾ Prices of most farm commodities were below average in 1939, but the crop yields were about normal, except for a higher fruit yield.⁽¹⁴⁾

TABLE XI. FINANCIAL STATEMENT, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

	Average Value per Farm	
Gross receipts	\$637	
Total expenses	375	
Farm income		262
Interest on average capital @ 5%	149	
Labor income		113
Value of perquisites	313	
Labor earnings		426

The farm income obtained by subtracting expenses from receipts, averaged \$262 per farm (Table XI). This represents the amount left to

(13) Marsh, S. T., Agricultural Marketing Service, U.S.D.A. cooperating with University of Tennessee, Knoxville, 1941.

(14) Yields of crops and price of farm commodities applies to Tennessee.

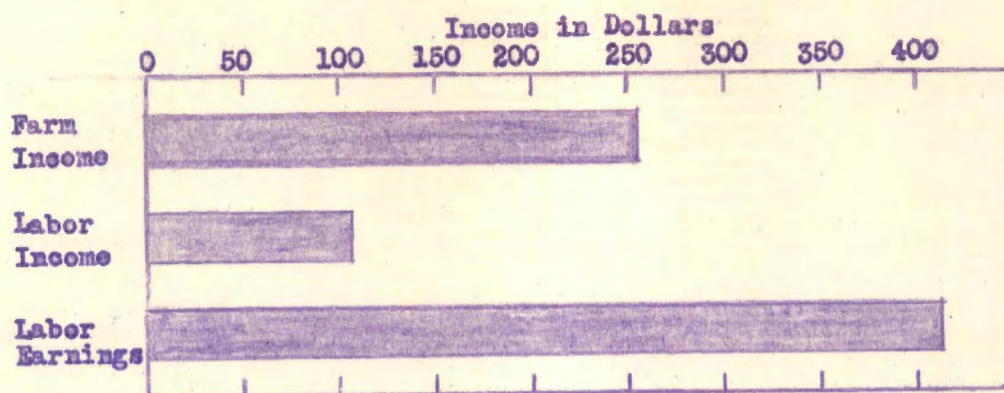


Figure 9. Average Income of 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XI.

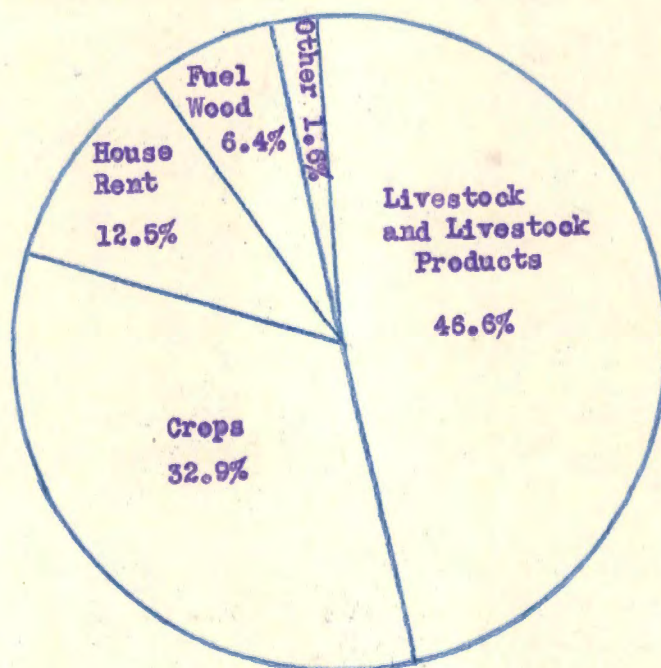


Figure 10. Percentage Distribution of Sources of Perquisites Values, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XII.

the operator as payment for his labor, management and use of his capital. Interest on investment when calculated at 5 percent amounted to \$149 per farm. The remainder of the farm income, after the interest on investment was subtracted, was the amount left for operator's labor and management, called labor income. Labor income was \$113 per farm (Figure 9).

When perquisites, valued at \$313, were added to labor income the average labor earnings was found to be \$426 per farm. Total value of perquisites was \$51 greater than the farm income.

Value of Perquisites

Perquisites are the items produced on the farm and used by the family. The value of these items was \$313 per farm. Livestock and livestock products supplied the family with an average of \$146 of food per

TABLE XII. VALUE OF PERQUISITES, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Source	Average Value per Farm	Percent of Total
Total value of perquisites	\$313	100.0
Livestock and livestock products	146	46.6
Crop	103	32.9
House rent	39	12.5
Fuel wood	20	6.4
Other	5	1.6

farm (Table XII). Crops ranked next to livestock, almost 1/3 of the value of items used by the family being furnished by crops. House rent averaged

\$39 per farm, approximately double the value of fuel wood.⁽¹⁵⁾ Livestock and livestock products plus crops constituted 79.5 percent of the total value of the perquisites (Figure 10). Other perquisites, mostly honey, averaged \$5 per farm.

(15) House rent was calculated at 10 percent of the value of the house, except for houses valued less than \$100, where 12 percent was applied. Fuel wood was valued on the basis of sale value cut and corded on the farm.

CHAPTER III

RELATION OF SOILS TO CROP YIELDS

Description of Soils

General Description. - Most of the soils of the 93 upland farms are in three general groups, upland, bottomland, and colluvial soils. The upland soils constitute most of the acreage. They were derived from marble, limestone, dolomite, shale, and Tellico sandstone. Very few of the soils are derived from high grade limestone.⁽¹⁾ There are no river bottoms in the sample farms. All of the bottomland on these farms lie in narrow strips along small streams, and have been washed down from the slopes above. The soils are all of different kinds of loams as follows: cherty, gravelly, sandy, silt, and clay loams. They are mostly of medium to low productivity.

Soil Slope. - Soils were divided into five different slopes, A, B, C, D, and E. The limits of the various slope classes were largely based on the relative rate of surface run-off, and the degree of resistance offered by slope to the use of farm machinery used in tillage and harvesting operations. These slopes represent the following degree of

(1) Mooers, C. A., Soils of Tennessee, Agricultural Experiment Station, Circular No. 5, Knoxville, Tennessee, April 1932.

(2)
steepness:

A slope	0 - 2 percent
B slope	2 - 7 percent
C slope	7 - 15 percent
D slope	15 - 30 percent
E slope	Over 30 percent

Land Class. - Soils were divided first into three divisions - cropland, pasture land, and forest land. Cropland was then subdivided into three classes which makes a total of five, namely: first class cropland, second class cropland, third class cropland; fourth class pasture; and fifth class forest. The main characteristics used for land classification were soil type, slope, erosion, stoniness, and depth. Soil type includes the physical, chemical, and biological internal characteristics of soils. In the first three classes the soils were allocated according to degree of natural productivity and adaptation to important prevailing crops of the region. (5)

Soils of Land Class I have hardly any objectionable characteristics.

Soils of Land Class II have one or more objectionable characteristics such as natural poverty of plant nutrients, scarcity of organic matter, severe leaching, unfavorable physical properties, and objectionable conditions of stoniness and erosion.

(2) Soils of Roane County were studied, classified and mapped by joint effort of Tennessee Agricultural Experiment Station, Tennessee Valley Authority, and U. S. Bureau of Plant Industry, Knoxville, Tennessee. Data unpublished.

(3) Ibid.

Soils of Land Class III are in this class due to greater development of one objectionable feature or some development of a greater number of objectionable features than in any soil of Class I or II, but less than any soils of the pasture or forest group.

Soils of Land Class IV have extreme development of one or more objectionable characteristics which make this land class best suited only for pasture or forest. These soils are allocated to pasture use rather than forest as they are characterized by at least moderate natural fertility and moderate to high moisture content.

Soils of Land Class V have low fertility, low moisture content and many other extreme objectionable characteristics which make the land suited only to forest.

Soil Type. - To better understand the relation of land class to crop yields on the farms studied, it is desirable to know the soil types in each land class. The soil types included in each land class are as follows: (4)

Land Class I - Cropland

None found on these farms

Land Class II - Cropland

Dewey silty clay loam

Pope very fine sandy loam

Allen very fine sandy loam

Greendale silt loam

Talbott silty clay loam, smooth phase

(4) Ibid.

Land Class III - Cropland

Philo very fine sandy loam
 Pope gravelly fine sandy loam
 Talbott silty clay loam
 Clarksville cherty silt loam
 Clarksville cherty silt loam, smooth phase
 Colbert silt loam
 Allen very fine sandy loam, slope phase
 Fullerton cherty silt loam
 Fullerton cherty silt loam, eroded phase
 Roane gravelly loam
 Apison very fine sandy loam
 Jefferson gravelly fine sandy loam
 Jefferson gravelly fine sandy loam,
 slope phase

Land Class IV - Pasture

Colbert silt loam, slope phase
 Colbert silty clay loam
 Upshur silty clay loam, valley phase
 Clarksville cherty silt loam, hill phase
 Fullerton cherty silt loam, hill phase
 Rolling stony land (Colbert and Talbott
 soil material)

Land Class V - Forest

Lebew stony fine sandy loam
 Apison very fine sandy loam, eroded phase
 Apison very fine sandy loam, eroded slope phase
 Rough gullied land (Apison soil material)
 Fullerton cherty silt loam, steep phase
 Fullerton cherty silt loam, eroded hill phase
 Rough gullied land (Fullerton soil material)
 Clarksville cherty silt loam, steep phase
 Clarksville cherty silt loam, eroded hill phase
 Talbott silty clay loam, hill phase
 Rough stony land (Talbott soil material)
 Hanceville stony fine sandy loam
 Armuchee silt loam, hill phase

As previously mentioned, there was no Land Class I on the upland farms; hence crop yields could not be obtained on these lands. Not all of the soil types on the farms were included in the land classes studied

for the following reasons: crops were not grown on some soil types; yields were not given for a number of fields; some fields, even though in a particular land class, were not included, inasmuch as they were composed of more than one soil type; and for certain cases only unfertilized fields were used.

Factors Other Than Soils Affecting Crop Yields and Disturbing
the Relationship of Soils to Crop Yields

Weather Conditions. - A discussion of climate and weather conditions is included in this chapter with the hope that it will help the reader in interpreting the relation of soil slope and land class to yields. It is definitely known that climate is an important factor in crop yields and that a change in weather may change the relationship of soils to crop yields. A good illustration of this is a sandy soil which usually yields the most in years of high rainfall, while other soils of poor drainage may yield more in years of below average rainfall. Thus the relation of soils to crop yields may change from year to year.

The nearest weather station to Civil District 4 is at Loudon, Tennessee, where the average annual temperature in 1939 was 61.1° Fahrenheit or 2.5° above an average temperature of 50 years (Table XIII). The average monthly temperature for 1939 was above the average for the period 1889-1938, except during April and November (Figure 11). The temperature in 1939 averaged 5.6° Fahrenheit higher during the growing

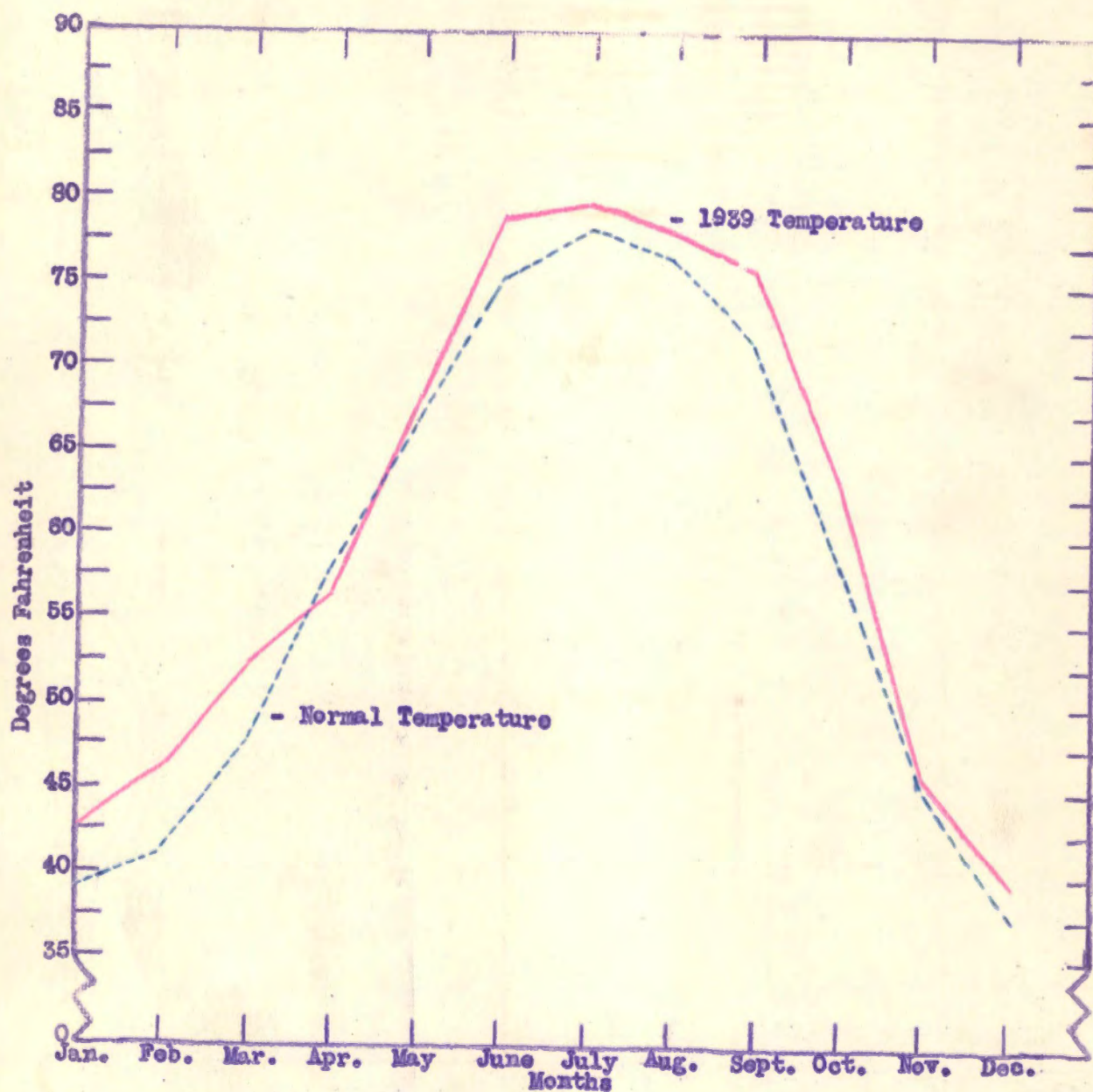


Figure 11. Average Temperature by Months for Year 1939 Compared With Average Monthly Temperature of Period 1889-1938, Loudon, Tennessee

Source: Table XIII.

season than the ideal temperature for corn. For this reason a corn yield lower than normal would be expected in 1939. The mean temperature in 1939 was above 75° in the months of June, July, August, and September. According to Wallace and Bressman a mean temperature of more than 75° Fahrenheit for the month of June is exceedingly hot and years of hot Junes are usually years of below average corn crops.⁽⁵⁾ Temperature above 75° in the summer months nearly always lowers corn yields because such temperature causes corn plants to transpire water more rapidly than they can take it up from the ground.

TABLE XIII. AVERAGE MONTHLY TEMPERATURES FOR YEAR 1939 COMPARED WITH THE 50-YEAR MONTHLY AVERAGE, 1889 - 1938, LOUDON, TENNESSEE

Month	Degrees Fahrenheit	
	1939	Average 1889 - 1938
January	42.6	38.9
February	46.4	41.2
March	52.4	47.5
April	57.0	58.2
May	67.9	66.8
June	78.7	75.6
July	80.1	78.9
August	78.4	77.2
September	76.7	72.2
October	64.0	59.4
November	47.0	48.0
December	41.8	39.8
Average annual temperature	61.1	58.6

Source: U. S. Weather Bureau

(5) Wallace, H. A., and Bressman, E. N., Corn and Corn Growing, Chapter XXIV, John Wiley & Sons, Inc., New York, 1937.

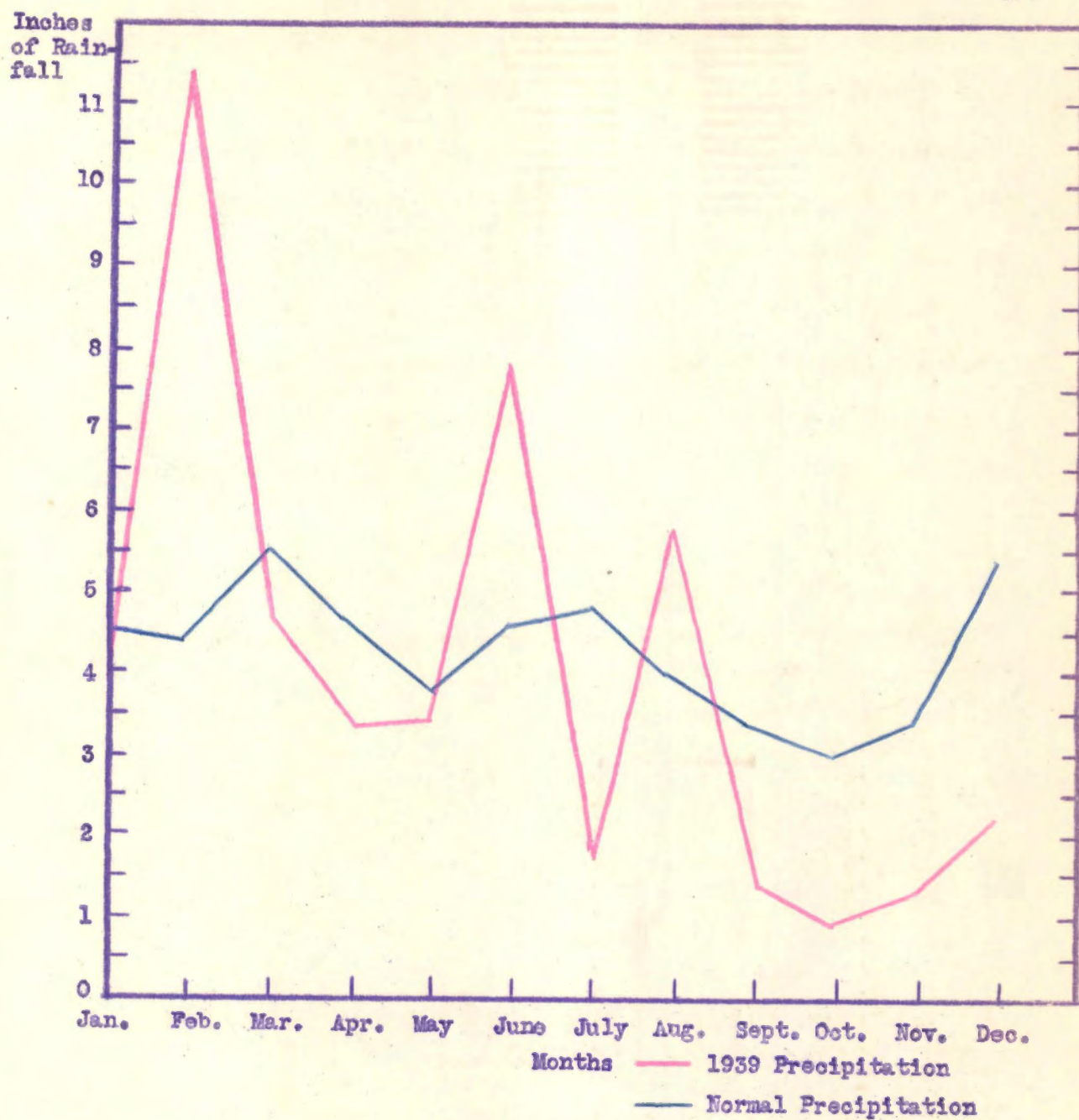


Figure 12. Monthly Precipitation for Year 1939 Compared With Average Monthly Precipitation for Period 1889-1938, Kingston, Tennessee

Source: Table XIV.

The growing season lasted 210 days at Loudon in 1939. The last frost in the spring was April 8 and the first in the fall was November 4. Since the average length of growing season over the period 1889-1938 was 192 days, all crops in 1939 should have had plenty of time to mature. (6)

Precipitation in terms of inches of rainfall is reported both at Kingston and at Loudon, Tennessee. These towns are near Civil District 4. Since there is a large variation in precipitation, even within small areas in East Tennessee, the precipitation at the two towns is given. The annual precipitation in 1939 at Kingston was approximately 2 3/4 inches below the average of the period 1889-1938, while at Loudon it was almost four inches below the 50-year average

TABLE XIV. MONTHLY PRECIPITATION FOR YEAR 1939 COMPARED WITH AVERAGE MONTHLY PRECIPITATION FOR 50-YEAR PERIOD 1889-1938, LOUDON AND KINGSTON, TENNESSEE

Month	Inches of Rainfall*			
	Kingston		Loudon	
	1939	Average 1889-1938	1939	Average 1889-1938
January	3.94	4.55	4.34	4.38
February	11.59	4.41	12.32	4.36
March	4.73	5.30	6.20	5.03
April	3.40	4.62	3.34	4.62
May	3.46	3.82	1.15	3.77
June	3.02	4.62	6.52	4.57
July	1.79	4.89	3.19	4.33
August	5.80	3.95	2.43	4.44
September	1.39	3.33	1.27	3.38
October	0.94	3.02	0.75	3.13
November	1.33	4.45	2.71	3.44
December	2.26	5.43	2.23	5.02
Annual pre- cipitation	48.65	51.42	47.11	51.08

* Precipitation expressed in inches of rainfall.

Source: U. S. Weather Bureau.

(6) U. S. Weather Bureau.

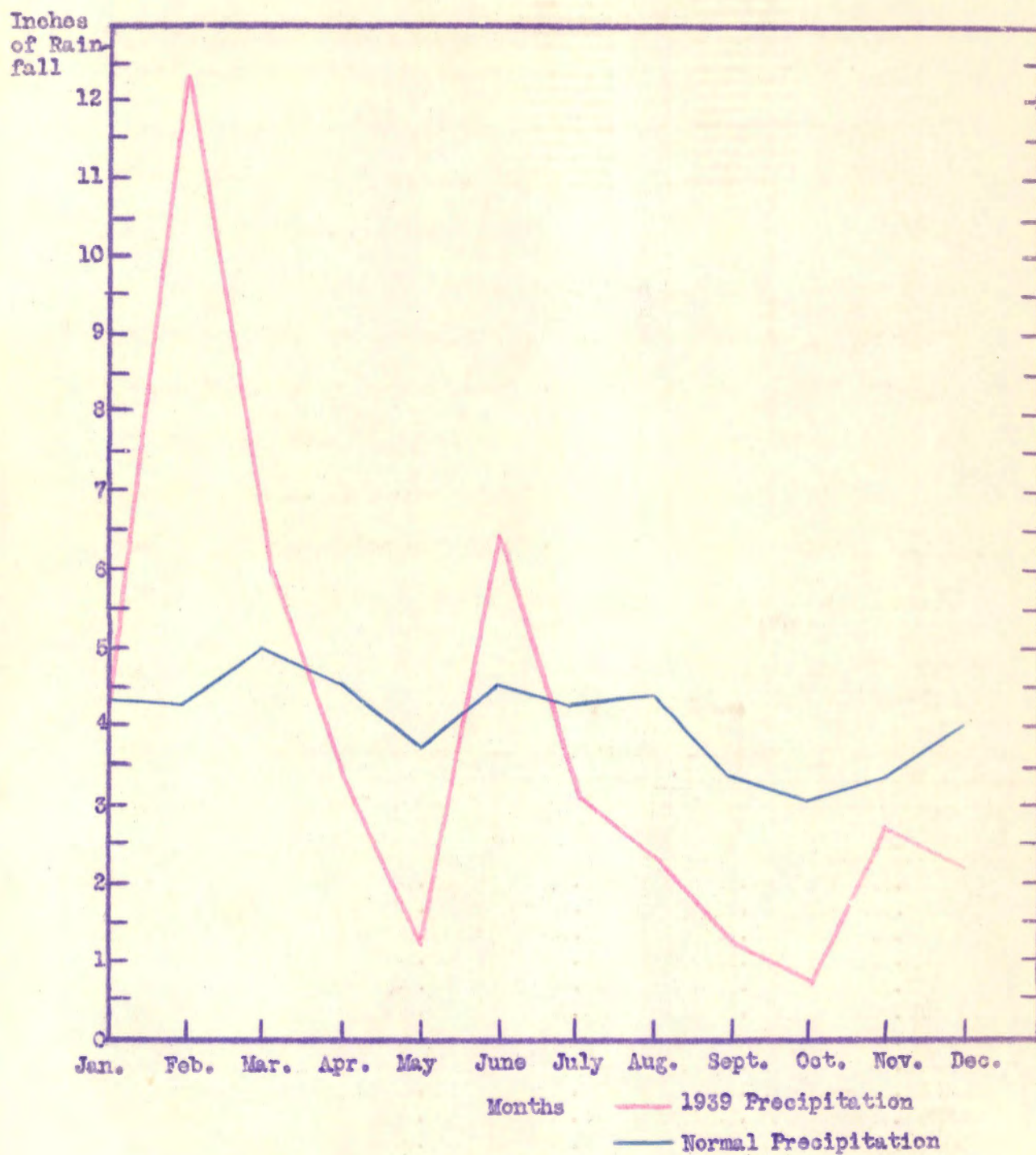


Figure 13. Monthly Precipitation for Year 1939 Compared With Average Monthly Precipitation for Period 1889 - 1938, London, Tennessee

Source: Table XIV.

(Table XIV). The monthly precipitation in 1939 at Kingston was above the 1889-1938 average only in February, June, and August. The rainfall was below average during the remainder of the year (Figure 12). The precipitation was above average only during the months of February, March, and June at Loudon (Figure 13). Looking at the situation another way the 1939 rainfall at Kingston was 2.7 inches below the ideal for corn in July while at Loudon it was below the ideal during all the summer months, except June. It is estimated that in the corn belt for each inch of July rainfall below four inches the yield of corn is reduced by two bushels per acre. (7)

In contrast with the year 1939 the normal rainfall and temperature for this area approximated the ideal for corn. Since the rainfall in 1939 was below and the temperature above the 50-year average, a reduction in yield of corn would be expected in 1939 and also probably a reduction in yield of some of the other crops. This difference in crop yields between 1939 and normal was not uniform on all land classes or slopes. It is probable that yields on gravelly and cherty soils were depressed more than others for the one year.

Fertilization and Tillage Practices. - No attempts were made to determine the direct effects of lime, manure, crop rotation and

(7) Op. cit., Chapter XXIV.

tillage practices on crop yields on these farms. But many studies have shown that fertilization and tillage practices do affect crop yields. These practices, unless uniform, will disturb the relation of soils to crop yields. An attempt was made to determine the relation of soils with and without fertilizers to crop yields, but there were not enough fields to give a representative sample.

The average yields of corn in 1939 on unfertilized fields of the 93 upland farms was 18.8 bushels per acre compared with an average yield of 27 bushels per acre on the fertilized fields.

In relating land class and slope to crop yields, the effects of tillage practices on crop yields could not be eliminated as no data were available on these practices. Fertilizer data on 1939 crops were available and in relating land class to 1939 crop yields either only unfertilized or fertilized fields (includes lime and manure) were used.

Soil Slope As a Factor in Crop Yields

In comparing slopes of varying degrees of steepness to crop yields normal corn yields were used. For crops other than corn, data were obtained only for the year 1939; hence there were too few fields of any crop to give representative yields on each slope within the same soil series. Normal yields were obtained for corn on all fields that the farmers had known for a number of years. ⁽⁸⁾

(8) Normal yield is the usual yield in this study. The yields the farmers can expect to get year in and year out. There is a tendency for the farmers to give the yields as what he should get. The yields may be a little higher than what the usual yields actually are, but care was taken by the enumerator to get as accurate normal yields as possible.

After the soil types were determined,⁽⁹⁾ slope for each field was determined by use of the Roane County soil legend which shows the slope of each soil type. The fields were then segregated according to slope, and the normal corn yield per acre was computed for each.

Relation of Degree of Slope to Normal Corn Yield (All Soils). -

As the slope of the fields increased in steepness⁽¹⁰⁾ the normal yields of corn decreased (Figure 14). Slope A (0 to 2 percent slope) yielded 32.6 bushels of corn per acre, yielding 7.4 more bushels per acre than any other slope (Table XV). Slope B yielded 25.2 bushels per acre,

TABLE XV. RELATION OF STEEPNESS OF SLOPE TO NORMAL CORN YIELDS PER ACRE, 95 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE

Slope	Number of Fields	Total Acres	Average Yield per Acre (Bushels)
A (0 - 2%)	45	140.3	32.6
B (2 - 7%)	29	142.8	25.2
C (7 -15%)	70	280.8	23.4
D (15-30%)	51	183.8	18.7
E (over 30%)	10	46.7	14.2

Slope C 23.4 bushels, Slope D 18.7 bushels, and Slope E (over a 30 percent slope) yielded only 14.2 bushels per acre. There was more

(9) Procedure for determining soil types of the fields is described in Chapter I, pages 3, 4.

(10) Classification of slopes described in this chapter, page 31.

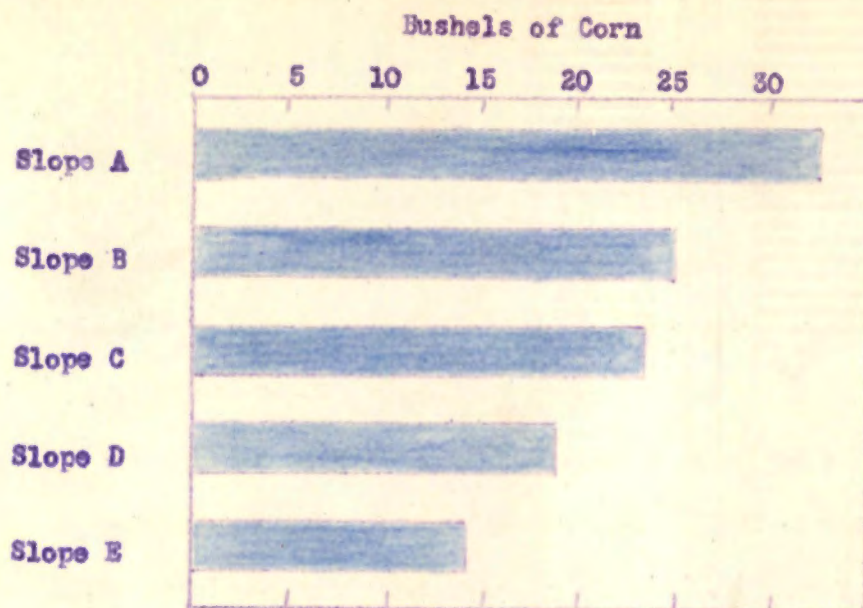


Figure 14. Normal Corn Yield per Acre by Steepness of Slope, 93 Upland Farms, Roane County, Tennessee

Source: Table XV.

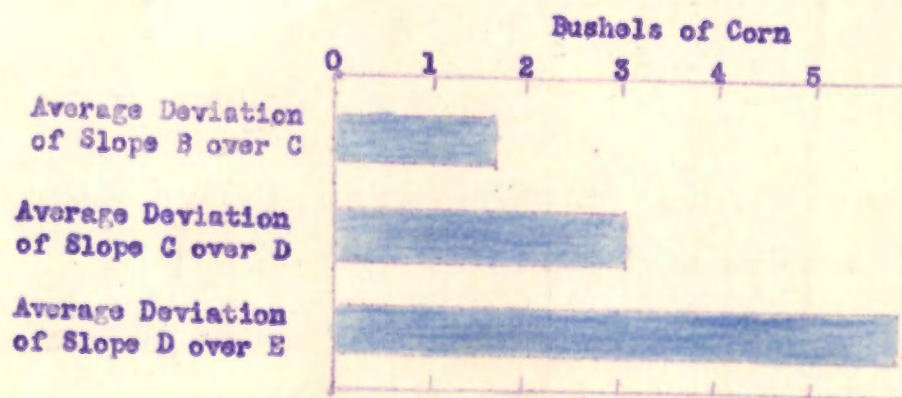


Figure 15. Average Deviation in Normal Corn Yield per Acre on Slopes of Varying Steepness*, 93 Upland Farms, Roane County, Tennessee

* Only slopes of the same soil series are compared.

Source: Table XVI.

difference in normal yields of corn per acre between Slope A and B than between any two successive slopes. There were only 10 fields with an E slope which may not be enough fields to be representative.

The above discussion presents the relationship found between slope and yield of corn. However, it should be remembered that not all the differences can be attributed to slope alone. The fields in slopes of less than two percent, for example, are composed almost entirely of Philo and Pope, none of which are found on the hillsides. It therefore seems desirable to inquire into yields produced on fields of the same soil series but of different slopes.

Deviation of Slopes of the Same Soil Series in Normal Corn Yields. - To more accurately ascertain the effect of slope on yields, only those soils were compared that were similar in all respects except slope. In doing this Talbott, Allen, Fullerton, Clarksville, Colbert, Apison, Hanceville and Lehigh were the only series for which normal yields were reported for more than one slope. The A slopes could not be compared with B slopes by this procedure, since not enough fields had the two slopes in the same soil series. The procedure used can be illustrated in comparing B with C slopes. In this case 4.9 acres of Talbott on a B slope produced 12.0 bushels more corn per acre than did the same acreage of Talbott on a C slope. Therefore the difference in total production of the 4.9 acres of B slope and the same acreage of C slope equals 58.8 bushels. Likewise 45.8 acres of Allen produced 9.3

bushels more per acre on a B slope. Soils of the Clarksville, Colbert and Apison series all yielded somewhat less on a B than on a C

(11) slope. When all yields were calculated for the soil series reported in both B and C slopes, there were 130.7 acres of land on a B slope which yielded 201.9 bushels more of corn than did the same acreage of the same soils of C slope. Therefore the average yield of B over C slope was 1.55 bushels per acre.

TABLE XVI. DEVIATION IN NORMAL CORN YIELDS PER ACRE ON SLOPES OF VARYING STEEPNESS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE

Slopes *	Average Deviation per Acre in Bushels of Corn
B over C	1.55
C over D	2.95
D over E	5.82

* Only slopes within the same soil series were compared.

Soils on C slope yielded 2.95 bushels more of corn per acre than similar soils on D slope, while the yields of D over E were 5.82 bushels per acre. It is thus seen that deviations in normal corn yields are more pronounced on the steeper slopes. While the data are not conclusive, indications are that, except for the more erosive soils, degree of slope does not seriously reduce the corn yields as long as the slopes are no steeper than 15 percent.

(11) It is possible that drainage is a factor inhibiting yields on level land of such soils as Colbert which has a tight subsoil.

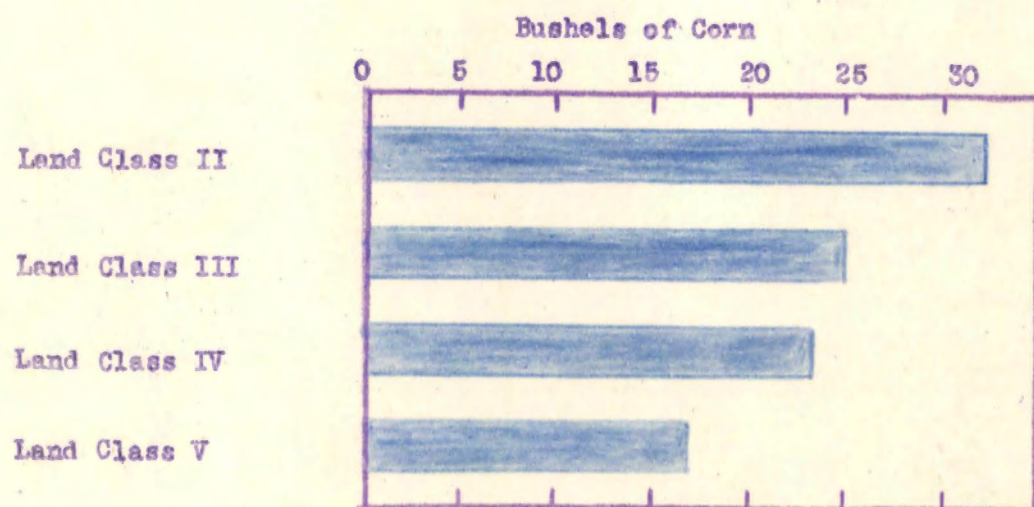


Figure 16. Normal Corn Yields per Acre by Land Class, 93 Upland Farms, Roane County, Tennessee

Source: Table XVII.

Land Class as a Factor in Crop Yields

In studying relationships of land class⁽¹²⁾ to crop yields the estimated normal yield of corn was used along with 1939 yields for corn, lespedeza, and tobacco. Other crops such as wheat, oats, barley, and potatoes were not grown widely enough to give a representative sample. Yields per acre for each land class were established by identifying each field on the soil survey map of Roane County described earlier.

Normal Corn Yield by Land Class. - Land Class II was first in normal yields of corn per acre followed by Class III, Class IV, and Class V respectively (Figure 14). Class II yielded approximately 32 bushels of corn per acre, or 7.3 more bushels per acre than Class III (Table XVII). There was more difference in normal corn yield per acre between Class II and Class III than between Classes III and IV, or Classes IV and V. Class III yielded only 1.8 bushels more of corn

TABLE XVII. RELATION OF LAND CLASS TO NORMAL CORN YIELDS PER
ACRE, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY,
TENNESSEE

Land Class	Number of Fields	Total Acres	Average Yield per Acre (Bushels)
II	41	148.9	31.9
III	81	303.2	24.6
IV	45	162.9	22.8
V	38	179.1	16.4
Total 4 classes	205	794.1	23.7

(12) Soil types included in each land class, together with a general description of each class, are presented on page 33.

per acre than did Class IV. Land Class V yielded only 16.4 bushels of corn per acre which is about one half the yield of Class II. The average normal yield per acre for the 4 classes was 23.7 bushels of corn. Classes III and IV yielded very close to the average of all classes. It is interesting to note that the estimated normal corn yields were 3.8 bushels per acre greater than the 1939 yield on all farms.

Corn Yields in 1939 by Land Class. - The average yield per acre for corn on the 93 upland farms was 19.9 bushels in 1939. In relating land class to 1939 corn yields only unfertilized fields were used. The average yield of corn for all land classes on the unfertilized fields was 18.8 bushels per acre.

Land Class II yielded 25.6 bushels per acre, or 10.4 bushels more than Class V, and approximately five bushels more than any other land class (Table XVIII). Class III yielded 18.5 bushels of corn per

TABLE XVIII. RELATION OF LAND CLASS TO ONE YEAR CORN YIELD
PER ACRE, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE
COUNTY, TENNESSEE

Land Class	Number of Fields *	Total Acres	Average Yield per Acre (Bushels)
Class II	12	40.6	25.6
Class III	52	144.0	18.5
Class IV	33	116.4	20.7
Class V	47	123.1	15.2

* No fertilizer, manure, or lime applied on these fields in 1939.

acre which was 2.2 bushels less than Class IV, which is generally considered less productive. Class IV yielded 20.7 bushels of corn per acre, and Class V yielded 15.2 bushels. There was more difference between Classes II and III in yields of corn per acre than between Classes III and IV, or Classes IV and V (Figure 17). The 1939 corn yields differed from normal yields, when Class III outyielded Class IV by 1.8 bushels. The reason for Class IV lands outyielding Class III in 1939 may have been due to seasonal conditions prevailing that year, when rainfall in this area was slightly below normal and temperatures slightly above. The rainfall was especially low in July, which is a critical period for corn.

Class III soils were mostly of gravelly, cherty and stony texture and less retentive of moisture than the finer soils. Only four out of twelve soil types were of fine texture. On the other hand one half of the soil types included in Class IV were silt loams or silty clay loams.

Lespedeza Yields in 1939 by Land Class. - Only unfertilized fields were used in relating land class to lespedeza yields. This made the number of fields to give a representative sample rather small, especially for Class V (Table XIX).

Land Class II yielded 1.01 tons of lespedeza per acre. Land Class III yielded .75 tons per acre, Class IV .81 tons, and Class V .41 tons. Approximately the same relation was shown between land class and lespedeza yields as was true for corn yields. Class IV

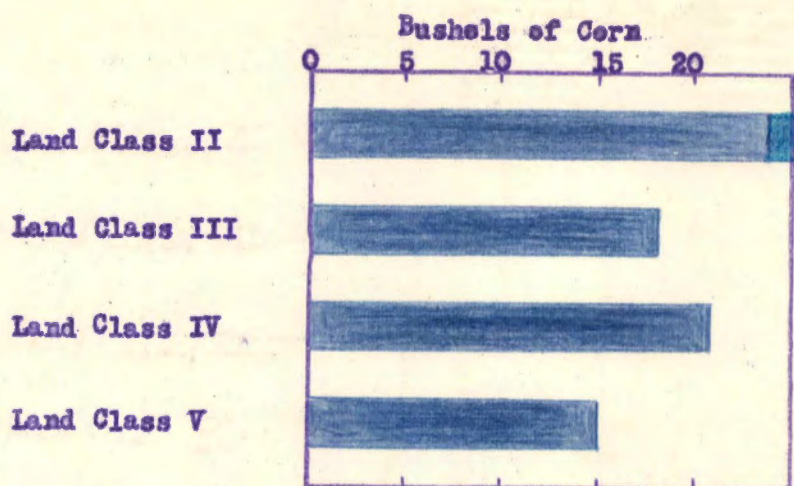


Figure 17. One Year Corn Yields per Acre by Land Class,
93 Upland Farms, Roane County,
Tennessee, 1939

Source: Table XVIII.

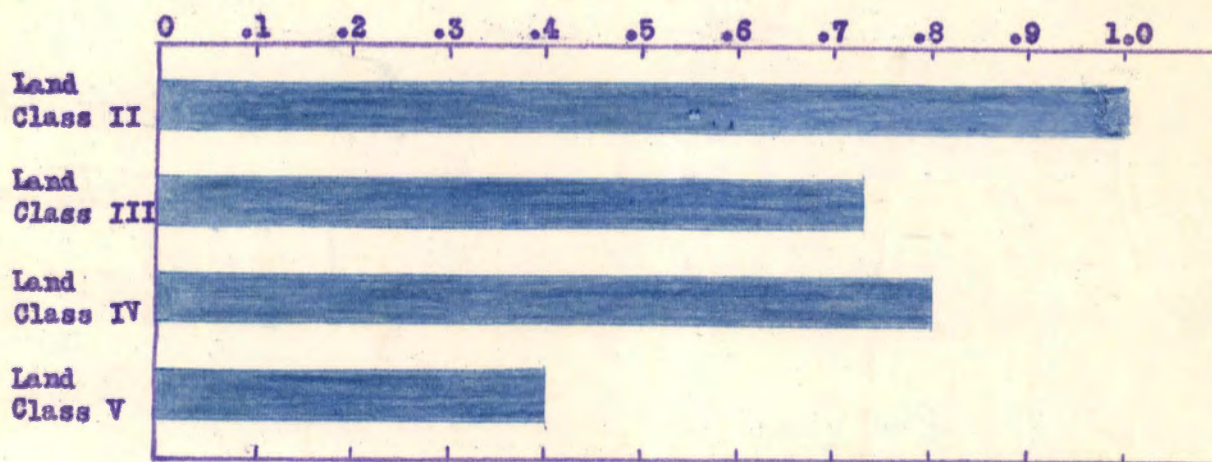


Figure 18. One Year Lespedeza Yields per Acre by Land Class,
93 Upland Farms, Roane County,
Tennessee, 1939

Source: Table XIX.

yielded more lespedeza per acre than Class III, and Class V yielded the least of all classes (Figure 18).

TABLE XIX. RELATION OF LAND CLASS TO ONE YEAR LESPEDEZA
YIELDS PER ACRE, 93 UPLAND FARMS, CIVIL DISTRICT 4,
ROANE COUNTY, TENNESSEE,
1939

Land Class	Number of Fields*	Total Acres	Average Yield per Acre (Tons)
II	15	50.1	1.01
III	25	115.1	.75
IV	11	55.7	.81
V	6	33.7	.41

* No fertilizers, manures, or lime applied on these fields in 1939.

Tobacco Yields in 1939 by Land Class. - Fertilized and unfertilized fields were included in relating land class to tobacco yields as almost every field has an application of manure or fertilizer. The number of acres in each land class was small, but the yields of tobacco are accurate as the farmers had the poundage sold (Table XX).

Tobacco yields on the 93 farms were larger per acre than for the state. The land classes ranked in order of yield of tobacco the same as they did in the annual corn and lespedeza yields (Figure 20). Class II yielded 1320 pounds of tobacco per acre, Class III 1067 pounds, Class IV 1155 pounds, and Class V 1009 pounds. Class V yielded the least pounds of tobacco per acre, but this was 49 pounds per acre above the 1939 state average yield (Table XX). The least amount of fertilizer was used on Land Class II and the most on Class III, which was 515

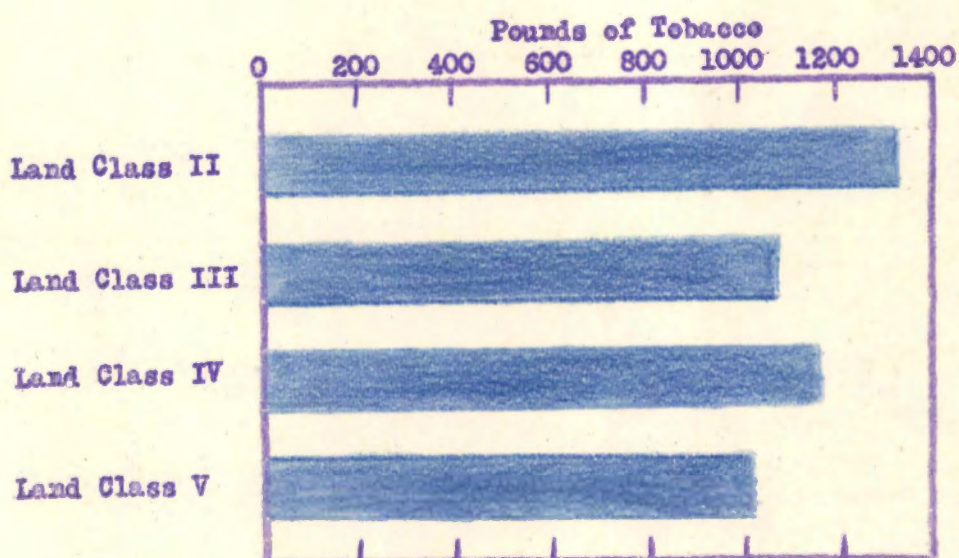


Figure 19. One Year Tobacco Yields per Acre by Land Class, 93
Upland Farms, Roane County, Tennessee,
1939

Source: Table XX.

pounds per acre. The exact amount of manure applied per acre could not be obtained.

The relative difference between land classes in yields of tobacco per acre is not as great as for corn or lespedeza. This may be due to the use of more fertilizers, manure, and labor in the production of tobacco. Also inaccuracies that can result in classifying small fields into certain land classes may have occurred.

TABLE XX. RELATION OF LAND CLASS TO ONE YEAR TOBACCO YIELDS
PER ACRE, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE
COUNTY, TENNESSEE, 1939

Land Class	Average Pounds of Fertilizer Applied per Acre	Number of Fields *	Total Acres	Average Yield per Acre (Pounds)
II	383	14	4.7	1320
III	515	46	19.0	1067
IV	459	12	6.2	1155
V	427	23	10.3	1009

* Includes fertilized and unfertilized fields.

CHAPTER IV

RELATION OF AGE AND TENURE TO LABOR EARNINGS

Labor earnings was chosen as the most satisfactory measure of relative profitableness in this study.⁽¹⁾ This measure is more satisfactory than either farm income or labor income where the type of farming is mostly self-sufficing. Farm income and labor income measure only receipts above expenses and inventory changes. These may require only a small fraction of the labor expended on a self-sufficient farm. On this type of farm most of the labor is spent in producing food, fuel, and shelter for use by the family. Labor earnings including cash income plus items used by the family most nearly represent the complete returns secured for labor on these farms. The value of perquisites on the 93 farms studied was greater than either farm income or labor income (Chapter II, page 27). So in relating various factors to the profitableness of the farms, labor earnings was used as the measure in every case, although other measures were also shown where it was felt that they contributed to clarity.

(1) Labor earnings in this study refers to labor earnings of the entire farm. (In other words what the operator labor earnings would be if the farms were owner operated.)

The farms had the following labor earnings:

3 farms with minus (-) labor earnings
10 farms with \$ 0 - 99 labor earnings
17 farms with \$100-199 labor earnings
16 farms with \$200-299 labor earnings
13 farms with \$300-399 labor earnings
8 farms with \$400-499 labor earnings
4 farms with \$500-599 labor earnings
12 farms with \$600-699 labor earnings
10 farms with \$700 & up labor earnings

Labor earnings varied from a minus \$407 to a plus \$3,204. Five farms were above \$1000 in labor earnings, two had labor earnings of between \$1000 and \$2000. The labor earnings of the farms with minus earnings were -\$407, -\$92, and -\$4.

In relating the various factors to labor earnings computations were based on the entire farm business rather than on an operator basis unless otherwise stated.

For the first factor related to labor earnings, median, arithmetic mean, bar chart, and scatter diagram of labor earnings are presented to show the procedure used in analyzing the relation of a specific factor to labor earnings. For each succeeding factor only the arithmetic mean and bar chart were shown, unless the median or scatter diagram indicated different results. In those cases either the median is mentioned or the scatter diagram is substituted for the bar chart. The arithmetic mean is spoken of as the average in this study.

Unequal class intervals had to be used for certain factors in determining relationships to labor earnings.

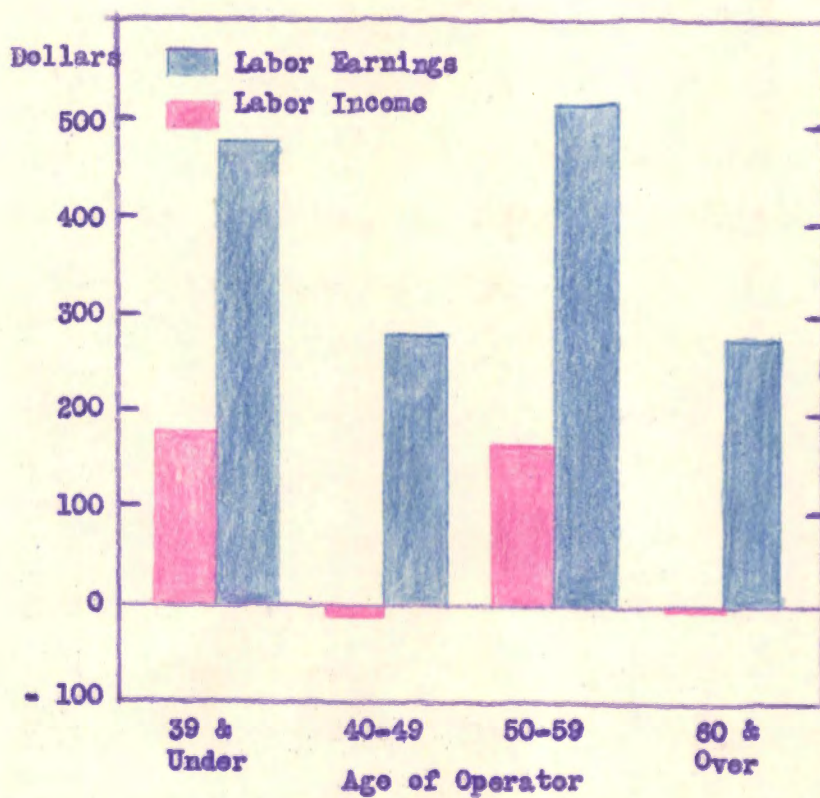


Figure 20. Relation of Age of Operator to Labor Income, and Labor Earnings, 76 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXI.

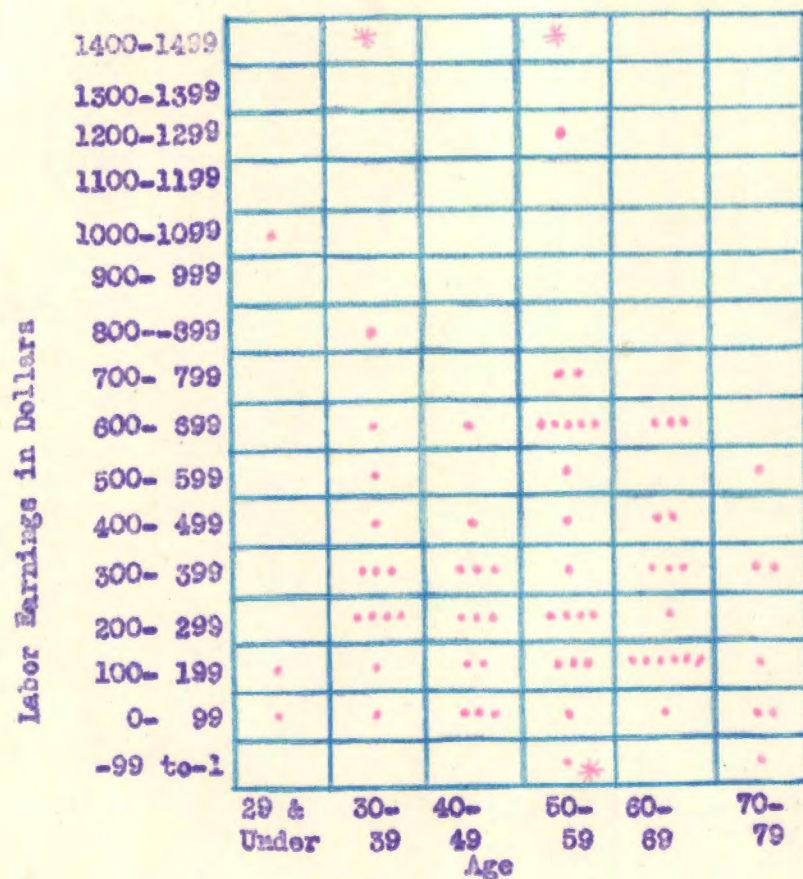


Figure 21. Labor Earnings by Age of Operator,
76 Upland Farms, Roane County, Tennessee,
1939

- Labor earnings of one farm.
- * Value of labor earnings too low or too high to be shown on chart.

Source: Surveys of 93 upland farms.

Age

There appeared to be little relationship between the age of operator and financial returns (Figures 20 and 21). The youngest operators with labor earnings averaging \$475 had the second highest income of any age group. Operators with ages of 40 to 49 had an average labor earnings of \$277, approximately the same as the operators of 60 years of age and over. The farmers from ages of 50 to 59 had an average labor earnings of \$509 (Table XXI).

TABLE XXI. RELATION OF AGE OF OPERATOR TO LABOR EARNINGS,
76 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY,
TENNESSEE, 1939

Age	Number* of Farms	Average Age	Average Total Invest- ment	Average Other Sources of In- comes	Average Labor Income	Average Labor Earnings	Median Labor Earnings
39 & under	17	32	\$3036	\$209	\$176	\$475	\$314
40-49	14	45	2341	124	-14	277	270
50-59	22	55	4195	183	168	509	412
60 & over	23	67	2668	105	- 6	279	261

* Only 76 operators reported their ages.

It appears that age was of less importance in determining labor earnings in this area than were some other factors. Farmers with ages ranging from 50 to 59 years having the highest labor earnings had also the greatest investment per farm. The investment averaged \$4195 per farm

in this group. At the same time those farmers ranging in age from 40 to 49 years and having the lowest labor earnings as a group had an investment per farm of only \$2341, or the lowest investment of any age group. Farm people during the ages of 40 to 50 years are usually more active than from 50 to 60 years and very definitely more active than when they have passed 60 years. Operators over 60 years of age, although they had about 20 more acres of cropland per farm and a larger investment, had about the same labor earnings as those from 40 to 49 years. Slowing up of physical effort brought about by age may have caused the labor earnings of the older farmers to be as low as for the men of 40 to 49 with a lower investment.

The median labor earnings for the different age groups showed practically the same relation to age as did the arithmetic average. The median, however, was lower in each group than was the arithmetic average, because farms with extreme earnings greatly affected the average of the group.

Operators in the age group 50 to 59 years had slightly lower average labor income than the youngest operators, but they had higher labor earnings. These farmers of ages 50 to 59 probably had the largest families which caused them to put out larger gardens and to furnish more food for home use, in this way giving them larger labor earnings.

The results in this area did not agree with those found in Pennsylvania, where a definite relationship between age of operator and

financial returns was found. (2) The farm incomes of the Pennsylvania farmers decreased as they became older.

Tenure

Most of the farms are owner-operated. Only 13 of the 93 farmers were renting all their land. The tenants' average farm income was \$96, or one-third as large as the average of all 93 farms. The tenants' average labor income was \$72, or \$41 less than the average of all farms. The average labor earnings of the tenants was \$349 compared with an average of \$426 for all farms.

The tenants had fewer total acres, less acres of rotation pasture, more idle tillable land, but they had about two more acres of crops, and approximately six more acres of Classes II and III land cleared than the owner-operated group.

Studies in the corn belt have shown that tenants in those areas have larger incomes than owners. In other areas such as Tennessee and the cotton belt of the south, studies have shown that owners usually have the largest incomes.

(2) McCord, J. E., Farm Practices and Management in Central Pennsylvania, Pennsylvania Agricultural Experiment Station, Bulletin 379, p. 86, 1939.

CHAPTER V

RELATION OF SIZE OF BUSINESS TO LABOR EARNINGS

A moderately large business is desirable for the most profitable farming. Size of farm may be measured by many factors. The following were used as measures of size in this report: total acres, acres of cropland, acres in crops, man equivalent, productive man work units, number of workstock, amount of livestock, total investment in the farm, and gross receipts. An attempt was made in this chapter to show the general relationship of size to labor earnings and to determine what measures of size are most closely related to labor earnings in this area.

Total Acres

Except for the smallest farms labor earnings increased as total acres in the farm increased (Figure 11). For farms of 74 acres and under labor earnings averaged \$290 per farm. Farms with from 75 to 124 acres averaged \$286. The farms having from 125 to 199 acres had an average labor earnings of \$569, while those with 200 acres and over averaged \$591 each.

When income was measured in terms of labor income there did not appear to be any association with total acres.

Operators of the smallest farms did more part-time work off the

farm, thereby enabling them to attain slightly higher labor earnings than were found on farms in the next larger size group (Table XXII).

TABLE XXII. RELATION OF TOTAL ACRES IN FARM TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Total Acres	Number of Farms	Average per Farm				
		Total Acres	Total Investment	Non-Farm Income	Labor Income	Labor Earnings
74 & under	27	50	\$1119	\$133	\$80	\$290
75-124	22	101	2090	60	14	286
125-199	21	162	3037	68	207	569
200 & over	23	332	5957	36	161	591

Farms of 200 acres and above had the highest average labor earnings. In this group, however, were farms with both the lowest and the highest labor earnings, the range being from \$407 to \$3204. The arithmetic average was greatly affected by two farms with high earnings. The median labor earnings of these large farms was lower than for farms ranging in size from 125 to 199 acres. Thus the median showed different results than did the arithmetic average for the same farms. The scatter diagram indicated a tendency for labor earnings to drop after farms reached about 300 acres in size. It also showed that the farms with between 200 and 299 acres of farm land had the highest labor earnings of any size.

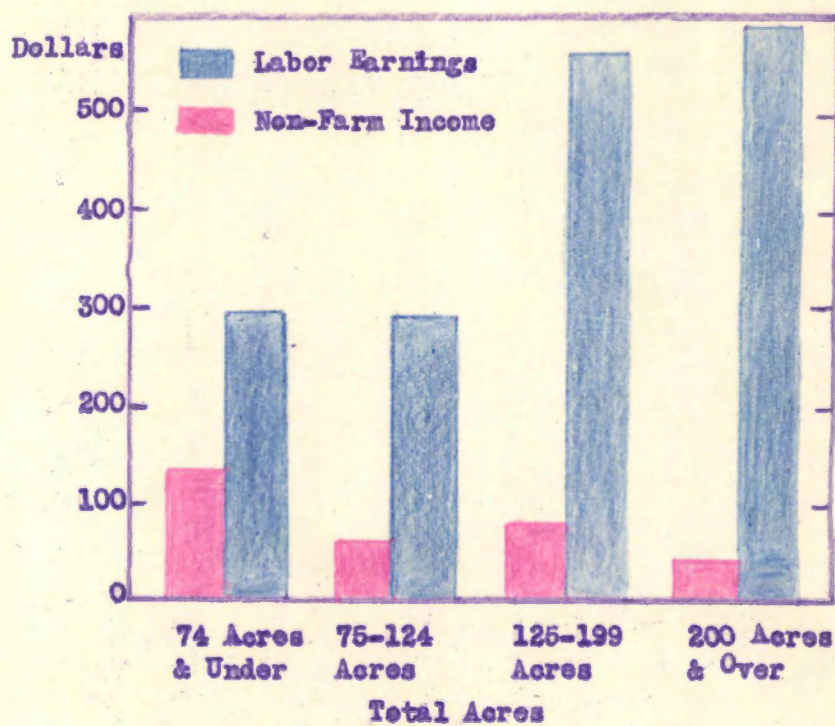


Figure 22. Relation of Total Acres in Farm to Non-Farm Income and Labor Earnings, 93 Upland Farms, Reane County, Tennessee, 1939

Source: Table XXII.

Perhaps a reason for no closer association between earnings and total land acreage is the large amount of farm woodland and idle cropland found in this area. Over half of the acreage in these farms was woodland. Thus a farm with over 300 acres of land having 250 acres in woods would be a large farm in terms of total acres, but would be a small farm in terms of productive agricultural land.

Cropland

Average acres of cropland per farm was 66.7, ranging from 5.5 to 292.3. ⁽¹⁾ A closer relationship existed between acres of cropland and labor earnings than was true for total acres (Figure 23). Labor earnings increased steadily from an average of \$270 for farms with less than 30 acres of cropland to \$632 for farms with 90 or more acres (Table XXIII). Farms with the greatest acreage of cropland were very

TABLE XXIII. RELATION OF ACRES OF CROPLAND TO LABOR EARNINGS,
93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY,
TENNESSEE, 1939

Acres of Cropland	Number of Farms	Average per Farm	
		Acres of Cropland	Labor Earnings
0 - 29.9	20	18.0	\$270
30 - 59.9	33	42.3	366
60 - 89.9	16	72.7	438
90 & over	24	136.9	632

(1) Cropland includes acres used for crops, tillable land lying idle, rotation pasture, and permanent pasture tillable.

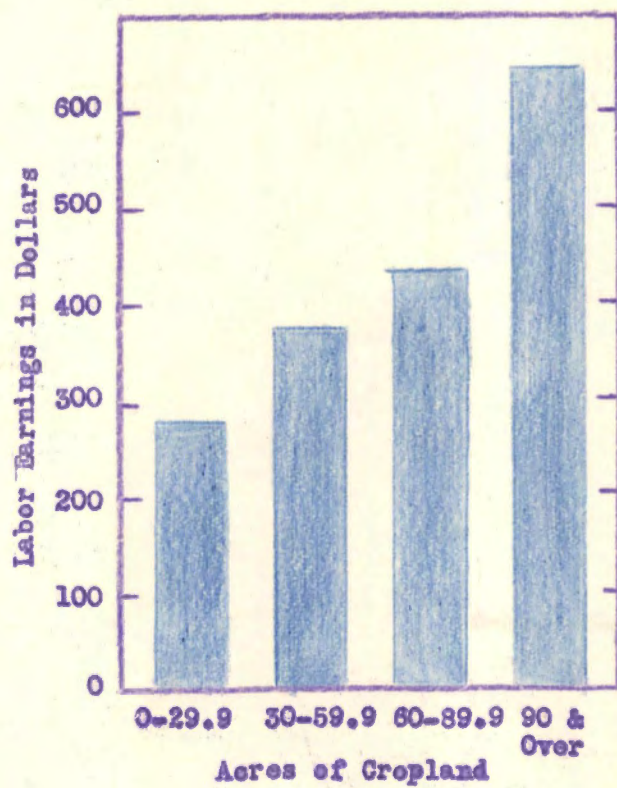


Figure 23. Relation of Acres of Cropland to Labor Earnings, 93 Upland Farms, Reame County, Tennessee, 1939

Source: Table XXIII.

irregular in labor earnings, varying from a -\$407 to \$2796 per farm. One farm with earnings of \$2796 had 224 acres of cropland. A probable reason for the low labor earnings on some of the farms was the relatively large amount of idle cropland. One farm with labor earnings of -\$407 had 113 acres of cropland, but 47 acres of this were idle.

Acres in Crops

Acres in crops on these farms averaged 34.1, ranging from 0.2 to 114.2 acres per farm.

As acres in crops ⁽²⁾ increased there was a tendency for labor earnings to increase also (Figure 24). The farmers having only 14.9 or less acres in crops were able to secure an average labor earnings of \$257 because of more work performed off the farm (Table XXIV). Farms with 15 to 29.9 acres in crops secured an average labor earnings of \$271. Farms with from 30 to 49.9 acres in crops obtained an average labor earnings of \$551, while those with over 50 acres in crops secured an average labor earnings of \$665.

As the acres in crops increased there was also an increase in total acres in the farm, total investment, and number of workstock. The farms with 14.9 acres or less in crops obtained more man work units

(2) Acres in crops is the acres used for crops. It differs from crop acres in that the latter includes double cropped acres.

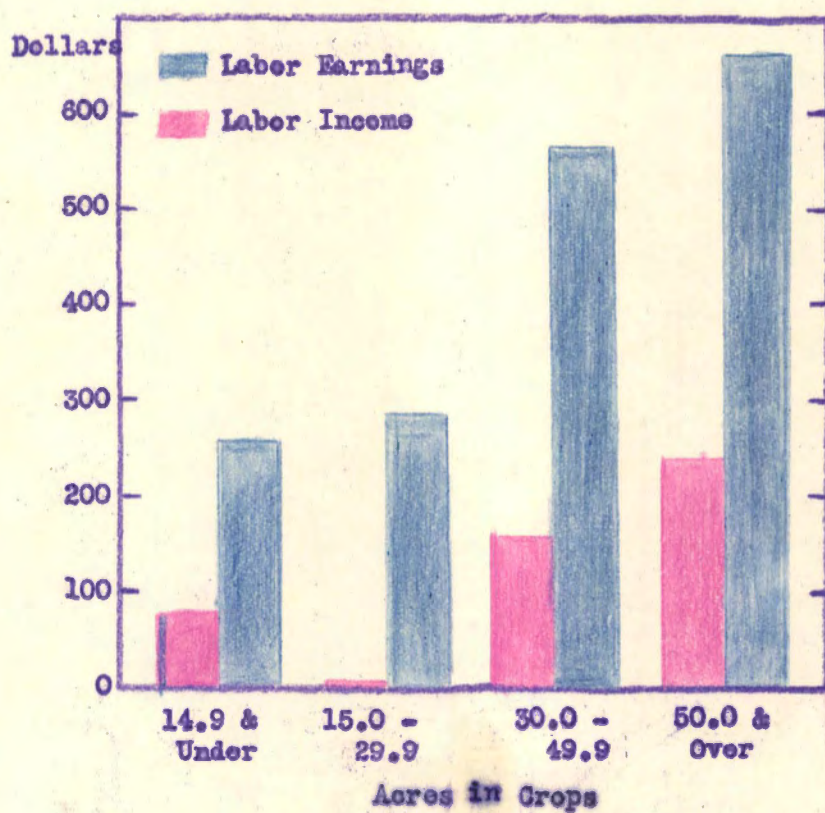


Figure 24. Relation of Acres in Crops to Labor Income and Labor Earnings, 93 Upland Farms, Reane County, Tennessee, 1939

Source: Table XXIV.

per man, larger farm incomes and larger labor incomes than did those with double the acres in crops. Farms with the largest number of

TABLE XXIV. RELATION OF ACRES IN CROPS TO LABOR EARNINGS,
93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY,
TENNESSEE, 1939

Acres in Crops *	Number of Farms	Average per Farm			
		Acres in Crops	Non-Farm Income	Labor Income	Labor Earnings
14.9 & less	26	6.9	\$128	\$89	\$257
15.0 - 29.9	24	21.0	77	3	271
30.0 - 49.9	17	37.0	55	162	551
50.0 & over	24	74.0	40	209	665

* Double cropped acreage is not included.

acres in crops did not have as great variation in labor earnings as the farms with the greatest total acres of land or acres of cropland. None of the farms having over 55 acres in crops had minus labor earnings.

Man Equivalent

Another measure of size is the average number of men used in operating the farm. This is spoken of as man equivalent. (3)

The arithmetic average of labor earnings showed an increase as man equivalent per farm increased (Table XXV). The median labor earnings on the other hand showed a decrease for farms having the highest man equivalent per farm.

(3) Man equivalent equals one man working 12 months of the year. Chapter II, page 20, tells how man equivalent is calculated.

Man equivalent on 92 farms for which these data were available ranged from .13 to 3.66 per farm, with an average of 1.36.

Labor earnings increased from \$278 per farm for the group having lowest man equivalent to \$323 average for farms in the next larger man equivalent group, and to \$520 and \$596 average respectively for the largest sized groups.

A scatter diagram is shown along with the table of average labor earnings in order to better visualize the relationship of man equivalent and labor earnings. The scatter diagram showed a definite

TABLE XXV. RELATION OF MAN EQUIVALENT TO LABOR EARNINGS,
92 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY,
TENNESSEE, 1939

Man Equiv- alent	Number of Farms *	Average per Farm			
		Man Equiv- alent	Acres of Crop- land	Productive Man Work Units	Labor Earnings
.74 & below	24	.4	35.6	70.1	\$278
.75 - 1.24	23	1.0	49.6	148.0	323
1.25 - 1.74	18	1.4	68.4	207.2	520
1.75 & over	27	2.4	108.5	449.9	596

* One farm discarded as no operator labor given.

increase in labor earnings as man equivalent increased up to 2.00 (Figure 25). Three farms with extreme high earnings raised the labor earnings disproportionately for the farms with the largest man equivalent. However, more of the farms with a man equivalent of 2.00 or

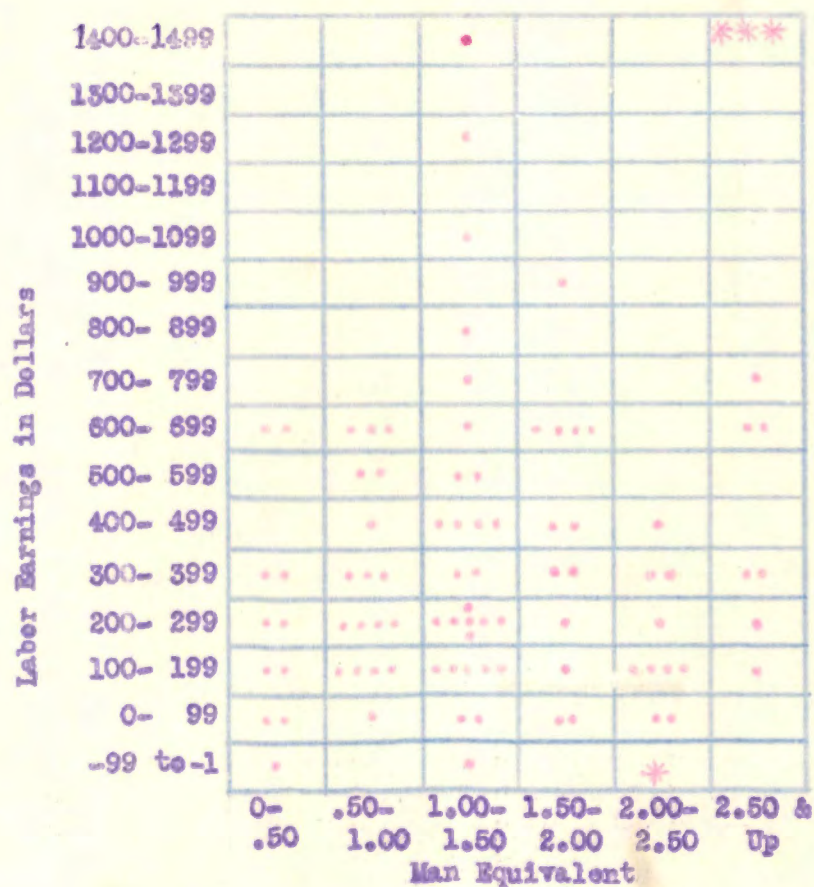


Figure 25. Labor Earnings by Total Man Equivalent,
92 Upland Farms, Roane County, Tennessee,
1939

- Labor earnings of one farm
- * Value of labor earnings too low or too high to show on the chart

Source: Survey of 93 Upland Farms.

over had smaller labor earnings than farms with slightly less men.

As man equivalent increased there was an increase in acres of cropland, in total investment, in productive man work units, and in crop index. Other measures of size of business and production rate all seemed associated with man equivalent.

Productive Man Work Units

Probably one of the best measures of size of farm business is the number of productive man work units⁽⁴⁾ accomplished on the farm. This measures all enterprises on the farm in terms of productive work expended on them. A hay farm of 200 acres has a smaller size business than the same acreage in truck crops, or the same acreage used as a dairy farm. Productive man work units weigh all enterprises on the farm in proportion to the average amount of work required for each.

The average number of productive man work units for 92 farms was 184.6 with a range of from 7.9 to 747.6. Thirty-one farms, or 1/3 of the total, had less than 100 productive man work units each.

Farms with 99 or less productive man work units had an average labor earnings of \$256, those with from 100 to 199 had labor earnings of \$281 per farm, those with from 200 to 299 averaged \$604 of labor

(4) Productive man work unit is the average amount of work accomplished by a man in ten hours. Chapter II, p. 21, tells how it is calculated.

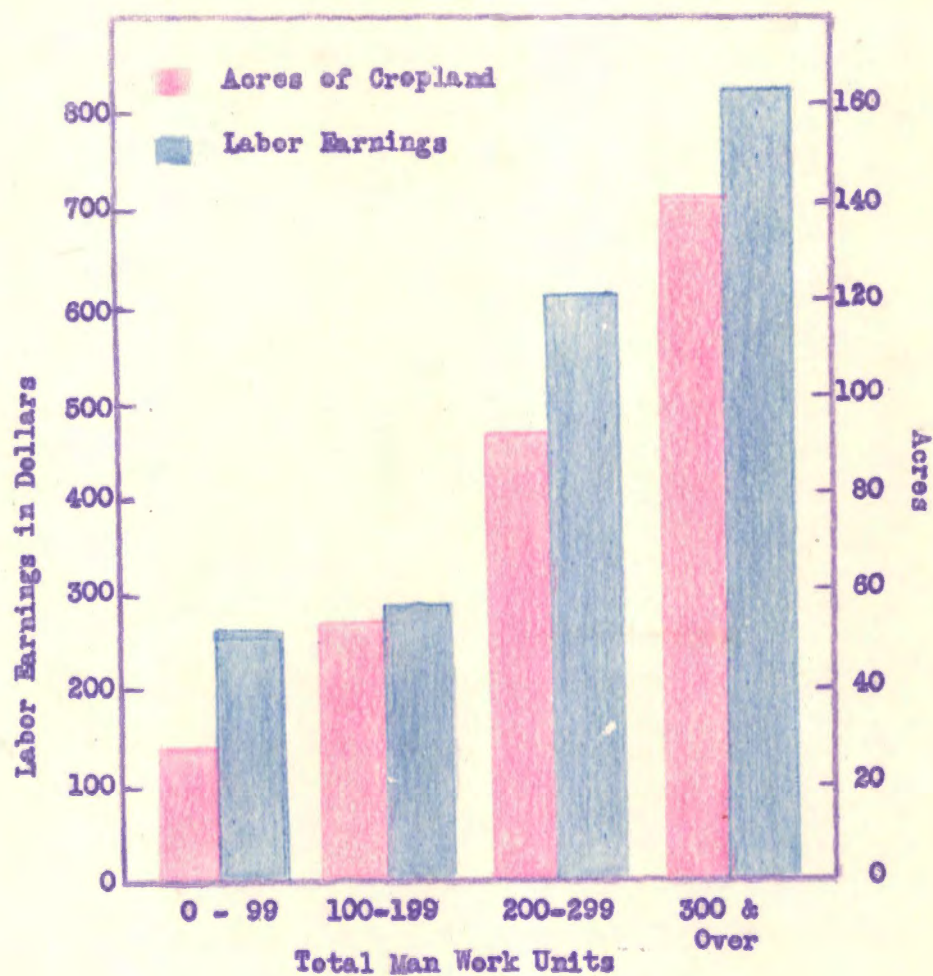


Figure 26. Relation of Number of Man Work Units to Acres of Cropland and Labor Earnings, 92 Upland Farms, Reane County, Tennessee, 1939

Source: Table XXVI.

earnings. The farms with 300 or more productive man work units per farm averaged \$816 of labor earnings (Table XXVI).

The scatter diagram showed that the labor earnings of most farms continued to increase even after 300 productive man work units had been reached. The increase in size of farm as measured by productive man work units had evidently not reached the point of diminishing returns. One farm with 747.7 productive work units had a labor earnings of \$2796.

TABLE XXVI. RELATION OF PRODUCTIVE MAN WORK UNITS TO LABOR EARNINGS, 92 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Productive Man Work Units	Number of Farms *	Average per Farm			
		Productive Man Work Units	Acres of Cropland	Total Investment	Labor Earnings
0 - 99	31	63.7	27.1	\$1077	\$256
100 -199	26	138.9	52.7	2145	281
200 -299	20	253.5	91.5	4104	604
300 & up	15	421.9	141.1	6916	816

* One farm discarded, as productive man work units were not given.

Acres of cropland also increased greatly as the productive man work units increased (Figure 26). Other factors increasing with productive man work units but in a lesser degree were total investment, amount of livestock, total acres in farm land, and man equivalent.

Workstock

Number of workstock⁽⁵⁾ is used as a measure of size of farm business in areas where tractors furnish only a small part of the farm power. On the 93 farms studied there were only 5 tractors. These farms with tractors were not included in tabulating the relation of workstock to labor earnings.

TABLE XXVII. RELATION OF NUMBER OF WORKSTOCK TO LABOR EARNINGS,
88 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE,
1939

Workstock	Number of Farms **	Average per Farm						
		Number of Work- stock	Acres Crop- land	Horse Work Units per Horse	Crop In- dex	Produc- tive Man Work Units per Man	Income Other Sour- ces	Labor Earn- ings
0 & .5	18	.05	27.8	75.7*	85.1	84.1	\$171	\$283
1.0 & 1.5	17	1.1	32.5	60.5	77.3	112.0	115	276
2 horses	34	2	73.5	73.8	91.4	157.0	103	406
Over 2	19	3.4	111.2	66.1	118.4	150.1	245	611

* Only 2 farms in the first group reported horse work units.

** Five farms which had tractors were omitted.

Sixteen of the farms had no workstock, while two farms each had a horse only part of the year. Five head were the greatest number kept on any farm. The 88 farms averaged 1.7 head per farm.

(5) Workstock in this study is work horses and mules over 2 years old.



Figure 27. Relation of Number of Workstock to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXVII.

Farms with no workstock or only a horse part of the time had an average labor earnings of \$283. Farms having one or 1.5 head of workstock averaged \$276 of labor earnings. Those with two head of workstock averaged \$406 of labor earnings, while those with over 2 head averaged \$611 (Table XXVII).

The farms with either no horse or one only part of the time had almost as many acres of cropland, had a higher crop index, and a much larger income from other sources than had farms with but one horse. If it had not been for income from other sources, which is mostly non-farm income, the labor earnings of the farms with no horses would have been the smallest of any group.

Farms with more than one head of workstock increased in labor earnings as the number of workstock increased, except for a few farms in the large size group (Figure 27).

There were four farms in the large size group with five head of workstock per farm. None of these farms had as great labor earnings as the average of the farms with two head of workstock. Although these four cases are not enough to be representative, indications are that five horses per farm might be too many on these farms.

The increase in labor earnings as number of workstock increased from one upward may have been due to close association of this factor with other factors such as acres of cropland, horse work units per horse, crop index, and productive man work units per man.

Total Animal Units

Total number of animal units is usually a very good measure of size in areas where the type of farming is mostly livestock. ⁽⁶⁾ A large number of animals usually mean also high crop yields. Returns from livestock and livestock products on these farms were almost as great as from crop sales. If there had been many fruit farms, or farms with income mostly from crops, the number of animal units would have been a poor measure of size of farm. An illustration of this is a fruit farm in this sample which had the highest labor earnings of any in the sample, but had only 3.6 animal units. On the other hand the farm with the greatest number of animal units had the next highest labor earnings.

TABLE XXVIII. RELATION OF NUMBER OF ANIMAL UNITS TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Animal Units	Number of Farms	Average per Farm			
		Number of Animal Units	Acres of Cropland	Crop Index	Labor Earnings
2.9 & below	22	1.6	25.4	73.1	\$243
3.0-5.99	31	4.5	42.8	78.7	378
6.0-9.99	16	7.8	83.0	101.4	448
10.0 & above	24	22.1	124.6	113.9	643

(6) Animal unit represents the equivalent of one horse or cow.

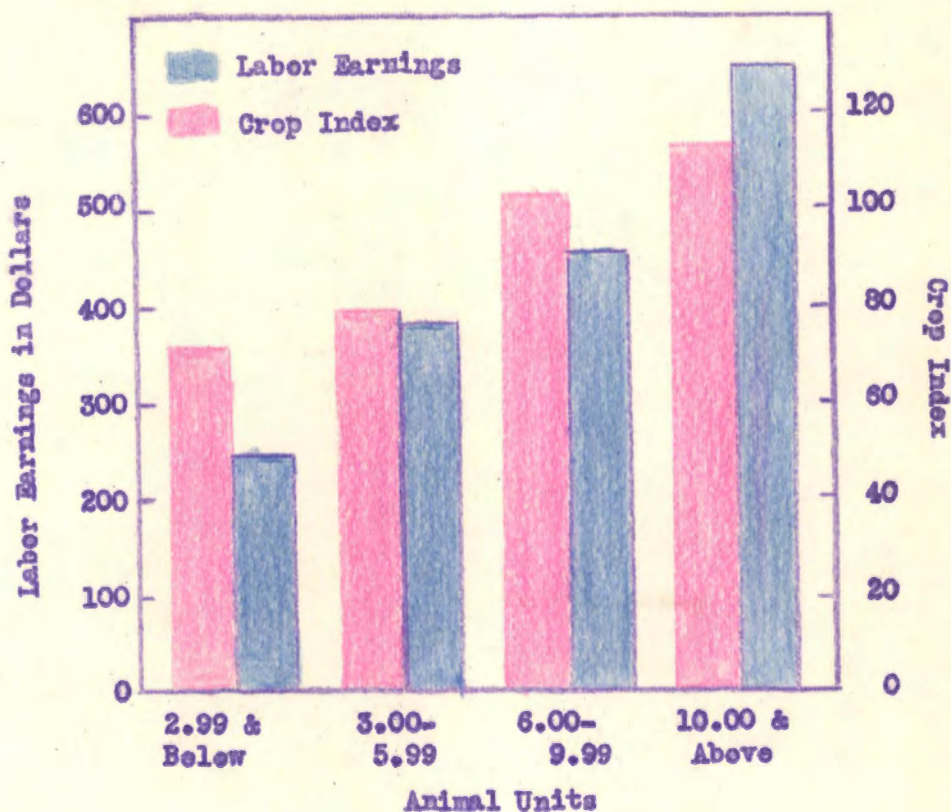


Figure 28. Relation of the Number of Animal Units to Crop Index and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXVIII.

A wide variation in number of animal units existed, the range being from .3 to 57.0 per farm. Average number of animal units was 8.9 per farm.

Labor earnings increased consistently from \$243 for farms with less than three animal units to \$643 for farms with seven or more animal units (Table XXVIII).

Other factors indicating size such as acres of cropland, productive man work units, and total investment were closely associated with the amount of livestock. Crop index increased constantly as the number of animal units increased (Figure 28). This was probably due to added fertility of the soil through the manure.

Total Investment

Farms with an investment of \$1799 or less had an average labor earnings of \$311. Those with the greatest investment (\$5400 or over per farm) had the highest labor earnings averaging \$714. The point of diminishing returns with respect to amount of investment does not appear to have been reached on these farms. Two farms with investment of \$17765 and \$18160 had the largest investment and the largest labor earnings of any within this group.

The average labor earnings in each investment groups exceeds that obtained by the next group below (Figure 29).

As investment increased labor earnings also increased, but the

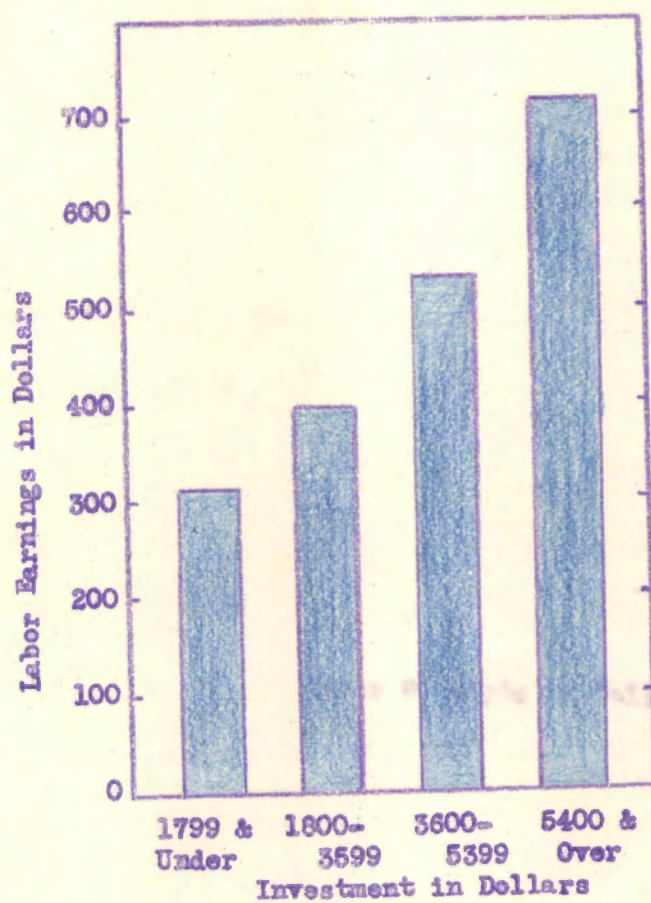


Figure 29. Relation of Total Investment to Labor Earnings,
93 Upland Farms, Reane County,
Tennessee, 1939

Source: Table XXIX.

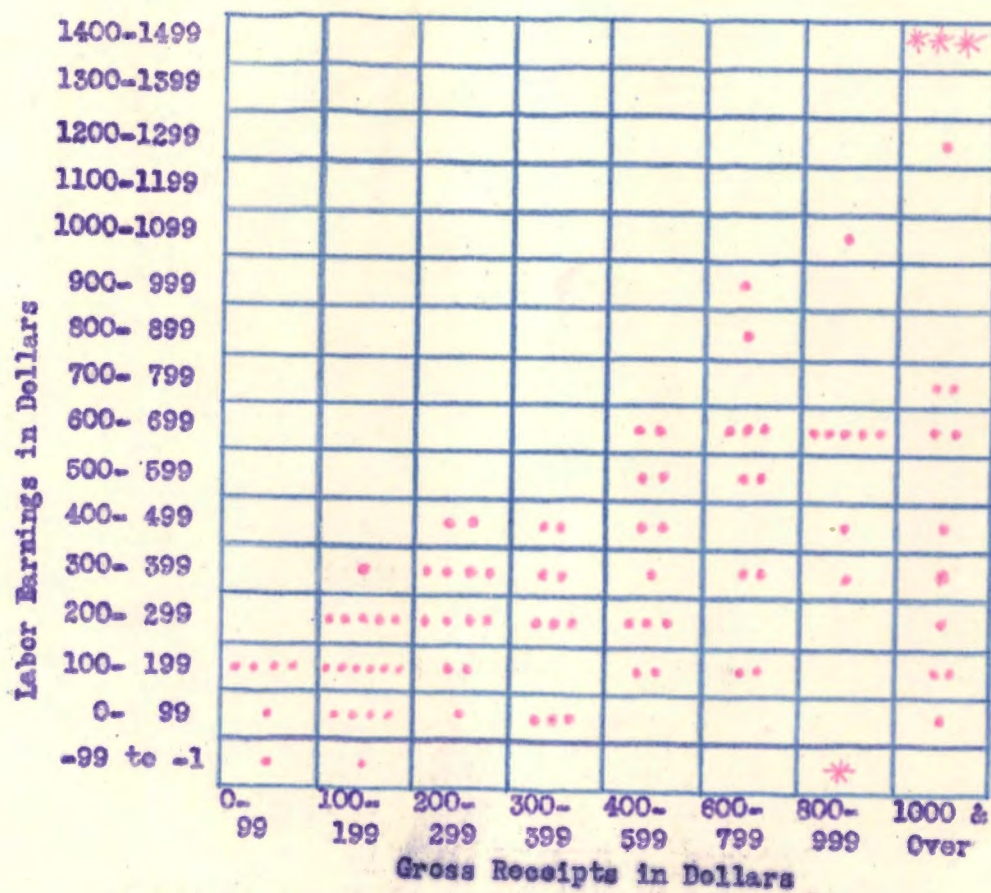


Figure 30. Labor Earnings by Gross Receipts, 93 Upland Farms, Reane County, Tennessee, 1939

- Labor earnings of one farm.
- * Value of labor earnings too low or too high to be shown on the chart.

Source: Surveys of 93 upland farms.

range in labor earnings became greater on farms with high investments, consequently the possibility of loss also became greater.

TABLE XXIX. RELATION OF TOTAL INVESTMENT TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Total Investment	Number of Farms	Average per Farm	
		Total Investment	Labor Earnings
\$1799 & under	41	\$986	\$311
1800 - 3599	25	2484	398
3600 - 5399	13	4145	534
5400 & over	14	8612	714

Gross Receipts

Relatively large gross receipts are important for a successful farm business. ⁽⁷⁾ In most areas the gross receipts are very closely

TABLE XXX. RELATION OF GROSS RECEIPTS TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Gross Receipts	Number of Farms	Average Gross Receipts	Average Labor Income	Average Labor Earnings
\$199 & under	23	\$132	\$ - 66.0	\$145
200 - 499	28	315	16.0	280
500 - 899	24	700	169.0	517
900 & over	18	1699	419.0	892

(7) Gross receipts does not include perquisites.

associated with both labor income and labor earnings. In this study a scatter diagram was used to show how close the relationship was between gross receipts and labor earnings (Figure 30). The labor earnings of farms with low gross receipts were concentrated in a narrow range. After the farms reached \$800 in gross receipts, however, labor earnings began to vary greatly.

The proportion of labor earnings to gross receipts was much greater for the farms with low receipts. Labor earnings for the farms with average receipts of \$132 was \$145, while for the farms with \$1699 of average receipts it was \$892 (Table XXX).

Regardless of factors used to measure size of farm the operators of small farms (as classified by that measure of size) compensated to some degree for small size of business by working off the farm.

On larger farms there were greater chances of making more money, however, the chances of losing more money were also greater on the larger farms.

Productive man work units showed a more positive relation to labor earnings than any other measure of size used in this study, other than gross receipts. Total acres in the farm and man equivalent per farm showed the least relation to labor earnings of any of the factors here used.

CHAPTER VI

RELATION OF LAND CLASS TO LABOR EARNINGS

Studies have shown some relationship existing between land class and income from farming.⁽¹⁾ A study in Overton County, Tennessee, found that farms on the better land classes had relatively high earnings in comparison with those on the poorer lands.⁽²⁾ One reason for this relation of land class and earnings is the higher crop yields usually associated with superior lands. It was shown earlier that Land Class II had the highest crop yields of any in the Roane County study (Chapter III).

Since no farms in this area were exclusively of one particular land class, or even predominately of one class, it was impossible to group farms completely into the different land classes. As a result several measures were used as indices of land class. In studying land class only cleared land was considered. Assortments into groups were first made on the basis of acreage of cleared land in Class II (moderately productive agricultural land), and on the basis of proportion of cleared land in Class II. Then Classes II and III lands were combined and assortments made again on the basis of acreage and proportion of cleared lands in Classes II and III.

(1) Land Class is defined on pages 32 and 33.

(2) Robison, A. C., Farm Management in Overton County, Tennessee, Chapter V, p. 281, Master's thesis, University of Tennessee, 1937.

Acres of Cleared Land in Class II

The farms averaged 12.3 acres of cleared land in Class II, the range being from 0 to 89.1 per farm.

Farms with no Class II land averaged \$350 labor earnings, those with one to 14.9 acres averaged \$332, those with 15 to 29.9 acres averaged \$498, and those with 30 acres or more averaged \$760 (Table XXXI). One fruit farm with no Class II land had an orchard mostly on Land Classes IV and V. This farm had a labor earnings of \$3204 and raised the average earnings of the group with no Class II land slightly above the next group of farms.

TABLE XXXI. RELATION OF ACRES OF CLEARED LAND IN CLASS II
FARMS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY,
TENNESSEE, 1939

Acres of Class II Land Cleared	Number of Farms	Average per Farm		
		Acres of Class II Land Cleared	Acres of Cropland	Labor Earnings
0	35	0	41.0	\$350
1 - 14.9	31	8.1	53.3	332
15 - 29.9	13	22.4	87.3	498
30 & up	14	42.3	141.5	760

Both median labor earnings and scatter diagram, however, showed an increase in labor earnings for each group of farms as the acres of cleared land in Class II increased.

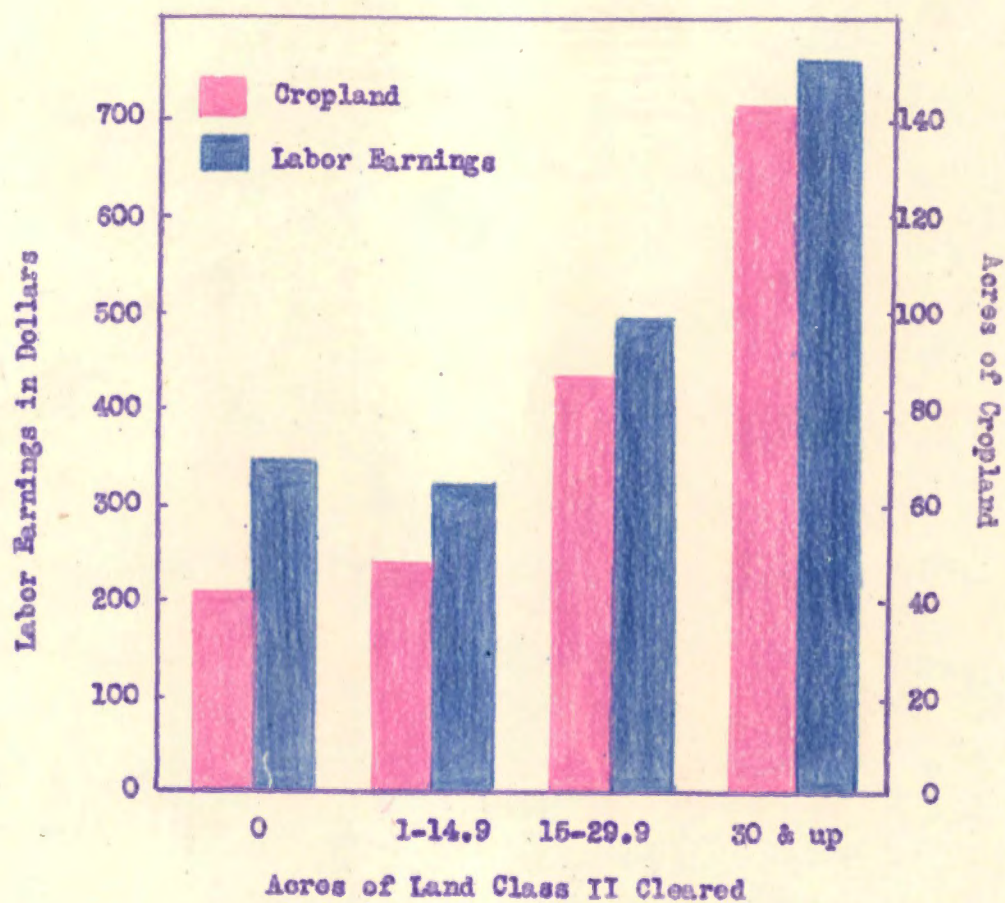


Figure 31. Relation of Acres of Land Class II Cleared to Acres of Cropland and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXXI.

It was noted, however, that acres of cropland also increased as acres of cleared land in Class II increased. This may have been a factor in the relation between acres of Class II land and labor earnings (Figure 31).

Proportion of Cleared Land in Class II

In order to compensate for size of farm, percent of cleared land in Class II was also used to find the relationship with labor earnings. The percent of Class II land that was cleared averaged 17.2 for all farms, ranging from 0 to 58.8 percent.

Farms with either no cleared land, or less than 10 percent, as good as Class II were also the least profitable farms when measured in terms of labor earnings. The average labor earnings per farm for this

TABLE XXXII. PROPORTION OF CLEARED LAND IN CLASS II RELATED
TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4,
ROANE COUNTY, TENNESSEE, 1939

Percent Land Class II Cleared	Number of Farms	Average per Farm		
		Percent Land Class II Cleared	Acres of Cropland	Labor Earnings
0 - 9.9	44	1.1	48.6	\$351
10 - 29.9	31	18.1	87.4	494
30 - 59.9	18	43.8	69.8	494

group was \$351 (Table XXXII and Figure 32). The farms with 10 to 29.9 percent of the cleared land in Class II had an average labor earnings of

\$494. Labor earnings of farms with the most Class II land were no greater than for the medium group. However, those farms with the greatest percent of Class II lands appeared to be smaller as measured by acres of cropland.

Median labor earnings increased from \$263 to \$322, to \$465 respectively as percent of land in Class II increased. Thus it appears that, aside from the exceptional cases, the chances of attaining high labor earnings increases with good land. Since neither acres of cropland nor investment appeared to be very closely associated with the percent of Land Class II on these farms it seems that increases in income with Land Class II are likely to be due to land quality rather than size of business. However, as the amount of Land Class II is small on these farms it does not appear to have as much effect on labor earnings on these farms as does size of business.

Acres of Cleared Land in Classes II and III

With the amount of good land or moderately good land limited in this area it seems desirable to include the land that is only fair in quality and determine its effect upon returns from farming. Cleared land of Class III was accordingly included with Class II and relationships run with labor earnings.

In Chapter III it was shown that, in 1939, Land Class III had lower crop yields of the important crops than Class IV. This situation, however,

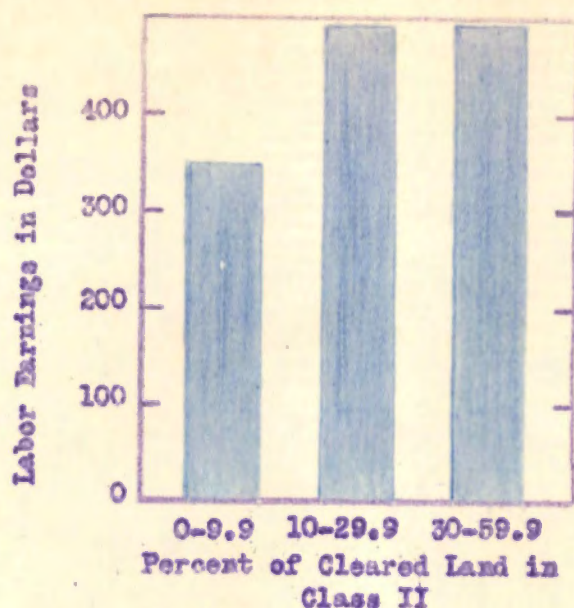


Figure 32. Proportion of Cleared Land in Class II Related to Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939.

Source: Table XXXII.

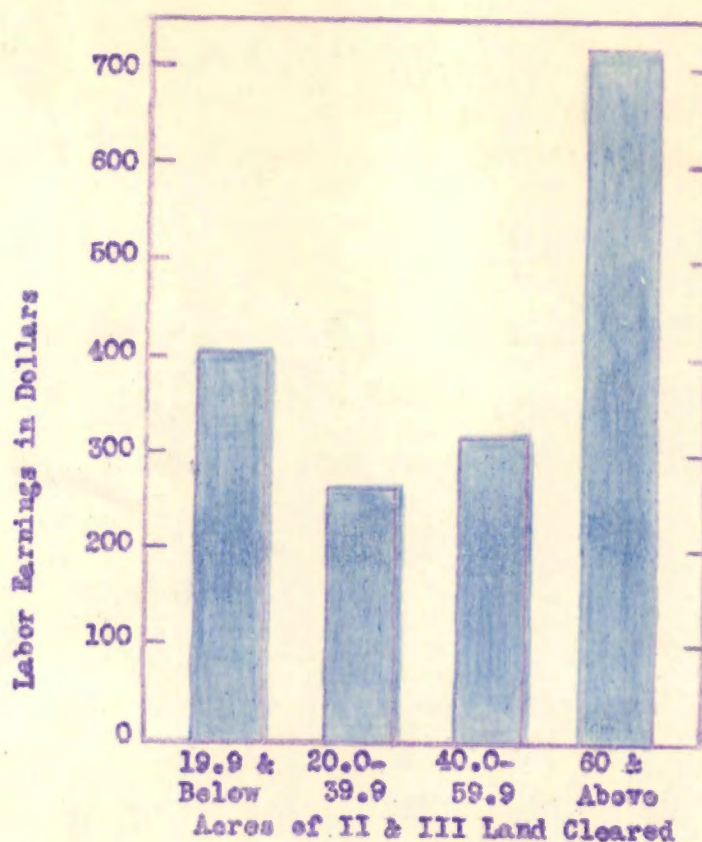


Figure 33. Relation of Acres Land Class II and III Cleared to Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXXIII.

was not generally true in other years. When the acres of Classes II and III combined were related to labor earnings the acreage of Class III seemed to bear no more relation to labor earnings than to crop yields (Figure 24).

Farms with less than 20 acres of Land Classes II and III had an average labor earnings of \$401. Those with 20 to 39.9 acres had an average labor earnings of \$261, those with 40-59.9 acres had an average earnings of \$319, and those with 60 or more acres had an average labor earnings of \$721 (Table XXXIII).

TABLE XXXIII. RELATION OF ACRES OF CLEARED LAND IN CLASSES II AND III TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Acres of Land Classes II and III Cleared	Number of Farms	Average per Farm		
		Acres of Land Classes II and III Cleared	Acres of Cropland	Labor Earnings
19.9 & below	32	10.0	29.9	\$401
20 - 39.9	26	29.0	47.0	261
40 - 59.9	13	48.7	85.4	319
60 & above	22	90.2	133.7	721

Proportion of Cleared Land in Classes

II and III

The percent of cleared land in Classes II and III also appeared to have had no relation to labor earnings. The range in labor earnings was only \$50 from the lowest to the highest group, or from an average of \$401 to \$451 (Figure 34).

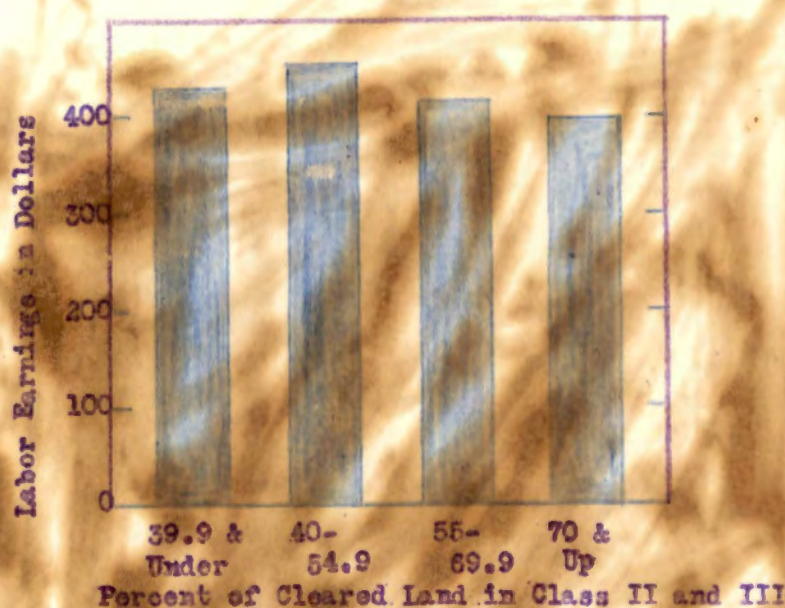


Figure 34. Proportion of Cleared Land in Classes II and III Related to Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXXIV.

TABLE XXXIV. PROPORTION OF CLEARED LAND IN CLASSES II AND III, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Percent Land Classes II & III Cleared	Number of Farms	Average per Farm		
		Percent II & III Land Cleared	Acres of Cropland	Labor Earning
39.9 & under	27	26.2	45.2	\$429
40 - 54.9	25	47.2	86.2	451
55 - 69.9	19	62.4	85.8	417
70 & up	22	80.8	54.5	401

Farms with the highest percent of Land Classes II and III had the lowest average labor earnings. Farms with the lowest percent of Classes II and III had an average labor earnings of \$429 (Table XXXIV). This group of farms was second largest in labor earnings.

Such a relationship as just shown between labor earnings and Classes II and III land combined may have been due to a number of factors. The weather conditions of 1939 may have had more serious effect on Land Class III than Class IV causing the yields of Class III to be less with resulting lower labor earnings. The values of Class III land in comparison with IV may have been higher than yields would justify. It may be that Class III lands are marginal lands which only in some years can show a profit.

CHAPTER VII

RELATION OF TYPE OF FARMING TO LABOR EARNINGS

Type of farming and the amount of specialization within a given type influences labor earnings in many areas. More specialization in a given type of farming produces the largest labor earnings in some areas, while in others general farming may result in the largest labor earnings. The most profitable type may also vary from year to year in the same area. For example a fruit farm in this area had labor earnings of \$3204 in 1939 which in other years may have had very little fruit to sell.

The farms in this area were classified by type, and labor earnings calculated for each. Because of variations in size, farms were first grouped into commercial and non-commercial farms on the basis of total gross receipts. Farms with more than \$500 total gross receipts were classed as commercial farms, and those with less than this amount non-commercial. The basis of determining type for both commercial and non-commercial farms was whether as much as 40 percent of the gross receipts were from any one source.

Percent of receipts from livestock and livestock products, percent from crops, percent from tobacco, and percent of receipts from other sources were used as indices of specialization.

Types of Farms

The number and types of commercial farms included in this study were two dairy, one fruit, one lespedeza, one cotton, two tobacco, ten part-time, fifteen general, and ten livestock. The number and type of non-commercial farms were ten part-time, twenty-one tobacco, eleven general, six livestock, and three timber products.

The average labor earnings for the prevailing commercial types were:

Part-time	\$609
General	578
Livestock	519
Tobacco	353

The commercial types of farms did not differ greatly in average labor earnings, except for tobacco. Since the average acreage of tobacco on these two farms was 1.5 acres each, and with tobacco allotments hard to increase under the A.A.A. program, it seems that the farmers in this area should not depend on tobacco as the major source of income. The earnings of the part-time farms seems to indicate that work off the farm, if it can be obtained, is profitable to most all the farmers as measured by labor earnings. There were a few farms of other types that had higher labor earnings than any of the prevailing

types of farms. Two dairy farms had average labor earnings of \$1670, one lespedeza farm had labor earnings of \$706, one cotton farm had earnings of \$564, and one fruit farm had labor earnings of \$3204. In most areas where there are one or more prevailing types of farms there is also opportunity for a limited number of farms to succeed with emphasis on other enterprises.

The average labor earnings for the following prevailing non-commercial types of farms were:

General	\$240
Part-time	234
Livestock	215
Tobacco	202

Differences in earnings of these non-commercial types of farms are very slight. Type of farming, except in a few special cases, seems to be of slight importance in determining labor earnings. The large difference between commercial farms and non-commercial farms in labor earnings was practically all due to size. The non-commercial farms being much smaller had an average labor earnings of \$223.

Percent of Receipts from Livestock and Livestock Products

Approximately 33 percent of all the receipts were from livestock and livestock products, ranging from 0 to 87.2 percent per farm.

There appeared to be very little increase in labor earnings as the farms became more highly specialized in livestock. Farms with the

least and the greatest percent of receipts from livestock and livestock products had approximately the same labor earnings, the average being \$500 per farm. Both of these groups were above average in labor earnings. Farms with 10 to 29.9 percent of receipts from livestock and livestock products had an average labor earnings of \$325, while those with 30 to 49.9 percent averaged \$395 (Figure 35).

Median labor earnings were about the same for all groups of farms, except that farms with 10 to 29.9 percent of receipts from livestock and livestock products had lower labor earnings than the other three groups.

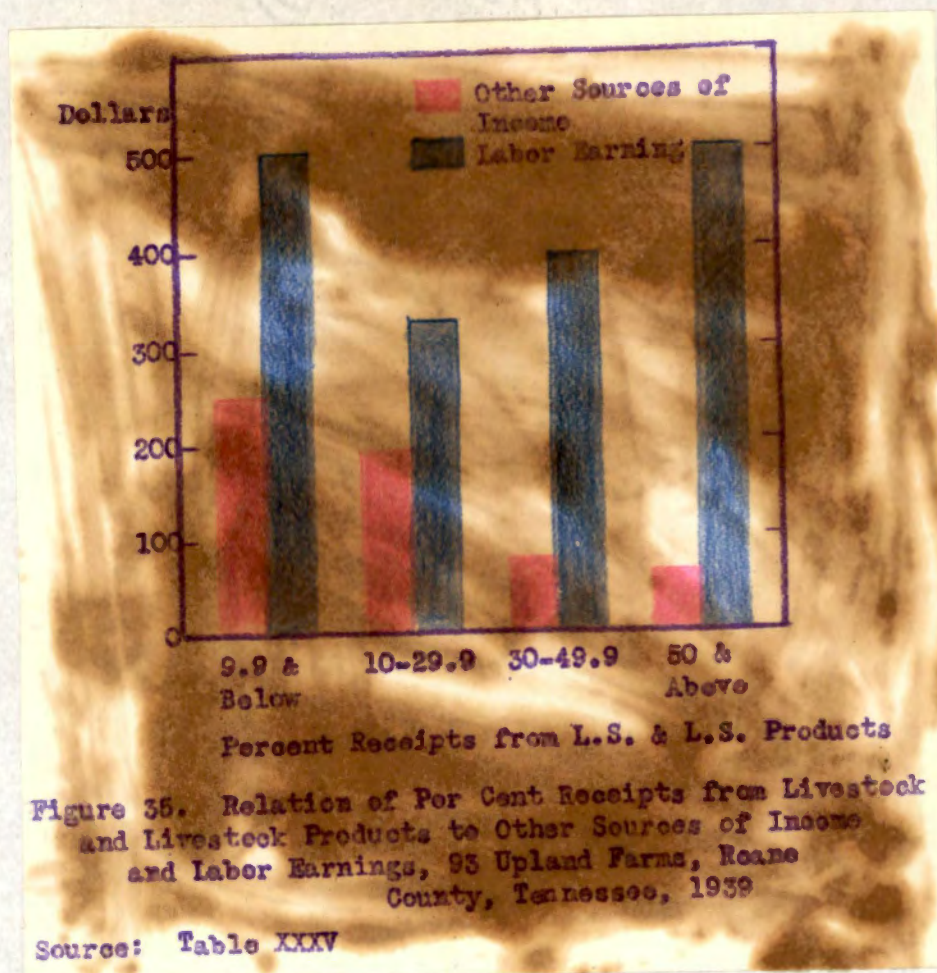


TABLE XXXV. RELATION OF PERCENT RECEIPTS FROM LIVESTOCK AND LIVESTOCK PRODUCTS TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Percent of Receipts from Live-stock and Livestock Products	Number of Farms	Average per Farm				
		Percent Receipts from Live-stock and Livestock Products	Acres of Crop Land	Total Invest-ment	Income from Other Sources	Labor Earn-ings
9.9 & below	28	3.2	48.7	\$1807	\$249	\$500
10 - 29.9	25	22.2	68.1	2929	187	325
30 - 49.9	24	40.3	77.6	3277	78	395
50 & above	16	75.5	80.8	4657	67	502

Farmers with the most livestock had more acres of cropland, a higher investment in the farm business, and were obtaining less income from other sources (Table XXXV).

In Central Pennsylvania a somewhat similar relation was found between percent of receipts from livestock and livestock products and labor income. The groups of farms with the least and the largest percent of receipts from livestock had the highest average labor in-
(1)
comes.

Little relation was found between percent of receipts from live-stock and labor income in Appomattox County, Virginia, the farms with

(1) McCord, J. E., Farm Practices and Management in Central Pennsylvania, Pennsylvania Agricultural Experiment Station Bulletin 379, p. 75, State College, Pennsylvania, 1939.

about average percent of receipts from livestock having the largest labor
(2)
incomes.

Percent of Receipts from Crops

Practically no relation existed between percent of receipts from crops and labor earnings, as the percent of receipts from crops increased, the labor earnings were \$467, \$441, \$318, and \$587 for each group of farms respectively (Table XXXVI).

TABLE XXXVI. RELATION OF PERCENT RECEIPTS FROM CROPS TO
LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4,
ROANE COUNTY, TENNESSEE, 1939

Percent Receipts from Crops	Number of Farms	Average per Farm				
		Percent Receipts from Crops	Acres of Crop- land	Total Invest- ment	Income from Other Sources	Labor Earn- ings
0 - 24.9	30	10.0	54.0	\$2825	\$239	\$467
25 - 49.9	26	35.7	83.2	3723	211	441
50 - 74.9	28	61.1	67.5	2685	56	318
75 - 99.9	9	91.1	58.9	2253	39	587

The median labor earnings showed approximately \$330 for all groups of farms, with the exception of farms within the third group (50 to 74.9 percent of receipts from crops). For this group the median was only \$232.

(2) Gibson, W. L., An Economic Study of Farming in Appomattox County, Virginia, Virginia Agricultural Experiment Station Bulletin 311, p. 36, Blacksburg, 1937.

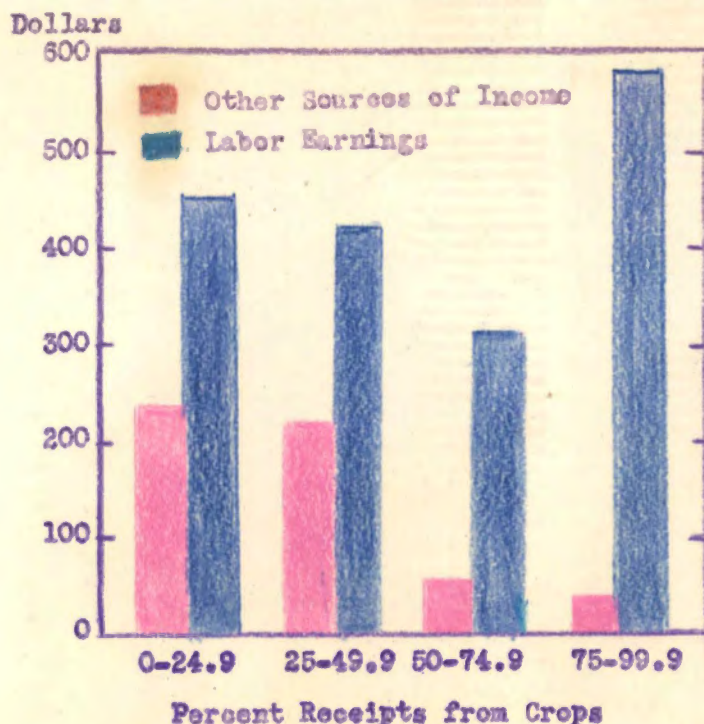


Figure 36. Relation of Percent Receipts from Crops to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXXVI.

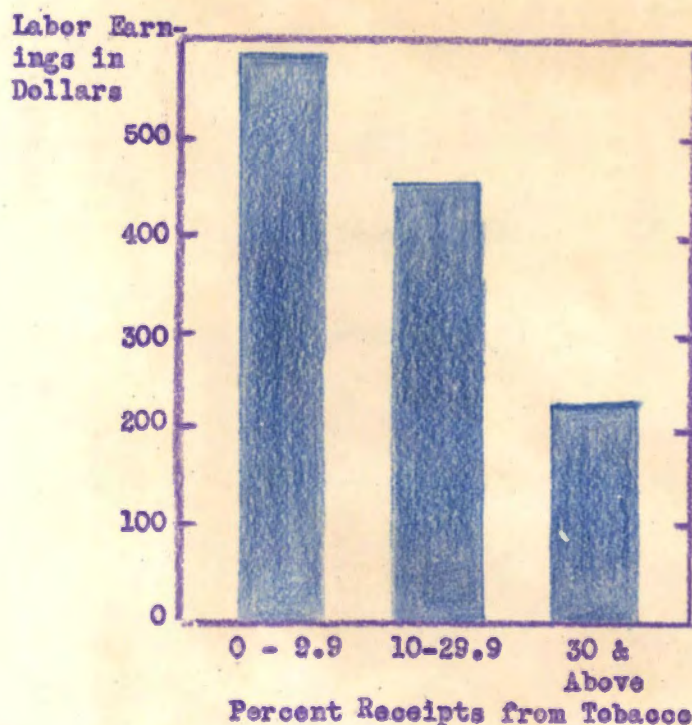


Figure 37. Relation of Percent Receipts from Tobacco to Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XXXVII.

Other sources of income decreased as percent of receipts from crops increased while acres of cropland and total investment were not significantly different (Figure 36).

Percent of Receipts from Tobacco

Tobacco constituted 21.3 percent of the gross receipts. Since tobacco was an important cash crop one might expect a relation to exist between percent of receipts from tobacco and labor earnings.

Farms with less than 10 percent of receipts from tobacco had an average labor earnings of \$579, those with 10 to 29.9 percent averaged \$440, and those with 30 percent or over had an average labor earnings of \$226 per farm (Table XXXVII). The percent of receipts from tobacco showed an inverse relationship to labor earnings (Figure 37). Three farms with the highest labor earnings received less than 10 percent of their total receipts from tobacco.

TABLE XXXVII. RELATION OF PERCENT RECEIPTS FROM TOBACCO
TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4,
ROANE COUNTY, TENNESSEE, 1939

Percent Receipts from Tobacco	Number of Farms	Average per Farm				
		Percent Receipts from Tobacco	Tobacco Sold	Acres of Crop- land	Total In- vest- ment	Labor Earn- ings
0 - 9.9	34	1.5	\$13	62.9	\$3209	\$579
10.0 - 29.9	31	15.1	141	77.7	3542	440
30.0 & above	28	42.6	144	59.1	2074	226

The value of tobacco sold was approximately the same for the last two groups, but the gross receipts were much lower for the latter. This, however, does not indicate that less tobacco should be grown. On the other hand it indicates that since allotments tend to restrict the acreage of tobacco, other enterprises should be expanded.

In an area in Virginia, where tobacco was the principal cash crop, there was no relationship between percent of receipts from tobacco and labor income.⁽³⁾

Percent of Receipts from Other Sources

Many of the farmers depend on receipts from other sources for their cash needs rather than from crops and livestock. Some of the farms obtained all of their cash receipts from other sources. Farm products in these cases were mostly for home use. Other sources constituted 24.6 percent of the total gross receipts on all farms.

The percent of receipts from other sources appeared to have no relation to labor earnings (Figure 38). Farms with less than 10 percent of their receipts from other sources had an average labor earnings of \$464, or approximately the same as for those with the greatest percent from other sources. The labor earnings of farms with 10 to

(3) Ibid., p. 36.

39.9 percent of receipts from other sources averaged \$347.

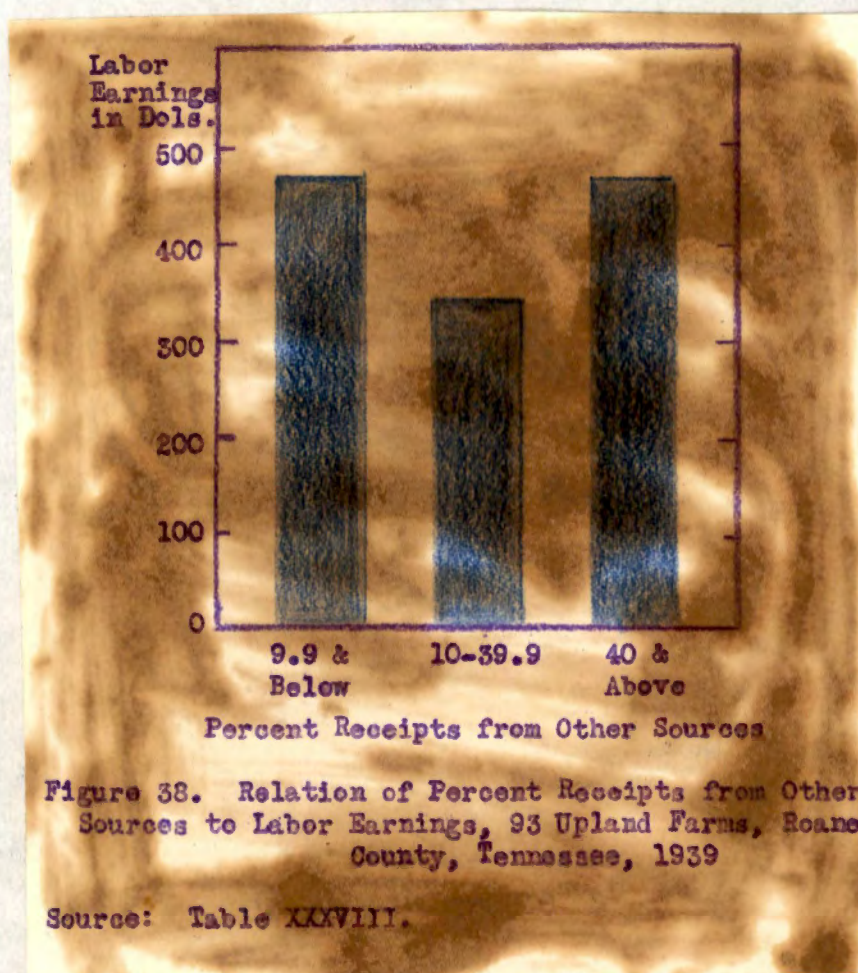


TABLE XXXVIII. RELATION OF PERCENT RECEIPTS FROM OTHER SOURCES TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Percent Receipts from Other Sources	Number of Farms	Average per Farm			
		Percent Receipts from Other Sources	Acres of Crop-land	Total Investment	Labor Earnings
9.9 & below	39	5.8	75.6	\$3591	\$464
10 - 39.9	30	20.3	70.3	2747	347
40 & above	24	66.6	47.9	2272	403

The acres of cropland and investment decreased as the percent of receipts from other sources increased.

Except for the few unusual farms, the types developed in this area differed very little in labor earnings. The amount of specialization in one type of farming also appeared to have little if any relation to labor earnings, except for tobacco.



CHAPTER VIII

RELATION OF PRODUCTION RATES TO LABOR EARNINGS

Productivity is of major importance in determining farm earnings. Increased crop yields usually mean increased earnings, as on most farms the cost items entering into their production seldom reach the point where the additional cost increases directly as yield per acre. Farmers on small farms with extra labor available usually find it profitable to use some of this labor in extra care of crops or livestock, and thereby increase production rates. If more livestock are fed, to consume extra feed, the size of business is also increased.

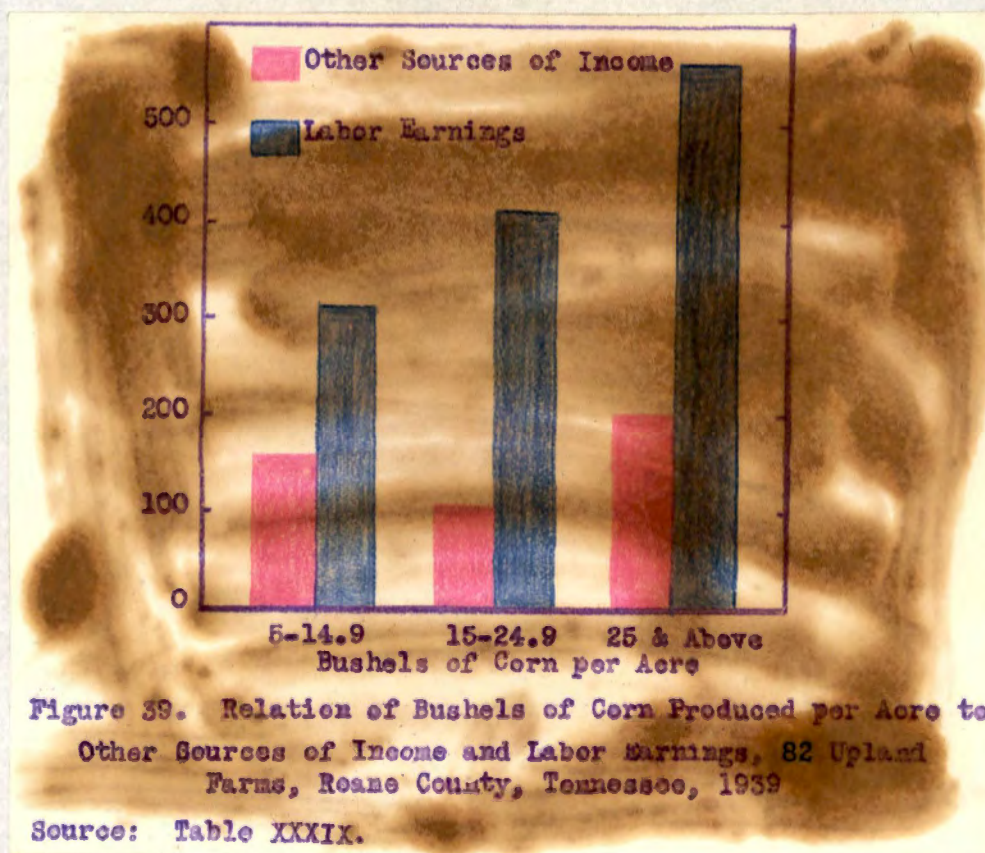
Farm productivity may be measured in terms of physical production such as crop yields, pounds of gain per unit of stock, pounds of milk per cow, eggs per hen; or measured in terms of economic returns, such as value of crops sold per acre, or value of livestock and livestock products sold per unit of livestock.

Measures of crop production used in this study were bushels of corn per acre, crop index, and crop sales per acre in crops; while livestock production was measured in terms of value of livestock and livestock products sold per productive animal unit.

Bushels of Corn Per Acre

In areas where one crop is of outstanding importance on a majority of the farms, yield per acre in that crop is a good measure of productivity. In Appomattox County, Virginia, the farms with highest tobacco yields per acre had also the largest labor incomes.⁽¹⁾ In Grayson County, Kentucky, corn was the most important crop. In that area farms with the highest corn yields per acre also secured the largest labor earnings.⁽²⁾

Since corn was the most important crop on the farms in this study yield per acre was related to labor earnings. Yields ranged from 5.2



(1) Gibson, W. L., An Economic Study of Farming in Appomattox County, Virginia, Virginia Agricultural Experiment Station, Bulletin 31, p. 31, Blacksburg, 1937.

(2) Rouse, W. L., and Others, Farm Organization and Management in Grayson County, Kentucky, Kentucky Agricultural Experiment Station, Bulletin 317, p. 184, Lexington, 1937.

to 50 bushels per acre, averaging 19.9 bushels.

TABLE XXXIX. RELATION OF CORN YIELDS TO LABOR EARNINGS, 82
UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TEN-
NESSEE, 1939

Bushels of Corn per Acre	Number of Farms *	Average Yield per Acre (bu.)	Average per Farm		
			Acres of Cropland	Other Sources of Income	Labor Earn- ings
5 - 14.9	29	11.3	51.7	167	\$312
15.0- 24.9	34	19.3	73.0	106	420
25.0 & over	19	32.2	98.0	199	561

* Eleven farms having less than one acre of corn each were omitted.

Farms with corn yields of less than 15 bushels per acre had labor earnings averaging only \$312. On farms which secured 15 to 24.9 bushels per acre labor earnings averaged \$420. The group of farms with 25 bushels and over were the most profitable having an average labor earnings of \$561 (Table XXXIX).

Other sources of income did not increase as corn yields per acre increased, but both acres of cropland and investment increased as yield of corn per acre increased (Figure 39). Since both of these factors are associated with corn yields they may be partly responsible for the higher labor earnings received as the crop yields increased.

Crop Yield Index

Corn yields alone do not adequately measure crop production rates on farms where considerable of the acreage is in hay, small grains, and

other crops. In measuring production rates of all crops an index was used for the purpose of showing, for each farm, a percentage comparison of yields per acre of all crops with the average of the area. A weight was placed on each crop corresponding to the average number of productive man work units required per acre of the crop. This weighting compensated to some degree for intensity of crop.

Most studies have found that crop index is associated with farm returns. This has been true even on livestock farms.

Farms with crop indices of less than 75 had labor earnings of \$283 per farm (Table XL). For those obtaining crop indices of 75 to 99.9 labor earnings averaged \$379 per farm. On farms securing crop indices of 100 to 124.9 the labor earnings averaged \$384. The group of farms with the highest average crop index were the most profitable, having an average labor earnings of \$1052. Both increase in crop index and labor earnings for the last group of farms over the preceding group were greater than in the other groups. The second group of farms had an average crop index of almost 25 percent under the next group, but due mainly to large incomes from other sources (mostly non-farm income) the average labor earnings were almost as great (Figure 40). Farms with the highest crop index had also the largest incomes from other sources, mostly from Agricultural Conservation Payments, forest products, and machine hire.

The total number of animal units per farm increased from an average

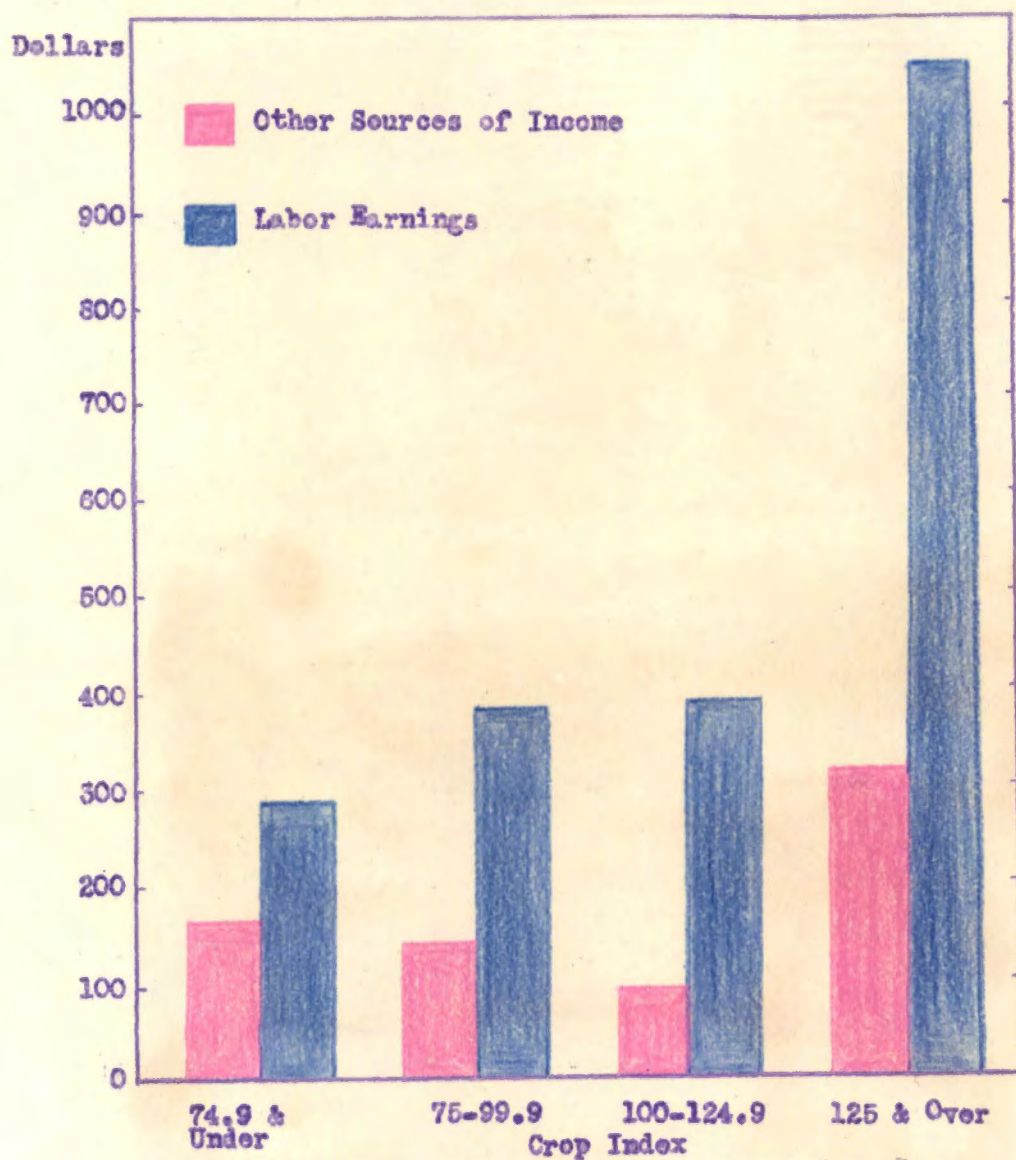


Figure 40. Relation of Crop Index to Other Sources of Income and Labor Earnings, 92 Upland Farms, Roane County, Tennessee, 1939

Source: Table XL.

of 3.93 for farms with the lowest crop index to 18.01 for the group with the highest crop index. Acres of cropland also increased as crop index increased.

TABLE XL. RELATION OF CROP INDEX TO LABOR EARNINGS, 92
UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY,
TENNESSEE, 1939

Crop Index	Number of Farms *	Average per Farm				
		Crop Index	Acres of Cropland	Total Animal Units	Other Sources of In- come	Labor Earn- ings
74.9 & under	29	61.2	44.9	3.93	\$168	\$283
75 - 99.9	29	89.1	68.6	9.20	142	379
100 -124.9	23	112.5	72.7	10.73	89	384
125 & over	11	158.5	109.2	18.01	317	1052

* One farm was omitted inasmuch as it had only truck crops.

Value of Crop Sales per Acre in Crops

The average value of crops sold per acre in crops was \$7.63, ranging from 0 to \$120.71.

Since cash crops were important as sources of income on these farms one would expect value of crops sold per acre in crops to reflect production rates. However, crops fed to livestock or used in family living will affect this as a measure on many farms. Those farms with crop sales of less than \$5 per acre in crops averaged \$415 labor earnings per farm, on farms obtaining \$5 to \$9.99 of crop sales per acre in crops the labor earnings averaged \$361, and farms securing \$10 and over had average labor

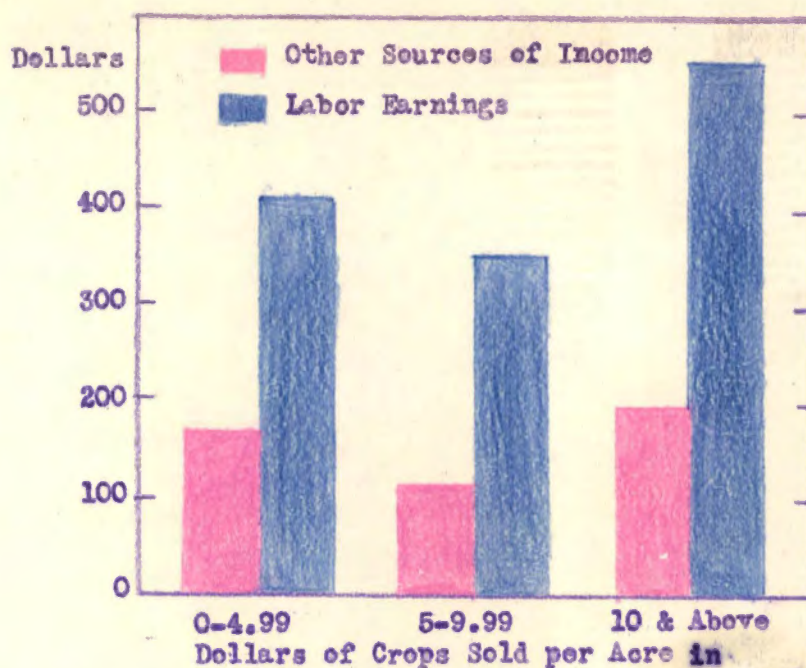


Figure 41. Relation of Dollars of Crops Sold Per Acre in Crops to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XLI.

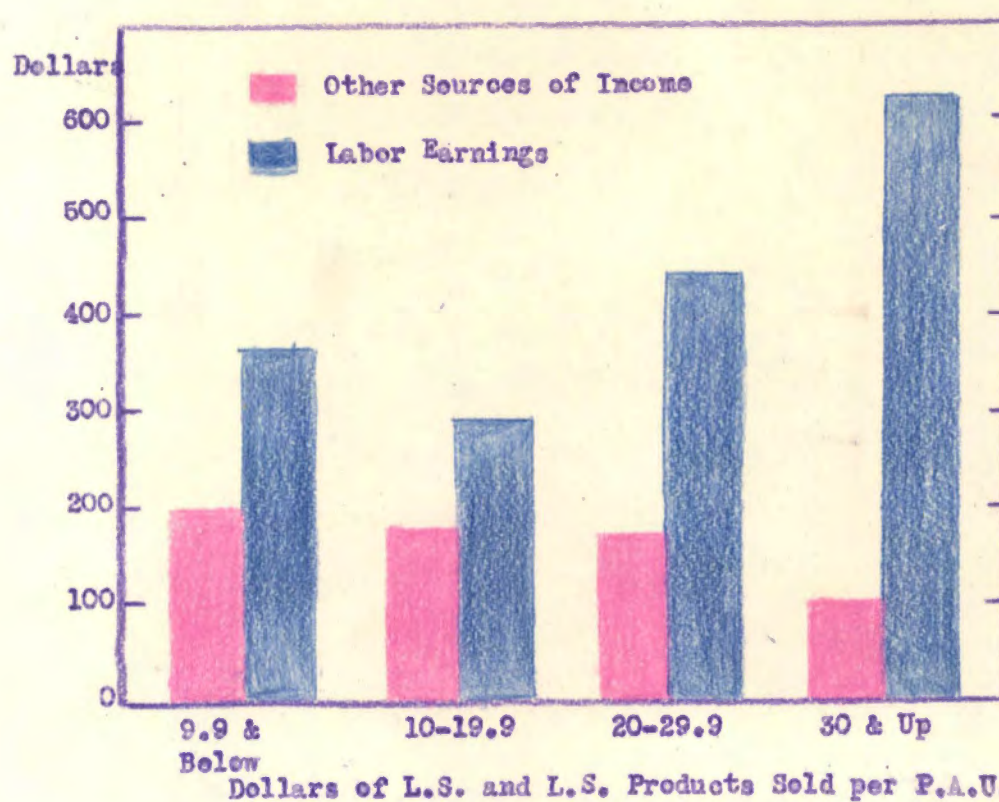


Figure 42. Relation of Dollars of Livestock and Livestock Products Sold per Productive Animal Unit to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table XLII.

earnings of \$555. No relationship appeared to exist between earnings and values of crop sales per acre in crops (Figure 41).

There was also no association of total investment, acres of cropland, and other sources of income with crop sales per acre in crops (Table XLI).

TABLE XLI. RELATION OF CROP SALES PER ACRE IN CROPS TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Crops Sold per Acre in Crops	Number of Farms	Average Value of Crop Sales per Acre in Crops	Average per Farm			
			Acres of Crop-land	Total Invest-ment	Other Sources of In-come	Labor Earn-ings
\$ 0 - 4.99	37	\$2.69	61	\$2875	\$168	\$415
5.00 - 9.99	35	7.08	72.6	3134	120	361
10.00 & up	21	20.77	67	2902	199	555

These findings did not agree with the results found in Laurel County, Kentucky, where receipts per acre of crops were closely associated with income. In that area the labor earnings increased constantly as receipts per acre of crops increased. (3)

Livestock Receipts per Productive Animal Unit

Receipts per productive animal unit as used in this study includes livestock increases and decreases, net sales, plus sales of livestock

(3) Nicholls, W. D., and Hawthorne, H. W., Farm Management and Incomes of Farm Families in Laurel County, Kentucky, Kentucky Agricultural Experiment Station, Bulletin 305, p. 250, Lexington, 1930.

products. It does not include the animal products used in the home. Average receipts per productive animal unit were \$29.50, ranging from a minus (-) \$53 to a plus \$30.

Except for the group of farms with lowest receipts per productive animal unit there was an increase in labor earnings as receipts per productive animal unit increased (Figure 42). The farms with less than \$10 receipts per productive animal unit averaged \$357 of labor earnings per farm; those securing \$10 to \$19.9 per productive animal unit had an average labor earnings of \$297. Farms obtaining \$20 to \$29.9 receipts per productive animal unit had labor earnings averaging \$427 per farm. The group with receipts of \$30 and above per productive animal

TABLE XLII. RELATION OF LIVESTOCK RECEIPTS PER PRODUCTIVE ANIMAL UNIT TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Receipts per Productive Animal Unit	Number of Farms	Average Receipts per Productive Animal Unit	Average per Farm		
			Acres Cropland	Income Other Sources	Labor Earnings
\$9.9 & below	18	\$3.9	44.4	\$198	\$357
10 - 19.9	23	16.2	66.3	172	297
20 - 29.9	29	25.1	76.9	165	427
30 & up	23	53.8	71.2	99	610

unit had an average labor earnings of \$610.

Acres of cropland and investment in the farm business both increased with receipts per productive animal unit until these receipts became as

large as \$30 per animal unit. Following this point both acres of cropland and investment decreased slightly. Other sources of income decreased as receipts per productive animal unit increased (Table XLII). Part-time work off the farm is probably not conducive to proper feeding and care of livestock.

Farms in Overton County, Tennessee, which had about the same average receipts per productive animal unit, had an increase in farm earnings as the receipts per productive animal unit increased.⁽⁴⁾

(4) Robison, A. C., Farm Management in Overton County, Tennessee, Chapter V, p. 293, Master's thesis, University of Tennessee, Knoxville, 1937.

CHAPTER IX
RELATION OF EFFICIENCY TO LABOR EARNINGS

Capital Efficiency

Capital, one of the factors of production, does not usually constitute as much of the expense of farm operation as does labor. However, it is limited, and hence efficient use of it is necessary if one is to secure the greatest farm returns. Factors measuring the efficient use of capital in this study were gross receipts per \$100 of investment, gross receipts per \$1.00 of expense, and gross receipts per \$1.00 invested in machinery and equipment. Percent of investment in working capital and acres in crops per \$1.00 invested in machinery might have been used to measure capital efficiency, but were used instead in the following chapter as factors of balance in organization.

Gross Receipts per \$100 Investment. - The average gross receipts for all farms per \$100 invested in the farm business was \$21.39, ranging from \$2.22 to \$164.84 per farm.

There was a moderate increase in labor earnings as the gross receipts per \$100 invested increased. Farms with less than \$15 gross receipts per \$100 invested in the farm business averaged labor earnings of \$218 (Table XLIII). The next group of farms with approximately double the receipts per unit of investment had average labor earnings of \$504

per farm. Labor earnings for the next two groups of farms averaged \$566 and \$601 respectively. The increase in earnings was greatest

TABLE XLIII. RELATION OF GROSS RECEIPTS PER \$100 INVESTED TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Gross Receipts per \$100 Invested	Number of Farms	Average Receipts per \$100 Invested	Average per Farm			
			Acres of Cropland	Total Investment	Other Sources of Income	Labor Earnings
\$14.99 & under	35	\$10.45	52.2	\$3012	\$61	\$218
15.00 - 24.99	24	19.70	95.8	4186	169	504
25.00 - 34.99	15	28.38	78.7	3307	230	566
35.00 & over	19	66.74	47.3	1133	260	601

between the first two groups (Figure 43).

Acres of cropland and investment were smallest for those groups with largest and smallest receipts per unit of investment. Other sources of income increased as gross receipts per \$100 invested increased.

Gross Receipts per \$1.00 of Expense. - The average gross receipts per \$1.00 of expense ⁽¹⁾ on these farms was \$1.70, ranging from \$.13 to \$26.09.

Farms with average receipts of \$.91 per \$1.00 expended received average labor earnings of \$139 per farm. On farms obtaining from \$1.25 to \$1.99 per \$1.00 of expenditure, the labor earnings averaged \$430.

(1) Expense includes current expenses, unpaid family labor, livestock net decrease, depreciation, and decrease in feed and supplies.

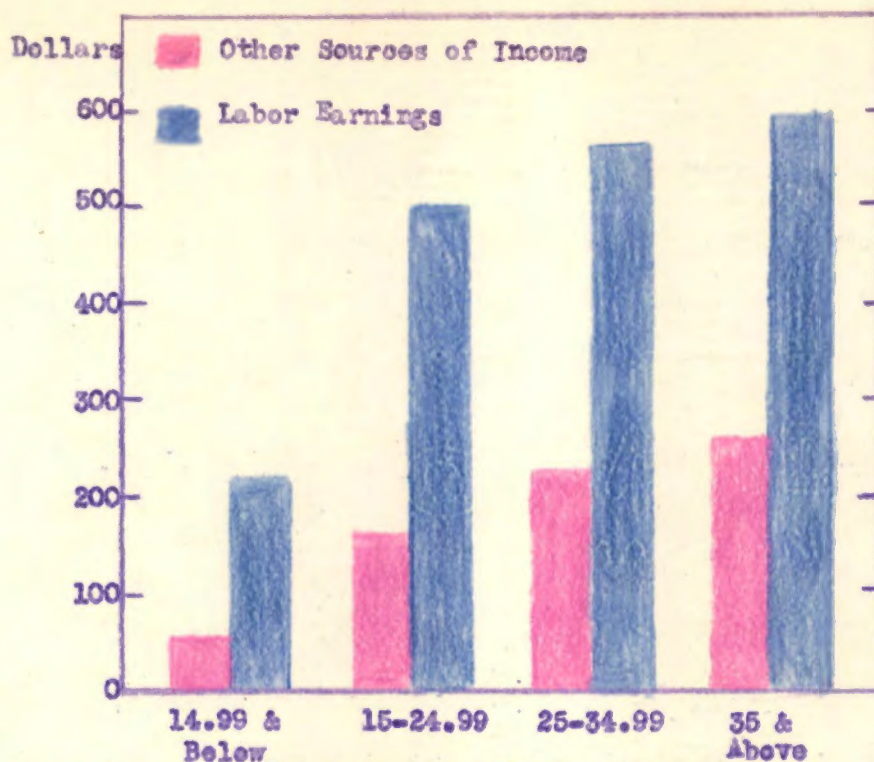


Figure 43. Relation of Gross Receipts per \$100 Invested to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939
Source: Table XLII.

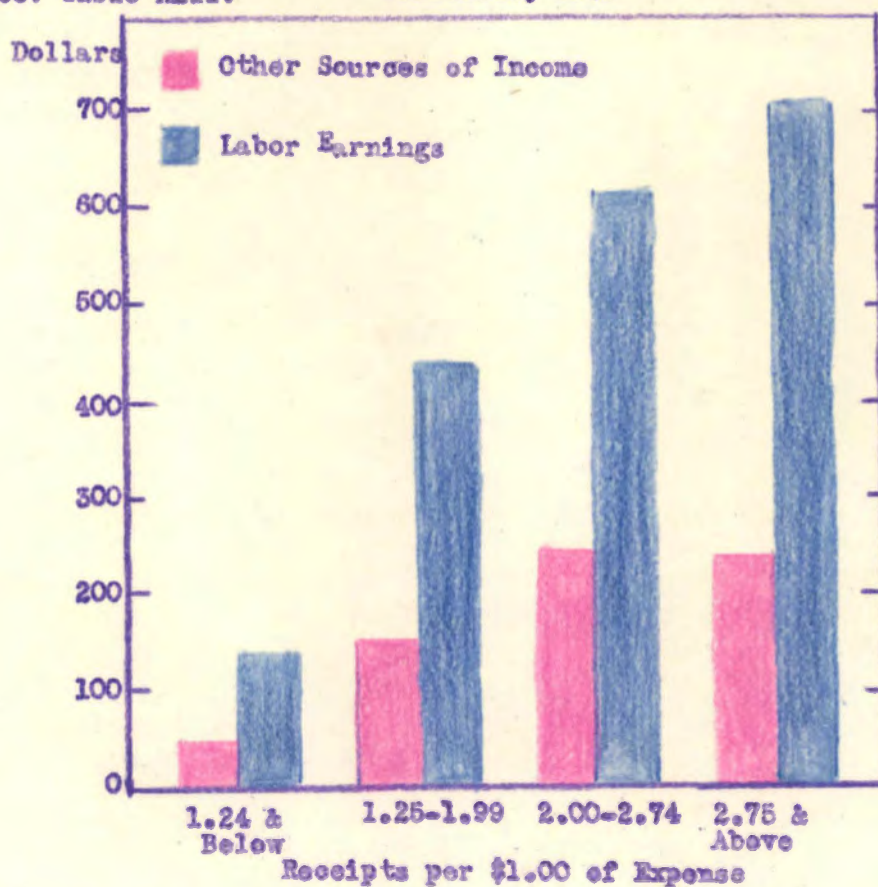


Figure 44. Relation of Gross Receipts per \$1.00 of Expense to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939
Source: Table XLIV.

The group of farms securing from \$2.00 to \$2.74 per \$1.00 of expense had an average labor earnings of \$606, and those farms which received \$2.75 per \$1.00 of expense averaged \$705 (Figure 44).

TABLE XLIV. RELATION OF GROSS RECEIPTS PER \$1.00 EXPENDED TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Gross Receipts per \$1.00 Expense	Number of Farms	Average Gross Receipts per \$1.00 Expense	Average per Farm			
			Acres of Cropland	Total Investment	Other Sources of Income	Labor Earnings
\$1.24 & below	30	\$.91	57.2	\$2961	\$51	\$139
1.25 - 1.99	25	1.52	79.6	3298	160	430
2.00 - 2.74	21	2.35	76.6	3432	246	606
2.75 & above	17	3.42	52.2	1979	230	705

The scatter diagram showed a very definite increase in labor earnings as receipts per \$1.00 expended increased, until receipts reached \$3.00 per \$1.00 of expense, at which point there was a leveling off of labor earnings. Other sources of income and total investment both rose with an increase in receipts per \$1.00 of expense, until receipts became as large as \$2.75 per \$1.00 expended.

The group of farms with the largest receipts per \$1.00 of expense had approximately 14 acres less cropland and \$1000 less invested in the farm business than the average of all 93 farms; yet they had higher labor earnings (Table XLIV). This relationship indicates that economy in operation is probably as important as size in this area.

A close relation of receipts per \$1.00 expended and farm earnings was also found on farms in Overton County, Tennessee.⁽²⁾

Gross Receipts per \$1.00 Invested in Machinery and Equipment. - There appeared to be no relation between receipts per \$1.00 invested in machinery and labor earnings (Figure 45). Farms with from \$7 to \$9 receipts per \$1.00 investment in machinery had an average labor earnings of \$769 (Table XLV). According to the arithmetic average this group of farms had the highest labor earnings, however, the median for this group was only \$278, or lower than the median of any of the other groups. Median labor earnings were \$513, \$342, \$278, and \$299 per farm for each group as receipts increased relative to farm investment. Thus the median earnings varied very little between groups, and showed no relationship.

TABLE XLV. RELATION OF GROSS RECEIPTS PER \$1.00 INVESTED IN MACHINERY AND EQUIPMENT TO LABOR EARNINGS, 91 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Gross Receipts per \$1.00 Investment in Machinery	Number of Farms *	Average Receipts per \$1.00 Invested in Machinery	Average per Farm		
			Total Investment	Other Sources of Income	Labor Earnings
\$ 1 - 3	39	\$2	\$3524	\$122	\$361
4 - 6	18	5	2400	135	368
7 - 9	13	8	3799	131	769
10 & above	21	17	2090	249	406

* Two farms omitted as they had no machinery.

(2) Robison, A. C., Farm Management Survey of Overton County, Tennessee, Chapter V, p. 293, Master's thesis, University of Tennessee, 1937.

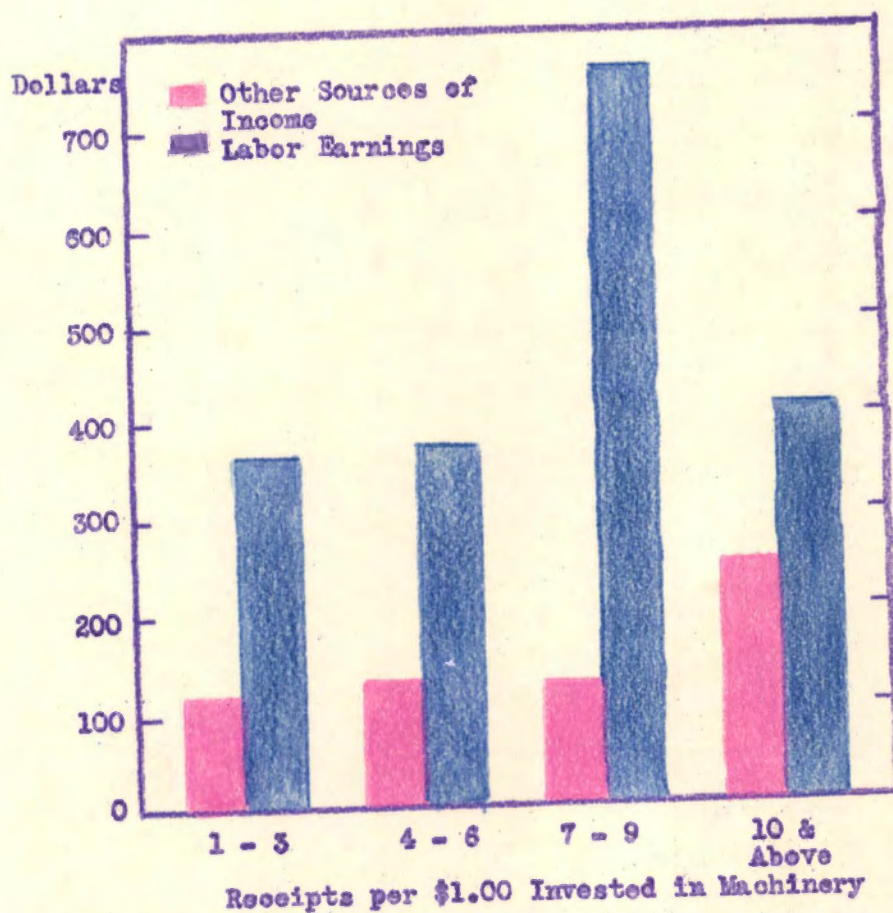


Figure 45. Relation of Gross Receipts per \$1.00 Invested in Machinery to Other Sources of Income and Labor Earnings, 91 Upland Farms, Roane County, Tennessee, 1939

Source: Table XLV.

Labor Efficiency

Labor is usually the most important item of farm expense, and for this reason labor accomplishment per man usually exerts a marked influence on farm earnings. Productive man work units per man and productive horse work units per horse were used as measures of labor efficiency in this study. Other studies have also used acres in crops per man, and acres in crops per horse as measures of efficiency of labor. In this study, however, these are discussed under farm balance.

Productive Man Work Units per Man. - On the farms in this study man labor, while an important item of expense, was relatively plentiful. Many of the operators did not have enough work to keep themselves busy at productive enterprises. Productive man work units were only 184.6 per farm, and 135.3 per man.

Farms obtaining less than 80 productive work units per man ⁽³⁾ had an average labor earnings of \$424. Farms in the following groups accomplishing more work per man had average labor earnings of \$330, \$462, and \$594 in the order named (Table XLVI). While the arithmetic average labor earnings of farms with the least productive man work units per man was larger than the earnings of the next group of farms, median labor earnings showed a definite increase among the four groups

(3) Productive man work units per man is defined in Chapter II, page 21.

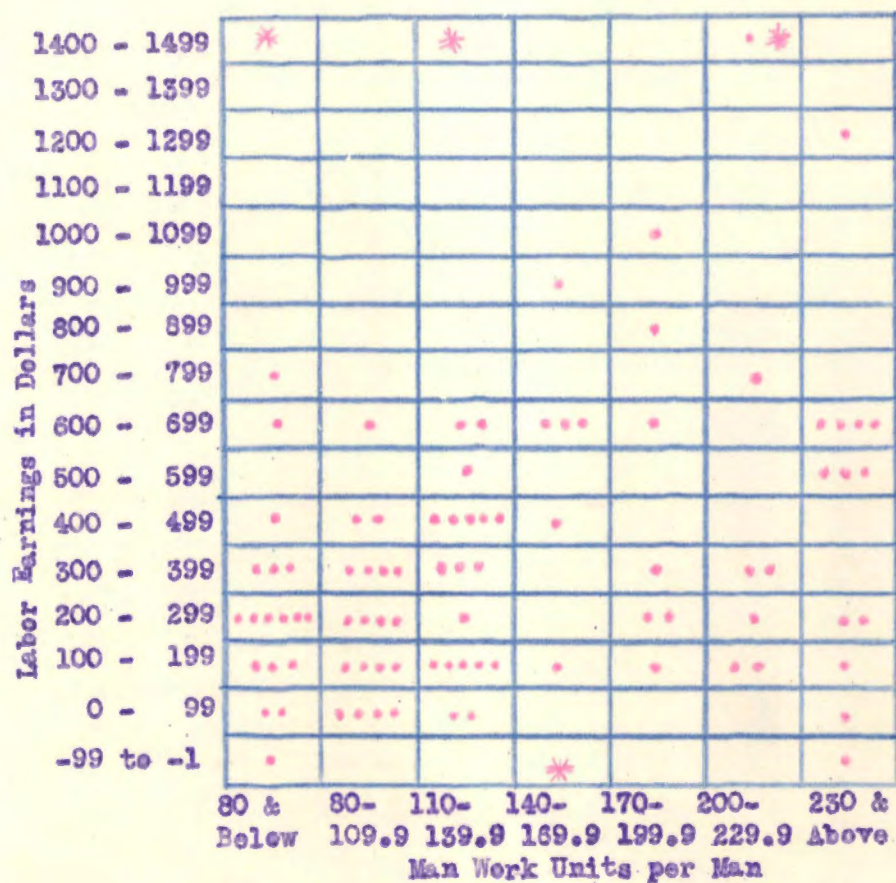


Figure 46. Labor Earnings by Man Work Units per Man, 92 Upland Farms, Reane County, Tennessee, 1939

- Labor earnings of one farm.
- * Value of labor earnings too low or too high to be shown on the chart.

Source: Surveys of 93 Upland Farms.

as productive work per man increased. Median earnings for each of the four groups were \$235, \$298, \$523, and \$543 respectively.

TABLE XLVI. RELATION OF PRODUCTIVE MAN WORK UNITS PER MAN TO LABOR EARNINGS, 92 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Productive Man Work Units per Man	Number of Farms *	Average Productive Man Work Units per Man	Average per Farm			
			Acres of Crop-land	Total Animal Units	Other Sources of Income	Labor Earnings
20 - 79.9	19	64.7	35.6	3.87	\$187	\$424
80 -139.9	38	113.9	69.8	8.64	135	330
140-199.9	14	177.7	88.5	14.91	186	462
200 & above	21	256.4	75.6	10.28	153	594

* One farm omitted for lack of complete data.

The scatter diagram showed an increased earnings for groups having up to about 200 productive man work units per man. A slight drop in labor earnings was shown, however, for the farms obtaining 230 or more (Figure 46).

Both acres of cropland and total animal units increased in this area as productive man work units per man increased up to about 200, and then decreased.

Findings from farm management studies in Kentucky, Virginia, Texas, and Pennsylvania all showed a close relation between man work units per man and farm returns. Labor was one of the most important items of expense in all four studies.

(4)

Productive Horse Work Units per Horse. - Because of the many small farms in this area, horse labor is a more acute problem than man labor on these farms. A man can usually do part-time work off the farm, thus being more efficient with his labor. There is, however, less opportunity available for a horse to work off the farm for pay. For this reason large or medium size farms are in a better position to make efficient use of horse labor.

A study of farms in Ellis County, Texas, found that there was an increase in horse work units per horse as the number of crop acres increased.⁽⁵⁾ In Brooks County, Georgia, the farms that obtained 75 or less productive days of mule labor per mule had an average cost of \$1.70 for mule labor per day, while the farms with 151 or more of productive days mule labor per mule had an average mule cost of only \$.72 per day.⁽⁶⁾

TABLE XLVII. RELATION OF PRODUCTIVE HORSE WORK UNITS PER HORSE TO LABOR EARNINGS, 77 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Productive Horse Work Units per Horse	Number of Farms*	Average Productive Horse Work Units per Horse	Average per Farm			
			Acres of Crop-land	Non-Farm Income	Other Sources of Incomes	Labor Earnings
49.9 & below	25	54.4	43.1	\$70	\$135	\$216
50 - 99.9	31	69.3	72.8	70	129	440
100 and above	21	122.5	110.8	29	212	780

*There were 16 farms omitted as they had no horses.

(4) Productive horse work units per horse is defined in Chapter II, p. 21.

(5) Adams, R. L., Farm Management, Chapter XII, pp. 286 and 287, McGraw-Hill Book Company, Inc., New York, 1921.

(6) Ibid., Chapter XII, p. 287.

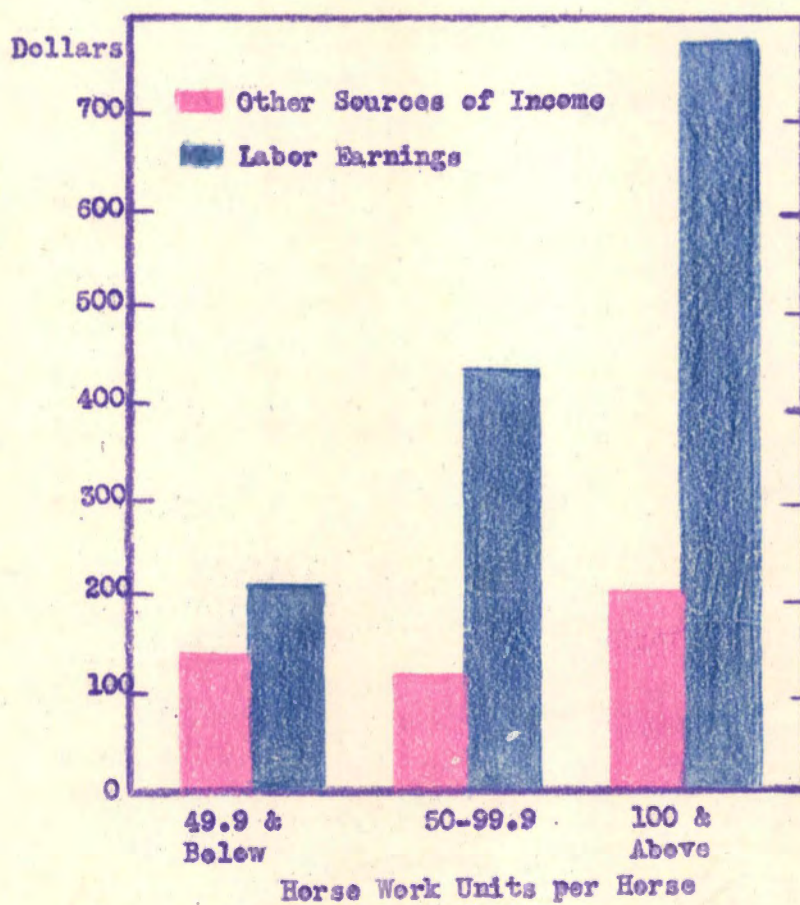


Figure 47. Relation of Horse Work Units per Horse to Other Sources of Income and Labor Earnings, 77 Upland Farms, Roane County, Tennessee, 1939

Source: Table XLVII.

In this area there appeared to be a much closer relation between efficiency of horse labor and labor earnings than was true for man labor. As productive work per horse doubled labor earnings increased in approximately the same ratio for each group (Figure 47). Farms obtaining less than 50 productive horse work units per horse had an average labor earnings of \$216; while farms with 50 to 99.9 had average labor earnings of \$440 per farm (Table XLVII). Farms securing 100 or more productive horse work units per horse had an average labor earnings of \$780.

Other sources of income appeared to show no relation to efficiency in use of horses, but the non-farm income was less on farms where horse labor was more efficient. Acres of cropland increased from approximately 48 acres for the group of farms with the lowest efficiency in use of horses to 111 acres for farms with the highest horse labor efficiency.

CHAPTER X

RELATION OF BALANCE IN ORGANIZATION TO LABOR EARNINGS

Achieving a balanced farm organization is one of the greatest problems confronting the farmer. Balance is used in this study to mean the proper relationship between size of business, amount of capital, utilization of labor and power, number of enterprises, and between crops and livestock to give the maximum earnings from the operation of the farm. Measures of balance used in this study were acres in crops per man, per horse, per productive animal unit, and per \$1.00 invested in machinery; number of sources of receipts; percent of investment in working capital; and number of factors in which farms were above average.

Balance is a shifting thing. Changing prices frequently make readjustments necessary. For example, when prices of machinery become high it may be necessary to offset amount of equipment with greater use of man and horse labor. Increase in farm wages, or scarcity of labor, may make it necessary that a farmer crop more acres himself.

An attempt was made here to determine what balance of the above organization factors gave the greatest labor earnings in 1939.

Acres in Crops per Man

On these farms the relation of acres in crops per man ⁽¹⁾ to labor earnings was not as positive as some of the other factors. This was probably because the intensity of crops grown varied for different farms. Some of the farms grew relatively large amounts of hay, while others grew mostly corn, or other intensive crops. These latter required more labor, and in return larger production was attained. The farms having less than 15 acres in crops had an average labor earnings of \$349, or approximately the same as was true for farms having 15 to 24.9 acres in crops per man (Table XLVIII). Farms with 25 to 34.9 acres in crops per man had labor earnings averaging \$567 per farm, while those farms with 35 acres in crops or more per man had

TABLE XLVIII. RELATION OF ACRES IN CROPS PER MAN TO LABOR EARNINGS, 92 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Acres in Crops per Man	Number of Farms *	Average Acres in Crops per Man	Average per Farm			
			Total Man Equivalents	Acres of Crop-land	Other Sources of Income	Labor Earnings
14.9 and under	25	9.9	1.17	29.3	\$131	\$349
15-24.9	30	20.0	1.53	65.9	125	343
25-34.9	17	31.3	1.69	98.8	264	567
35 & up	20	48.5	1.07	88.5	151	545

* One farm was omitted because of incomplete data.

(1) Acres in crops per man is calculated by dividing number of acres used for crops by the number of man equivalent per farm.

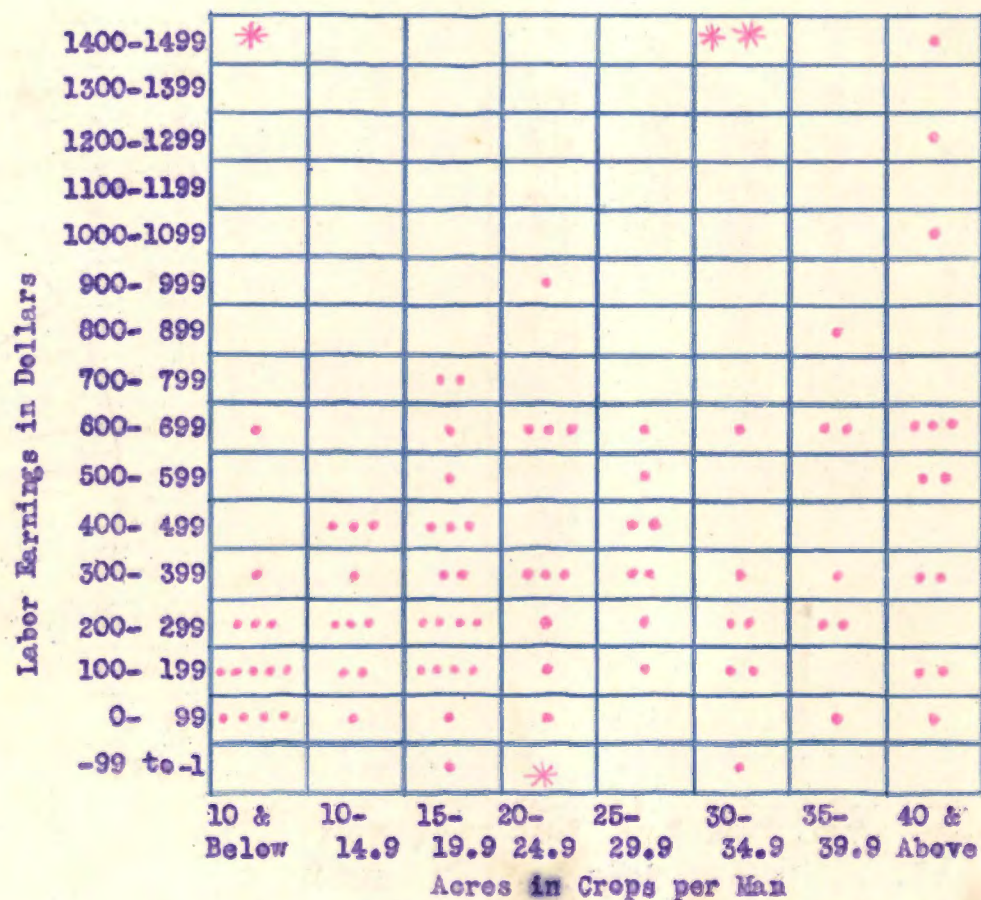


Figure 48. Labor Earnings by Acres in Crops per Man, 92 Upland Farms, Reane County, Tennessee, 1939

- Labor earnings of one farm
- * Value of labor earnings too high or too low to be shown on the chart.

Source: Surveys of 93 Upland Farms.

an average earnings of \$545. One fruit farm in the group with lowest acres in crops per man had high earnings and consequently raised the average for this group. A similar situation was true with respect to the third group. Median labor earnings for each group were as follows: \$229, \$312, \$322, and \$547. There appears to be a somewhat closer relation between acres in crops per man and labor earnings as shown by scatter diagram than when shown by the arithmetic average (Figure 48).

For the group with the most acres in crops per man there was a decline in number of acres of cropland, man equivalent and total animal units with a corresponding increase in non-farm income.

Farms in Appomattox County, Virginia, showed increases in farm income as crop acres per man increased.⁽²⁾ This relation, however, did not hold true for labor income. In Central Pennsylvania there appeared to be a slight relationship between crop acres per man and labor income.⁽³⁾

Acres in Crops per Horse⁽⁴⁾

In areas where horses are the only source of power, and the

(2) Gibson, W. L., An Economic Study of Farming in Appomattox County, Virginia, Agricultural Experiment Station, Bulletin 311, p. 28, Blacksburg, 1937.

(3) McCord, J. E., Farm Practices and Management in Central Pennsylvania, Agricultural Experiment Station, Bulletin 379, p. 69, 1939.

(4) Acres in crops per horse is a measure of efficiency in the use of horse work on farms which horses are the only source of power. It is determined by dividing the number of acres used for crops by the number of workstock per farm.

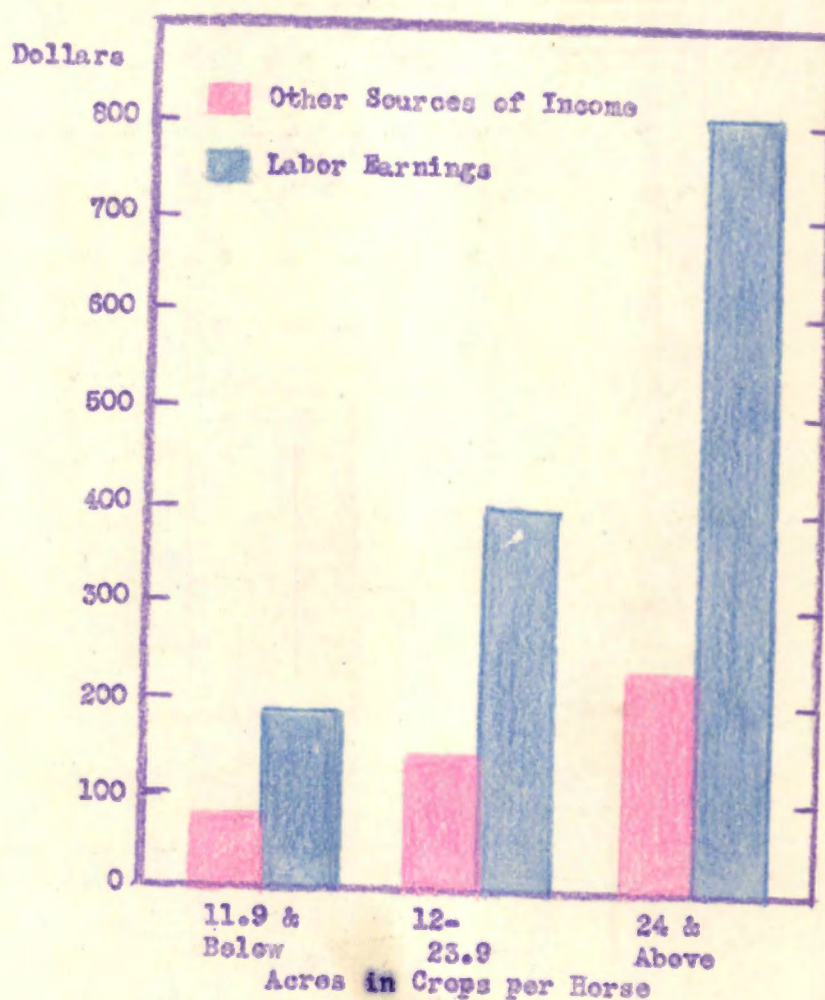


Figure 49. Relation of Acres in Crops per Horse to Other Sources of Income and Labor Earnings, 72 Upland Farms, Reane County, Tennessee, 1939

Source: Table XLIX.

intensity of crops grown does not vary greatly from the standpoint of horse labor required, a positive relation is usually found between acreage cultivated per horse and labor earnings. In Anderson County, Georgia, when income was calculated on a per mule basis the average income per mule was \$233 when 11 acres or less were tilled per mule. (5) Income increased as acres per mule increased. Farms with 28 acres or more in crops per mule earned an average of \$386 per mule. This data while not quite comparable in some respects with the study of the 93 farms in Roane County indicates a reason why farms are more profitable when maximum acres are tilled per horse; namely, that in those cases the cost of horse labor is reduced.

On these farms in Roane County there was probably the most positive relation between acreage in crops per horse than any factor

TABLE XLIX. RELATION OF ACRES IN CROPS PER HORSE TO LABOR EARNINGS, 72 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Acres in Crops per Horse	Number of Farms *	Average Acres in Crops per Horse	Average per Farm				
			Acres of Crop-land	Total Animal Units	Total Investment	Other Sources of Income	Labor Earnings
11.9 & below	25	8.5	43.3	6.8	\$2041	\$89	\$198
12-23.9	29	16.6	69.0	8.4	2753	144	400
24 & above	18	33.7	120.2	17.5	5577	223	803

* Five farms with tractors and 16 farms with no horses were omitted

(5) Adams, R. L., Farm Management, Chapter XII, p. 287, McGraw-Hill Book Company, Inc., New York, 1921.

related to labor earnings. Farms with less than 12 acres in crops per horse had average labor earnings of \$198 per farm. For those farms with 12 to 23.9 acres in crops per work horse, labor earnings averaged \$400, or double that of the former group with but half the acres in crops per horse. Other farms with 24 acres in crops per horse averaged \$803 in labor earnings. Thus, for each group where acres in crops per horse doubled, the average labor earnings also doubled (Figure 49).

Acres of cropland, animal units, investment, and other sources of income, also increased greatly as acres in crops per horse increased (Table XLIX).

The 16 farms with no workstock or tractors averaged only 6.6 acres in crops, 26 acres of cropland per farm, 1.4 animal units, but had \$65 higher average labor earnings than the farms having less than 12 acres in crops per horse and averaging 18.7 acres in crops. These farms with no horses, however, averaged \$172 per farm from other sources of income, almost double that received by the group of farms with the least acres in crops per horse.

The five farms with both tractors and horses averaged approximately the same labor earnings as the farms with 24 or more acres in crops per horse. These five farms obtained higher other sources of incomes and had higher investment, but had less cropland, less total animal units and had only 19.8 acres in crops per horse. None of the farms with tractors had the most total productive horse work units,

or productive horse work units per horse, or total productive man work units, or productive man work units per man.

Acres in Crops per Productive Animal Unit

Farms in this study averaged 4.79 acres in crops per productive animal unit,⁽⁶⁾ ranging from 1 to 44.3 acres.

Acres in crops per productive animal unit and labor earnings were not very closely related on these farms (Figure 50). Farms having less than three acres in crops per productive animal unit had average labor earnings of \$515 per farm. Those farms with one productive animal unit for every 3 to 5.9 acres in crops averaged \$405 of labor earnings. The third group of farms with 6 to 8.9 acres in crops per productive animal unit averaged \$346 of labor earnings,

TABLE L. RELATION OF ACRES IN CROPS PER PRODUCTIVE ANIMAL UNIT TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Acres in Crops per Productive Animal Unit	Number of Farms	Average Acres in Crops per Productive Animal Unit	Average per Farm			
			Number of Productive Animal Units	Acres of Crop-land	Other Sources of Income	Labor Earnings
0 - 2.9	17	2.06	11.43	60.7	\$248	\$515
3 - 5.9	34	4.16	9.82	83.9	140	405
6 - 8.9	15	7.55	5.81	53.3	114	346
9.0 & above	27	12.63	3.12	56.3	144	441

(6) Acres in crops per productive animal unit is calculated by dividing acres used for crops by the number of productive animal units (colts were counted as productive livestock).

while the group of farms having 9 or more acres in crops per productive animal unit had an average labor earnings of \$441 (Table L). Median labor earnings for the groups, in order of increased acres in crops per animal unit, were \$264, \$289, \$276, and \$331. Apparently there was very little relationship between labor earnings and acres in crops per productive animal unit.

Other sources of income showed practically the same relation to acres in crops per productive animal as did labor earnings.

J. E. McCord found that farms in Central Pennsylvania averaged four crop acres per animal unit.⁽⁷⁾ Farms that averaged 3 acres or less had the highest labor incomes and those farms that averaged over 5 acres were making the smallest labor incomes. His conclusion of a seven year study was that livestock men who stocked a little heavier than average had the advantage.

Acres in Crops per \$1.00 Invested in Machinery

Many American farmers are inclined to overstock their farms with machinery, thus making a higher equipment charge than is justified.

Farms in this study averaged .19 acres in crops per \$1.00

(7) McCord, J. E., Farm Practices and Management in Central Pennsylvania, Agricultural Experiment Station, Bulletin 379, p. 77, Pennsylvania State College, 1939.

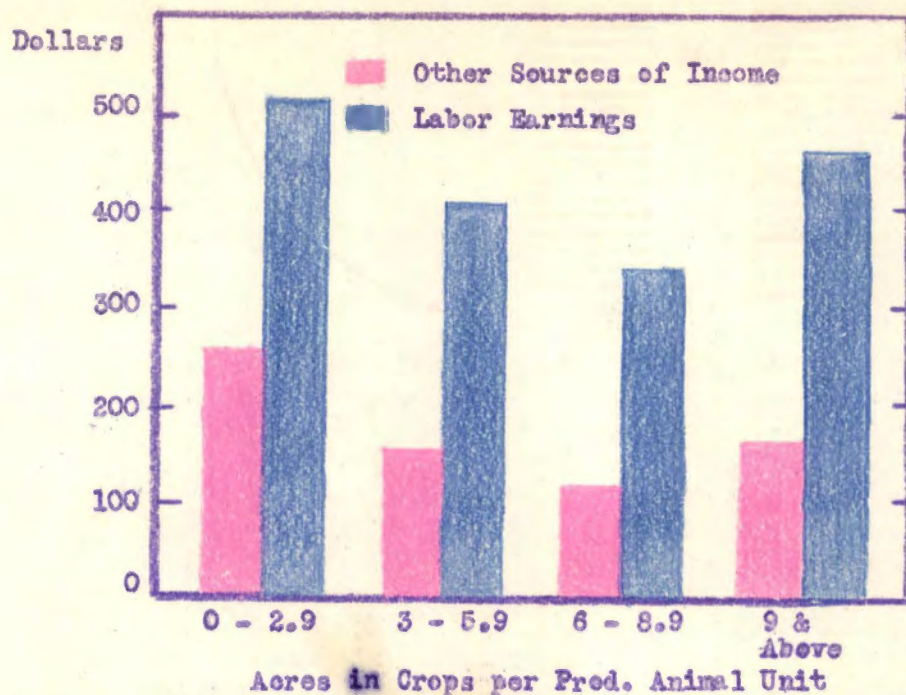


Figure 50. Relation of Acres in Crops per Productive Animal Unit to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table L.

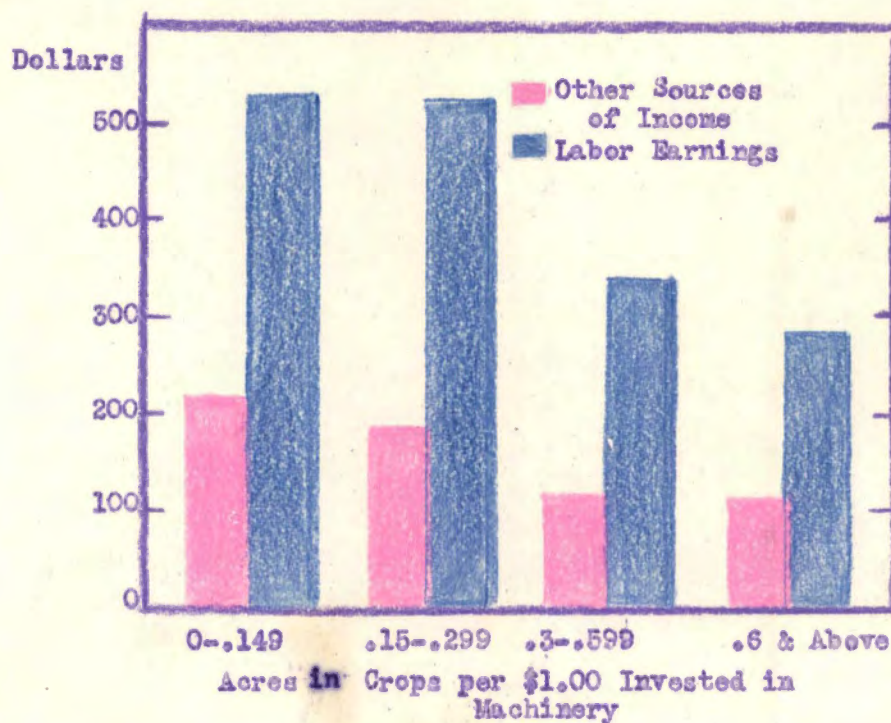


Figure 51. Relation of Acres in Crops per \$1.00 Invested in Machinery to Other Sources of Income and Labor Earnings, 91 Upland Farms, Roane County, Tennessee, 1939

Source: Table LI.

invested in machinery. This is approximately \$5 of machinery per acre used for crops with a wide range of from \$.15 to \$50.00 per acre in crops. A few of the farms appeared to have too much machinery, but more of them seemed to have too little equipment. Twenty-two farms averaged only \$.83 invested in machinery per acre used for crops.

TABLE LI. RELATION OF ACRES IN CROPS PER \$1.00 INVESTMENT
IN MACHINERY AND EQUIPMENT TO LABOR EARNINGS, 91 UPLAND
FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE,
1939

Acres in Crops per \$1.00 In- vested in Ma- chinery and Equipment	Number of Farms *	Average Acres in Crops per \$1.00 in Ma- chinery	Average per Farm			
			Value of Ma- chinery	Acres of Crop- land	Other Sour- ces of Income	Labor Earn- ings
0 - .149	24	.09	\$356	67.7	\$211	\$525
.15- .299	27	.21	228	89.7	181	519
.3 - .599	18	.43	71	61.2	106	343
.6 & above	22	1.19	21	43.4	104	291

* Two farms were omitted as they had no machinery and equipment.

Farms averaging .09 of an acre in crops per \$1.00 of machinery (or approximately \$11 invested in machinery per acre in crops) had an average labor earnings of \$525 (Table LI). As land increased with respect to machinery the average labor earnings decreased from \$525 to \$519, \$343, and \$291 respectively for each of the farm groups. The farms with the largest returns appear to have investments of from \$5

to \$10 in machinery per acre used for crops, or $1/5$ to $1/10$ of an acre per \$1.00 invested in machinery (Figure 51). The farms with more machinery relative to acres in crops had higher labor earnings, and also had more income from other sources. This increased income from other sources, however, was from additional machinery hire rather than working for wages.

Number of Sources of Receipts

Diversification in farming has been advocated by many. Some of its advantages are that it gives continuous income throughout the year if enterprises are properly selected, it spreads the demand for labor throughout the year, risk is decreased, land and equipment may be used to better advantage, soil fertility maintained more readily, and size of business can often be increased.

The 93 farms were classified according to the number of sources of income greater than the taxes paid for the year. The farms averaged approximately 4 sources of income. Four farms had only one source while eight farms had seven sources or over.

Farms with 3 or less sources of income averaged \$251 labor earnings; those with 4 and 5 sources averaged \$493; and those with 6 or more sources averaged \$624 labor earnings (Table LII). This increase in labor earnings may have been due to the association of number of sources with crop yields, animal units, acres of cropland, and other factors. Other sources of income increased as number of sources

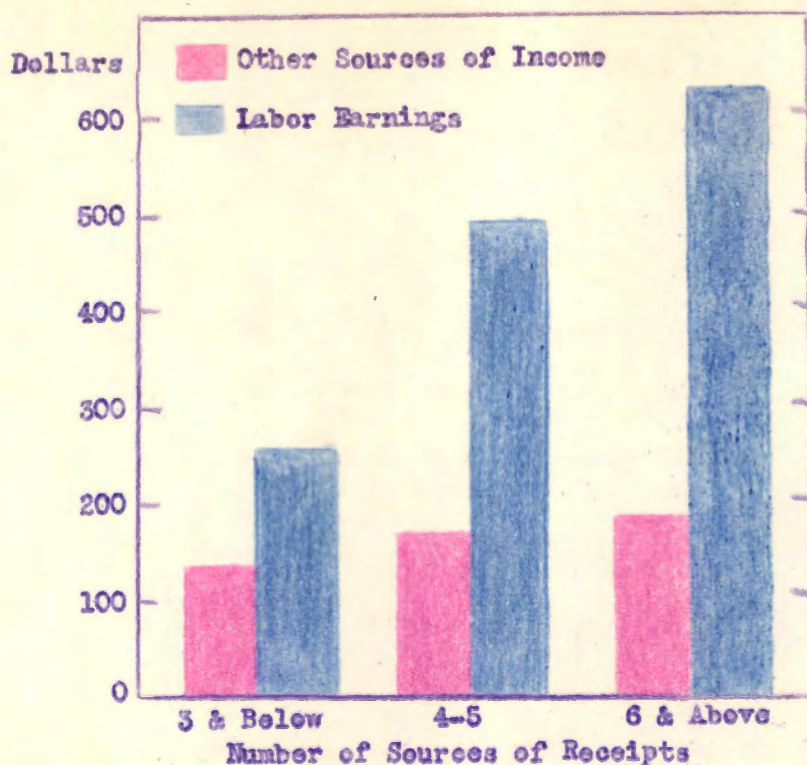


Figure 52. Relation of Number of Sources of Receipts to Other Sources of Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table LII.

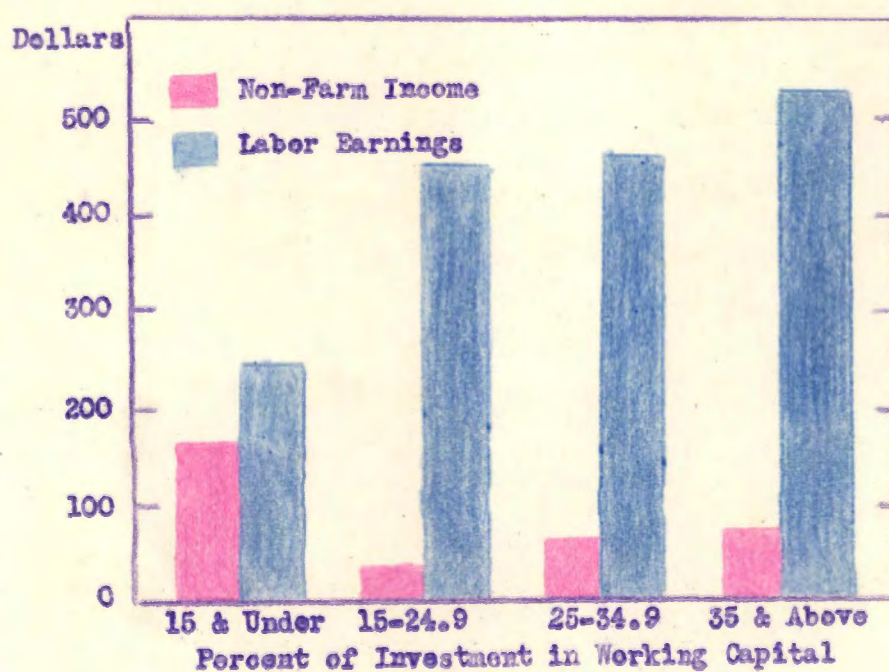


Figure 53. Relation of Percent of Investment in Working Capital to Non-Farm Income and Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table LIII.

TABLE LII. RELATION OF NUMBER OF SOURCES OF RECEIPTS
TO LABOR EARNINGS, 93 UPLAND FARMS, CIVIL DISTRICT
4, ROANE COUNTY, TENNESSEE, 1939

Number of Sources of Receipts *	Number of Farms	Average per Farm				
		Number of Sour- ces of Receipts	Acres of Crop- land	Number of Pro- ductive Animal Units	Other Sources of In- come	Labor Earn- ings
3 & below	37	2.4	43.4	3.47	\$128	\$251
4 - 5	35	4.5	80.1	8.02	166	493
6 & above	21	6.5	85.6	11.95	193	624

* Any source that exceeded the taxes in value was counted as a source of income.

increased (Figure 52).

A study of farms in Crockett County, Tennessee, showed that as the number of sources increased the labor income also increased.⁽⁸⁾ These farms, although mostly cotton farms, averaged approximately 5 sources of income. The Tennessee Agricultural Extension Service in studying farms of East Tennessee also found the number of sources of income closely related to farm returns.

Percent of Investment in Working Capital

The percent of total investment in working capital⁽⁹⁾ is very

(8) Sant, P. T., Farm Management in Relation to Land Use, Soil Conservation and Soil Type, Crockett County, Tennessee, Chapter VIII, p. 138, Master's thesis, University of Tennessee, Knoxville, 1938.

(9) Working capital as used in this study includes investment in machinery, livestock, feed and supplies, and cash on hand.

important in obtaining a well balanced farm. Many farmers have put too much of their capital in land and buildings with the result that not enough funds are left to properly develop and make use of the farm. Tenants with the same amount of capital as owners in the Corn Belt area will get a larger return on their investment as they have a larger percent in working capital. There are also cases of too much investment being in working capital, but the tendency is usually to put too much in land and buildings.

The average proportion of investment in working capital was about 27 percent which is large compared with that of the farms in Tennessee as a whole. Type of farming may have caused this difference. The investment in working capital ranged from 2.3 percent to 58.1 percent per farm. No definite percent of investment in working capital for all farms will give the largest labor earnings due to difference in total investment, size of farm, type of farming, prices and many other factors. But most farms must have above a certain percent of investment in working capital to give as large labor earnings as farms with slightly more or a lot larger percent in working capital.

Farms with less than 15 percent of investment in working capital had an average labor earnings of only \$247 per farm. The average labor earnings for the following three groups of farms were uniformly about \$200 higher; being \$458, \$463, and \$521 for each group in the order named.

TABLE LIII. RELATION OF PERCENT OF INVESTMENT IN WORKING CAPITAL TO LABOR EARNINGS* 93 UPLAND FARMS, CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE, 1939

Percent Investment in Working Capital	Number of Farms	Average per Farm				
		Percent Investment in Working Capital	Total Investment	Crop Index	Non-Farm Income	Labor Earnings
15 & under	22	10.7	\$1738	78.5	\$168	\$247
15 - 24.9	20	18.4	3744	98.2	34	458
25 - 34.9	28	29.6	4053	111.2	50	463
35 & above	23	44.4	2312	92.9	58	521

* Investments and returns for both owners and operators were included for rented farms.

Median labor earnings decreased for the group having the highest percent of investment in working capital. The proportion of investment in working capital did not appear to have much effect on labor earnings, unless it was less than 15 percent. Those with less than this amount declined in labor earnings (Figure 53). This group also had approximately three times the non-farm income of any other group. Because of the little working capital this group of farmers may have been forced to work off the farm.

Number of animal units, crop index, and total investment increased until the farms reached an investment of about 35 percent in working capital. There was a decrease in these factors for farms with greater investments in working capital (Table LIII).

Number of Factors in Which Farms Are Above Average

Rarely do farm earnings depend on any one factor. High labor earnings usually depend on a well balanced business in which the farm is above average in many factors.

In Laurel County, Kentucky, farms above average in no factors had an average labor earnings of only \$236.⁽¹⁰⁾ As the farms increased in number of factors above average the labor earnings increased. The farms above average in eight factors had an average labor earnings of \$838.

Factors representative of size of business, production rates, capital efficiency, labor efficiency, and balance in organization were used to show effects of a combination of factors on earnings. No attempt was made to select factors closest related to labor earnings, but if the factors did not show some positive relationship to labor earnings they were not included.

The seven factors used with the average of each for the 93 farms were:

Workstock (number of heads)	1.8
Crop index	100.0
Dollars of gross receipts per	
\$1.00 of expense	1.7
Man work units per man	135.3
Acres in crops per horse	18.1
Number of sources of receipts	4.1
Percent of investment in	
working capital	27.0

(10) Nicholls, W. D., and Hawthorne, H. W., Farm Management and Incomes of Farm Families in Laurel County, Kentucky, Agricultural Experiment Station, Bulletin 305, p. 257, Lexington, 1930.

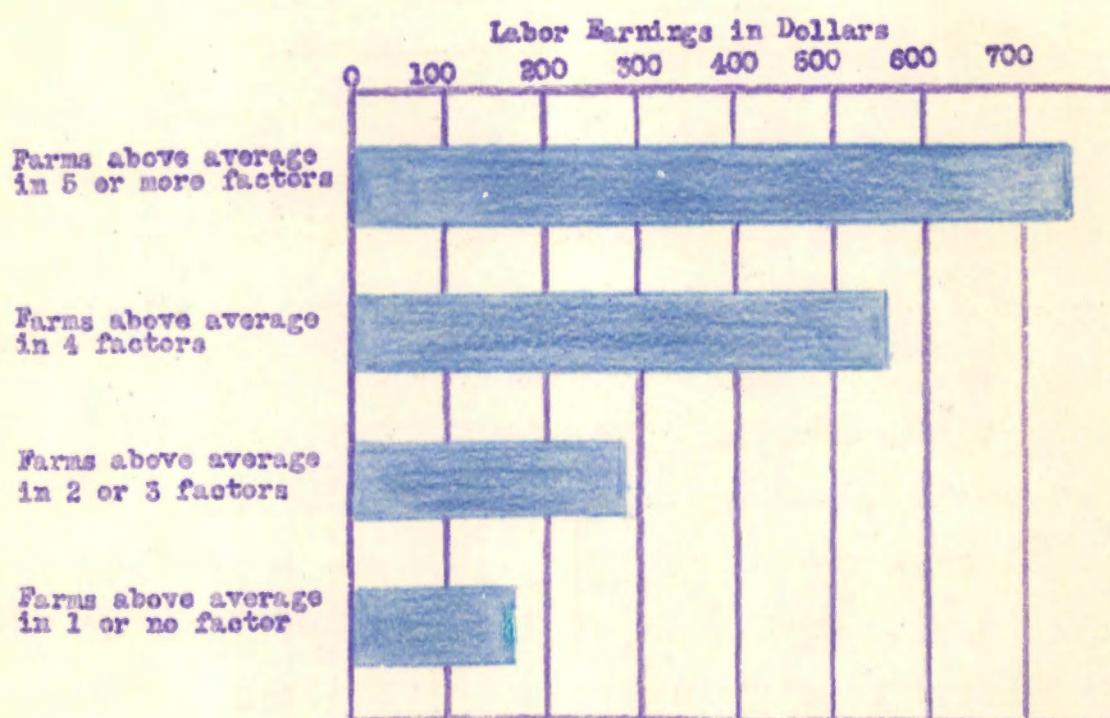


Figure 54. Relation of Number of Factors, in Which Farms Are Above Average, to Labor Earnings, 93 Upland Farms, Roane County, Tennessee, 1939

Source: Table LIV.

TABLE LIV. RELATION OF NUMBER OF FACTORS, IN WHICH FARMS
ARE ABOVE AVERAGE, TO LABOR EARNINGS, 93 UPLAND FARMS,
CIVIL DISTRICT 4, ROANE COUNTY, TENNESSEE,
1939

Number of Factors Above Average	Number of Farms	Average Labor Earnings
Farms above average in one or no factors	16	\$182
Farms above average in 2 or 3 factors	37	287
Farms above average in 4 factors	20	557
Farms above average in 5 or more factors	20	748

There were six farms that were not above average in any factors and four above average in all seven factors. The largest number of the farms were above average in only two or three factors.

As the farms increased in number of factors above average the labor earnings increased (Figure 54). Farms above average in one or no factors had an average labor earnings of \$182; those above average in two or three averaged \$287 of labor earnings. Farms above average in four factors had an average labor earnings of \$557; those above in five or more factors averaged \$748 of labor earnings (Table LIV). One of the farms above average in all seven factors had labor earnings of \$2796.

CHAPTER XI

EXAMPLES OF FARMS WITH HIGHEST AND LOWEST LABOR EARNINGS

To arrive at an understanding of ways and means by which farming in this area or similar areas may be made to give larger farm earnings, it is helpful to observe the organization and management of farms that are both high and low in labor earnings. Whether it is possible for other farmers making average or below average labor earnings to obtain results as good as those of the successful farmers will depend on organization, management, and natural conditions on these farms.

The natural conditions on many of the farms with low labor earnings were just as good as those of the farms with high labor earnings. The organization and management was much more inferior on farms with low labor earnings. Being inferior in but one factor was responsible for low labor earnings on a few farms, but in most cases many factors were involved. Likewise some farms with high incomes were about average in several factors, and above only in one or two important factors. As a rule, however, high income farms were superior in most factors.

It was not possible to determine the detailed operation practices that affected labor earnings of the farms used for illustrations in this chapter, as data available for these farms were only that contained in

the farm business surveys.

Organization and Management of Farms With High Labor

Earnings

Farm A (Labor Earnings \$3204). - This farm was a 169-acre fruit farm, having 57.4 acres of cropland. It is about average in size as measured by acres, and above average in size as measured by number of productive man work units, number of men, and number of horses.

Farm A obtained a yield of 125 bushels of apples per acre and 123 bushels of peaches to the acre.

Cheap land and cheap labor were used in producing the 33.5 acres of peaches and two acres of apples grown on the farm.

Class IV and V land constituted most of the cleared land. There was no Class II land cleared and only 8.4 acres of cleared land as good as Class III.

The owner was relatively efficient in the use of his capital, compared to the other farmers. Over half of his investment was in working capital. He received \$138.38 for every \$100 invested in the farm, and \$3.00 for every \$1.00 of expense.

Type of farming is probably the main reason for the high labor earnings in 1939. Extra heavy yields and good prices of tree fruits were obtained that year in this area.

Farm B (Labor Earnings \$2796). - Many factors contributed to the high earnings of this 373-acre dairy farm. The farm was very large

in all measures of size, related to labor earnings in Chapter V, compared to the average of the 93 farms.

The farm had an investment of \$18,160; it had 224 acres of cropland, 114 acres in crops, 57 animal units, 748 total productive man work units and a man equivalent of 3.3.

Eighty-seven percent of the receipts were from livestock and livestock products (mostly butter). No tobacco was grown. Although this farm had large gross receipts, it also had \$628 worth of perquisites, twice the average value of perquisites for all farms.

Production rate was greatly above average; the farm yielded about 39 bushels of corn to the acre; crop index was 174.8; and livestock production per productive animal unit was \$78, or 164 percent above the average of all farms.

Very efficient use was made of capital, horse labor, and man labor. Every man was able to take care of 33 acres in crops, and every horse was able to take care of 32 acres in crops. This was 14 more acres per horse than what these farms averaged.

To some extent type of farming was responsible for this high income. Whether more farmers could follow dairying is open to question. However, regardless of type, this farm was superior in all factors, showing a positive relationship to labor earnings.

Organization and Management of Farms With Low Labor

Earnings

Farm C (Labor Earnings Minus (-) \$407). - The owner and operator

of this farm is a livestock trader who uses the farm as a place for conducting his business, and does not depend on the farm for a living. It is a livestock farm, obtaining 56 percent of receipts from livestock. There were 444 acres in the farm, but 322 were in woodland, and 113 of cropland. Approximately 47 of the acres of cropland were idle. The farm had approximately three times the investment, and four times the average number of animal units found on the 93 farms.

There were about 21 acres more of Class II land cleared than on the average farm. But there were only 6.1 acres of Class IV, while there were 45 more acres of Class V land cleared than on the average farm.

Most of the crops were fed to low producing livestock. Twenty cows kept mainly for beef produced only 15 calves. These 15 calves sold for only \$300. Only \$16.40 of livestock and livestock products were sold per animal unit.

There were 5 horses on the farm, one to every 11 acres in crops. Three horses should have been enough to take care of all acres in crops.

This farm represents a situation of a large sized business, with moderate soils, yielding good crops, which were fed to low producing livestock, with resulting low labor earnings.

Farm D (Labor Earnings Minus (-) \$92). - The owner of this farm works at a job away from the farm, but he has a wife and a mature son who operate the farm.

There were 119 acres in this farm. It was below average in all measures of size used in this study. The farm had about one half the

average acres in crops, acres of cropland, animal units, investment, and productive man work units.

The farm had no Class II land cleared and only 5.8 acres of III land, the remainder being Classes IV and V land.

Most of the crops were failures, except for corn which yielded 2.4 bushels below average.

The value of items used by the family amounted to \$159, one half the average of all these farms.

One man was cropping only 19 acres, many of which were failures. There were 2.5 horses, or one to every 7.6 acres in crops. The average farmer on the 93 farms had about 18 acres in crops to each horse. Since corn and truck were the only crops harvested, one horse could have taken care of all crops. There were no cattle on this farm; nothing but horses to consume the roughages and pasture. It would take about three or four cows to make efficient use of all the pasture.

The operator received only 13 cents for every dollar of expense.

No work was performed off the farm by the operator. Yet only 66 productive man work units per man were accomplished on the farm. Horse labor was also inefficiently used, as only 29.4 productive horse work units per horse were obtained. This farm excelled in none of the factors that showed a positive relation to labor earnings.

CHAPTER XII

SUMMARY

Findings

This study represents an analysis of the farm business, relation of various factors to labor earnings, and the relation of soils to crop yields on 93 upland farms in the East Tennessee Valley for the farm year 1939.

The average annual temperature for the year at Loudon, the nearest weather station, was 61.1° Fahrenheit, or 2.5° Fahrenheit above normal.

The annual precipitation was 4.0 inches below normal at Loudon, and 2.8 inches below normal at Kingston for the year.

The average size of farm was 157 acres of which approximately 67 acres were in cropland.

About 52 percent of the farm land was in woods; more acreage being devoted to woods than to any other use of land.

An average of 34.1 acres of cropland per farm was used for crops, while 13.2 acres of cropland were idle.

There was an average of 74.3 acres of cleared land per farm. None of this was Class I land. Class II constituted 17.2 percent, Class III 36.2 percent, Class IV 25.3 percent, and Class V 21.3 percent.

In acreage corn was the principal crop with lespedeza second. Wheat was third, but small grains were of minor importance.

Tobacco was an important cash crop and was grown on 73 farms.

Only about two acres per farm were devoted to fruit, garden, and truck crops.

Alfalfa increased from no acres in 1935 to .4 acre per farm in 1939 on these farms.

Rye, alfalfa, and burley tobacco were the only crops yielding above the state average.

Fruits yielded above normal for the area in 1939, and corn below. The remainder of the crops yielded about average or slightly above.

The farms averaged 8.9 animal units per farm. Cattle constituted 5.3 animal units per farm, and horses approximately 1.8.

Chickens were the only livestock reported on all farms. They averaged only .5 animal unit per farm.

The farms averaged 1.36 man equivalent per farm.

The average investment per farm was \$2979 of which 27.3 percent was in working capital.

Gross receipts averaged \$637. Approximately 41 percent of total receipts were from the sale of crops, 33 percent from sale of livestock and livestock products, 2 percent from increase in feed and supplies, and 24 percent from other sources.

Other sources of income amounted to \$157 per farm. Approximately

37 percent of this came from part-time work off the farm.

Total expenses per farm were \$375, current expenses accounting for almost $2/3$ of the total.

The average farm income was \$262 per farm, and the labor income \$113.

Labor earnings averaged \$426 per farm.

House rent and farm products used by the family were valued at \$313 per farm.

Livestock and livestock products supplied 46.6 percent of the value of perquisites. Crops ranked second with 32.9 percent.

Fertilized corn fields yielded approximately 8.2 bushels more corn per acre than unfertilized in 1939.

As soil slope increased in steepness there was a decrease in yield of corn per acre, even within the same soil series.

Soils of the same series decreased in yield more rapidly as slopes became steeper than 15 percent.

Estimated normal corn yields averaged 31.9 bushels per acre on Class II, 24.6 bushels on Class III, 22.8 bushels on Class IV, and 16.4 bushels per acre on Class V.

Corn yields in 1939 on unfertilized fields of Class II averaged 25.6 bushels per acre, Class III 18.5 bushels, Class IV 20.7 bushels, and Class V 15.2 bushels per acre.

Lespedeza and tobacco showed approximately the same relative yields on the land classes as corn in 1939, Class IV outyielding Class III land.

Age of operator appeared to have little effect on labor earnings until the operator was over 60, and then there appeared to be a drop in labor earnings due to the slowing up in physical effort.

Tenants in this area had an average labor earnings of \$349, or \$77 less than owners.

Of the measures of size of business studied total productive man work units and gross receipts were the closest related to labor earnings.

The poorest measures of size in this study as measured by labor earnings were total acres of farm land and man equivalent.

Regardless of measure of size used, small farms (as measured by that factor) were compensated for by work off the farm to some extent.

Labor earnings increased as the acres or percent of cleared land in Class II increased.

Acres of Classes II and III land cleared, and proportion of cleared land in Classes II and III appeared to have no relation to labor earnings.

Except for a few types of farms differing from the prevailing types in this area there was not much difference in average labor earnings among the different commercial farms.

Non-commercial farms had much smaller labor earnings than commercial farms, but this was due to size of business.

The amount of specialization in various enterprises appeared to have little effect on labor earnings, except for tobacco.

As the percent of receipts from tobacco increased labor earnings decreased.

Yield of corn per acre was a good measure of production rate, and the labor earnings were the highest for the farms with the highest yield of corn per acre.

Crop index was closely related to labor earnings.

The value of crops sold per acre in crops was a poor measure of production, as the proportion of crops fed to livestock varied greatly on these farms.

There was a slight increase in labor earnings as livestock receipts per productive animal unit increased, except for those farms with less than \$10 receipts per animal unit.

Farmers receiving under \$15 per \$100 invested in the farm business had much lower labor earnings than those with greater receipts per unit of investment. However, there was not much difference in labor earnings after the receipts were over \$15 per \$100 invested in the farm.

The larger the receipts per \$1.00 of expense the larger were the labor earnings.

Receipts per \$1.00 invested in machinery showed no relation to labor earnings.

Man labor and horse labor efficiency exerted an influence on labor earnings in this study, but the relation of productive horse work units per horse to labor earnings was more positive than was the relation of productive man work units per man.

Acres in crops per horse appeared to be more closely related to labor earnings than any other factor studied.

Other factors measuring balance and closely related to labor earnings were number of sources of receipts greater than the taxes, and number of factors in which the farms were above average.

Acres in crops per man, acres in crops per \$1.00 invested in machinery, and percent of investment in working capital showed some relation to labor earnings.

Farms with an investment between \$5 and \$10 in machinery per acre in crops had higher labor earnings than farms with any other amount invested in machinery.

Acres in crops per productive animal unit showed practically no relation to labor earnings.

Conclusions

Size of farm business was one of the most important factors limiting incomes. It is necessary that the operator have at least 200 or more days of productive work.

In selecting a farm more consideration should be given to acres of cropland or acres suitable for crops than total acres in the farm. Slope of the land should also be considered. Slopes of less than 15 percent in degree of steepness should not differ greatly in land value if the soils are of equal quality otherwise. However, as slopes become steeper than 15 percent economic land values decrease rapidly. The economic value of Class II land is such that an extra price can be paid for it in preference to Classes III or IV, while Class V land should be discounted heavily. Only slightly more should be paid for Class III than for Class IV land.

These farms have an average of 15.8 acres of Class V that is cleared. Much of this should be reforested. On some of the farms part of the V land cleared cannot be reforested, as more intensive use is needed, or it may be desirable to keep some in cultivation so as to maintain fields that are not too irregular in shape. The farms averaged 6.1 acres of Class III and 32.5 acres of Class IV land per farm in forest of which some could be cleared and used for hay or pasture. Probably on most of the farms as many acres of Classes III and IV land

now in woods can be cleared as acres of Class V land are retired to forest. On many farms the Classes III and IV lands in woods lie in patches either too small or too isolated to be profitably cleared.

These farms averaged 13.2 acres of idle cropland per farm, much of which should be seeded to grass or hay.

On most of the farms as much tobacco should be grown as A.A.A. allotments permit; but farmers should not depend on tobacco for most of their income, as the acreage allotted for tobacco is limited. Enough truck and garden crops should be grown to supply all that is needed for home use. Also all farms should produce their own meats, dairy products and eggs. Applications of lime and phosphate should be made on all fields used for crops that have had none applied. More labor should be spent in giving better care to crops to obtain higher yields. This will enable the man operating a small farm to increase his size of business.

The seeding of idle land to hay and grasses will require more horse labor. On most farms this demand can be met by the workstock already on the farm. On some of the smaller farms there will still be too few acres to justify a horse. Unless a farmer can hire his horse out for pay part of the time, he should have at least 12 acres in crops before having a horse. On the other hand a horse should do 100 days or more of productive work and cultivate about 25 or more acres. Tractors cannot replace many of the horses on these farms as the topography is too rough.

With much of the 13 acres of idle cropland seeded to hay, additional fertilizers and lime applied, and more labor used in crop production, the number of cows should be increased by three. There will be need for a slight increase in workstock of about an average of .2 per farm.

If more land is used for hay, equipment for harvesting the crop will be needed on additional farms, since many farms do not now have hay machinery. On the small farms it may be desirable to buy one-horse mowers and rakes, exchange haying equipment, purchase it cooperatively, or hire it. Where none of these are feasible it may be necessary to seed idle cropland to rotation pasture.

The farms should have as much as 15 percent of the investment in working capital, and produce at least \$15 of gross receipts for every \$100 invested in the farm business. Many of the farmers need a higher investment in machinery. An investment between \$5 and \$10 in machinery per acre in crops gives the best results for most farms in this area with the present type of farming.

In this area economies in operation are essential. The farmer should try to keep expenses down so that about \$3 of gross receipts are obtained per \$1.00 of expense. The farm should try to have each man perform 200 or more days of productive work for the year. Unless truck crops, fruit, or other intensive crops are grown about 25 acres in crops should be farmed per man.

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